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GOVERNOR OF HAWAII



**STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES**

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

August 23, 2013

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ESTHER KIA'AINA
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

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HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

Genevieve Salmonson, Interim Director
Office of Environmental Quality Control
Department of Health, State of Hawai'i
235 S. Beretania Street, Room 702
Honolulu, Hawai'i 96813

REC'D OF ENVIRONMENTAL
QUALITY CONTROL
13 AUG 26 PM 2:39
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Dear Ms. Salmonson:

With this letter, the Department of Land and Natural resources, Division of State Parks hereby transmits the draft environmental assessment and anticipated finding of no significant impact (DEA-AFONSI) for the Kiholo State Park Master Plan situated at TMK: (3)7-1-002:008, (3)7-1-002:002, (3)7-1-003:002, (3)7-1-003:009, (3)7-1-003:007, (3)7-1-003:010, in North Kona, on the Island of Hawai'i for publication in the next available edition of the Environmental Notice.

Enclosed is a completed OEQC Publication Form, two copies of the DEA-AFONSI, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

If there are any questions, please contact Lauren Tanaka, State Parks Planner, at (808) 587-0293.

Sincerely,

Daniel S. Quinn
Hawaii State Parks Administrator

Enclosures

FILE COPY

SEP - 8 2013

**AGENCY ACTIONS
SECTION 343-5(B), HRS
PUBLICATION FORM (FEBRUARY 2013 REVISION)**

Project Name: Kīholo State Park Pre-Final Master Plan and Draft Environmental Assessment
Island: Hawai'i
District: North Kona
TMK: (3)7-1-002:008, (3)7-1-002:002, (3)7-1-003:002, (3)7-1-003:009, (3)7-1-003:007,
(3)7-1-003:010
Permits: Chapter 343 Environmental Assessment, NPDES-NOI-(C), Construction on a
State Highway, Grubbing & Grading, and Building Permits
Proposing/Determination Agency: Division of State Parks, Department of Land and Natural
Resources, State of Hawai'i
(Address, Contact Person, Telephone) P.O. Box 621, Honolulu, Hawai'i 96809
Lauren Tanaka, (808) 587-0293

Accepting Authority:
(for EIS submittals only)

Consultant: Planning Solutions, Inc., 210 Ward Avenue, Suite 330, Honolulu, Hawai'i 96814
Perry J. White, (808) 550-4483
(Address, Contact Person, Telephone)

Status (check one only):

- X** DEA-AFNSI Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day comment period ensues upon publication in the periodic bulletin.
- FEA-FONSI** Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
- FEA-EISPN** Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day consultation period ensues upon publication in the periodic bulletin.
- Act 172-12 EISPN** Submit the proposing agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov). NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
- DEIS** The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the DEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
- FEIS** The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
- Section 11-200-23 Determination** The accepting authority simultaneously transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the proposing agency. No comment period ensues upon publication in the periodic bulletin.
- Section 11-200-27 Determination** The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously

accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.

__Withdrawal (explain)

Summary (Provide proposed action and purpose/need in less than 200 words. Please keep the summary brief and on this one page):

Implementation of a proposed Master Plan for Kīholo State Park which will include at least one campground and parking area at Kīholo Bay and an optional additional campground and parking area at Keawaiki Bay. The Master Plan also calls for a new access road into the park from Queen Ka'ahumanu Highway, an optional additional access road to Keawaiki Bay, and other infrastructure improvements including toilets and trash enclosures. The plan also includes the creation of interpretive trails, signs, and archaeological site restoration.

OFFICE OF ENVIRONMENTAL QUALITY CONTROL
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**KĪHOLO STATE PARK
PRE-FINAL MASTER PLAN AND
DRAFT ENVIRONMENTAL ASSESSMENT**



**DIVISION OF STATE PARKS
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE OF HAWAII**



**PREPARED BY:
PLANNING SOLUTIONS, INC.**

AUGUST 2013

PROJECT SUMMARY

Project:	Kīholo State Park Master Plan
Proposing Agency:	Division of State Parks Department of Land and Natural Resources State of Hawai‘i P.O. Box 621 Honolulu, Hawai‘i 96809 Contact: Lauren A. Tanaka (808) 587-0293
Approving Agency:	Board of Land and Natural Resources Kalanimoku Building 1151 Punchbowl St. Honolulu, HI 96813
Location:	Pu‘u Wa‘awa‘a and Pu‘u Anahulu <i>makai</i> of Queen Ka‘ahumanu Highway, Island of Hawai‘i
Proposed Project:	Implementation of Kīholo State Park Master Plan.
Tax Map Key:	(3)7-1-002:008, (3)7-1-002:002, (3)7-1-003:002, (3)7-1-003:009, (3)7-1-003:007, (3)7-1-003:010
Project Area:	4,362 acres
Judicial District:	North Kona
State Land Use District:	Conservation, Agriculture
County Zoning:	Open, A-5a
Required Permits & Approvals:	HRS Chapter 343 Environmental Assessment National Pollutant Discharge Elimination System – Notice of Intent [Construction] (NPDES-NOI[C]) Construction on a State Highway Permit Grubbing & Grading Permit Building Permit
Determination:	Finding of No Significant Impact
Parties Consulted:	See Chapter 11
Consultant:	Planning Solutions, Inc. 210 Ward Avenue, Suite 330 Honolulu, HI 96814 Contact: Perry White (808) 550-4483

TABLE OF CONTENTS

CHAPTER 1 – INTRODUCTION.....1-1

1.1 BACKGROUND.....1-1

 1.1.1 Establishment of the Kīholo State Park Reserve1-1

 1.1.2 Kīholo State Wilderness Park and its Relationship to the Region1-4

 1.1.3 Hawai‘i Experimental Tropical Forest (HETF)1-5

1.2 HAWAIIAN LAND USE AND AHUPUA‘A CONCEPTS1-6

1.3 THE WILDERNESS PARK CONCEPT1-7

1.4 INTERPRETIVE OPPORTUNITIES1-9

1.5 INTERIM MANAGEMENT PLAN 2000-20061-10

1.6 THE ROLE OF THE COMMUNITY1-10

 1.6.1 Pu‘u Wa‘awa‘a Advisory Council1-10

 1.6.2 Hui Aloha Kīholo1-13

1.7 PLANNING PRECEPTS.....1-14

1.8 ORGANIZATION OF THE REPORT.....1-14

1.9 INITIAL ISSUE IDENTIFICATION AND COMMUNITY CONTACTS1-16

 1.9.1 Issue Identification: Individual Consultations1-16

 1.9.1.1 Lack of Management and Resources.....1-17

 1.9.1.2 State Parks Management1-18

 1.9.1.3 Enforcement1-18

 1.9.2 Issue Identification: State Parks.....1-18

 1.9.2.1 Vehicular Access.....1-18

 1.9.2.2 Hiking and Boating Trails1-19

 1.9.2.3 Camping1-19

 1.9.2.4 Lava Tubes1-20

1.10 PUBLIC MEETINGS.....1-20

CHAPTER 2 – NATURAL RESOURCES2-1

2.1 INTRODUCTION.....2-1

2.2 PHYSICAL ENVIRONMENT2-1

 2.2.1 Topography, Geology, and Soils2-1

 2.2.1.1 Topography2-1

 2.2.1.2 Geology2-1

 2.2.1.3 Soils.....2-6

 2.2.1.4 Topographic, Geologic, and Soils Opportunities and Constraints.....2-6

 2.2.2 Climate.....2-7

 2.2.2.1 Temperature2-7

 2.2.2.2 Rainfall.....2-7

 2.2.2.3 Climate Related Opportunities and Constraints2-9

 2.2.3 Hydrology2-10

 2.2.3.1 Surface Water2-10

 2.2.3.2 Groundwater.....2-10

 2.2.3.3 Hydrologic Opportunities and Constraints2-12

 2.2.4 Air Quality2-12

 2.2.4.1 Existing Air Quality at Kīholo2-12

 2.2.4.2 Air Quality Related Opportunities and Constraints2-13

2.3 TERRESTRIAL AND AVIAN BIOTA.....2-13

 2.3.1 Introduction2-13

 2.3.1.1 Purpose of the Biological Surveys2-13

 2.3.1.2 Biological Survey Methods2-15

 2.3.2 Botanical Surveys2-16

 2.3.2.1 Flora Present.....2-16

 2.3.2.2 Botanical Resources: Opportunities and Constraints2-23

 2.3.3 Avian and Mammalian Biota2-24

 2.3.3.1 Avian Species Present2-24

2.3.3.2 Mammalian Species Present..... 2-26

2.3.3.3 Avian and Mammalian Resources: Opportunities and Constraints 2-26

2.3.4 Invertebrates..... 2-27

2.3.4.1 Observed Species 2-27

2.3.4.2 Invertebrate Species: Opportunities and Constraints..... 2-27

2.4 AQUATIC RESOURCES 2-30

2.4.1 Overview of the Nearshore Environment 2-30

2.4.1.1 Background 2-30

2.4.1.2 Kīholo Bay Fisheries Management Area..... 2-31

2.4.2 Marine Environment 2-32

2.4.2.1 Water Quality 2-32

2.4.3 Marine Biota 2-33

2.4.3.1 Coral Communities..... 2-33

2.4.3.2 Fish Abundance..... 2-34

2.4.3.3 Molluscan Communities..... 2-37

2.4.3.4 Marine Mammals and Sea Turtles..... 2-41

2.4.3.5 Marine-Related Opportunities and Constraints 2-43

2.4.4 Kīholo Lagoon 2-44

2.4.4.1 Introduction 2-44

2.4.4.2 Temperature, Electrical Conductivity, and Dissolved Oxygen Concentration..... 2-44

2.4.4.3 Pond Biota..... 2-45

2.4.4.4 Micromollusks..... 2-45

2.4.4.5 Kīholo Lagoon-Related Opportunities and Constraints..... 2-45

2.4.5 Anchialine Ponds 2-46

2.4.5.1 Anchialine Pond Overview..... 2-46

2.4.5.2 Assessment of Anchialine Resources 2-47

2.4.5.3 Anchialine Pond-Related Opportunities and Constraints 2-48

2.5 SCENIC RESOURCES..... 2-49

2.5.1 Overview of the Resource..... 2-49

2.5.2 Scenic Resources: Opportunities and Constraints..... 2-49

2.6 EXISTING INFRASTRUCTURE..... 2-49

2.6.1 Existing Roadways and Trails..... 2-49

2.6.1.1 Characteristics and Constraints of Existing Roadways 2-49

2.6.1.2 Existing Trails and Paths within Kīholo State Park Reserve..... 2-55

2.6.1.3 Road Maintenance 2-59

2.6.1.4 Parking Areas 2-59

2.6.2 Existing Structures..... 2-60

2.6.3 Electrical Power and Communication Facilities 2-62

2.6.3.1 Electrical Power Service 2-62

2.6.3.2 Telecommunications Service..... 2-62

2.6.4 Water Supply and Wastewater Treatment and Disposal 2-62

2.6.4.1 Existing Water Supply Facilities 2-62

2.6.4.2 Existing Wastewater Treatment and Disposal Facilities 2-62

CHAPTER 3 – CULTURAL RESOURCES 3-1

3.1 OVERVIEW OF KĪHOLO 3-1

3.2 TRADITIONS AND LEGENDARY SITES 3-2

3.2.1 Introduction..... 3-2

3.2.2 Legends..... 3-3

3.2.2.1 The Legend of Kaulanapoki‘i..... 3-3

3.2.2.2 The Legend of Ke-Ahu-a-Lono..... 3-3

3.2.2.3 Native Traditions Recorded by Ka‘ohuha‘aheoinākuahiwi‘ekolu (J.W.H.I. Kihe)..... 3-4

3.2.3 Early Post-Contact Records and Reports 3-9

3.2.3.1 ‘Ōmu‘o Ceremony at Luahinewai and the Dedication of Pu‘u Koholā..... 3-9

3.2.3.2 Kekaha in the Eruptions of 1800-1801 3-11

3.2.3.3 An Account of Kekaha: 1812 to 1814..... 3-12

3.2.4 Archaeological Resources (Sites, Burials, and Artifacts) 3-12

3.2.4.1 T. Thrum (1908) and J.F.G. Stokes (1906-1909).....3-12

3.2.4.2 Archaeology of Kona, Hawai‘i (Reinecke ms. 1930)3-13

3.2.4.3 Handy, Handy and Pukui (1972).....3-14

3.2.4.4 Archaeological Reconnaissance Survey (1999)3-14

3.2.4.5 Archaeological Field Work Conducted for the Present Master Plan.....3-18

3.3 POST-CONTACT HISTORY OF KĪHOLO3-20

3.3.1 Post-Contact Land Use Patterns.....3-20

3.3.2 Descriptions in the Journals and Articles of Historic Visitors (1778-1902)3-20

3.3.2.1 Observations by Captain James Cook and Crew (1778-1779).....3-20

3.3.2.2 Journal of Captain George Vancouver3-20

3.3.2.3 The Journal of William Ellis3-21

3.3.2.4 The Journals of Lorenzo Lyons and Cochrane Forbes (1835-1859)3-22

3.3.2.5 Mai Kailua a hiki i Kīholo – From Kailua to Kīholo (1875).....3-23

3.3.2.6 Travel Along the Coastal Roads and Trails in 1880.....3-23

3.3.2.7 The Roads of Kohala and Kona (1902).....3-25

3.3.2.8 Ka Huaka‘i Lawai‘a i Kapalaoa – The Fishing Trip to Kapalaoa3-25

3.3.3 Post Contact Population and Land Use.....3-28

3.3.3.1 Population3-28

3.3.3.2 Land Use3-29

3.3.3.3 Trails and Access3-30

3.3.4 Cultural and Seasonal Traditions3-32

3.4 ORAL HISTORICAL ACCOUNTS FROM THE FAMILIES OF NĀPU‘U3-33

3.4.1 Overview and Methodology of the Kīholo–Nāpu‘u Oral History Programs3-33

3.4.2 Overview of Kama‘āina Documentation and Recommendations3-35

3.4.2.1 September 6, 2011, Kīholo State Wilderness Park Oral History Interviews3-37

3.4.2.2 September 7, 2011, Kīholo State Wilderness Park Oral History Interviews3-38

3.5 OPPORTUNITIES & CONSTRAINTS RELEVANT TO THE MASTER PLAN.....3-39

3.5.1 Introduction3-39

3.5.2 Opportunities and Constraints Related to Physical Features3-39

3.5.2.1 Habitation Sites and Structures: Opportunities and Constraints.....3-39

3.5.2.2 Trails: Opportunities and Constraints.....3-40

3.5.2.3 Special-Function Features: Opportunities and Constraints3-40

3.5.2.4 Petroglyphs: Opportunities and Constraints3-41

3.5.2.5 Utilized Lava Tubes: Opportunities and Constraints3-43

3.5.2.6 Anchialine Pools: Opportunities and Constraints.....3-44

3.5.3 Opportunities and Constraints Related to Cultural/Historical Programs3-44

CHAPTER 4 – PARK OPPORTUNITIES4-1

4.1 CAMPING OPPORTUNITIES.....4-1

4.2 HIKING OPPORTUNITIES4-2

4.3 BIKING OPPORTUNITIES4-6

4.4 PICNICKING4-6

4.5 LAVA TUBES4-6

4.6 OCEAN RECREATION OPPORTUNITIES4-6

4.7 INTERPRETIVE AND EDUCATIONAL PROGRAM OPPORTUNITIES.....4-7

CHAPTER 5 – MASTER PLAN ALTERNATIVES5-1

5.1 INTRODUCTION.....5-1

5.1.1 Physical Design Alternatives5-1

5.1.2 Habitat Management and Interpretive Program Modules5-1

5.1.3 Common Features5-2

5.1.4 Organization of the Chapter.....5-3

5.2 ALT-1: FOCUSED CAMPING/ACCESS ALTERNATIVE5-3

5.2.1 Focused Camping/Access Alternative Vision and Objectives.....5-3

5.2.2 Principal Features of the Focused Camping/Access Alternative5-4

5.2.3 Infrastructure for Focused Camping Alternative5-7

5.2.3.1 Kīholo Bay Access from Highway.....5-7

5.2.3.2 Campsites 5-10

5.2.3.1 Picnic Areas..... 5-10

5.2.4 Park Operations and Management for Focused Camping Alternative 5-12

5.2.4.1 Staffing 5-12

5.2.4.2 Service Groups and Volunteers 5-14

5.2.4.3 Park ‘Ohana..... 5-15

5.2.4.4 Park Safety and Security 5-15

5.2.4.5 Utilities and Telecommunications..... 5-16

5.2.4.6 Curatorship Volunteers..... 5-16

5.2.4.7 Warnings and Protection from Natural Hazards..... 5-17

5.2.5 Park Maintenance For the Focused Camping Alternative..... 5-18

5.2.5.1 Solid Waste 5-18

5.2.5.2 Restroom Facilities..... 5-19

5.2.5.3 Vandalism and Theft 5-20

5.2.5.4 Long-Term Facility Maintenance..... 5-21

5.2.6 Caves Management Plan..... 5-21

5.2.6.1 Purpose of Caves Management Plan 5-21

5.2.6.2 Types of Caves Present 5-21

5.2.6.3 Caves Management Options..... 5-21

5.2.7 Trail Management..... 5-23

5.2.7.1 Purpose of Trails and Trail Development..... 5-23

5.2.7.2 Managing and Protecting Resources Along Trails 5-23

5.2.7.3 Trail Development and Maintenance 5-24

5.2.8 Cultural Resource Interpretive Plan..... 5-25

5.2.8.1 Criteria for Inclusion of Cultural Resources in the Interpretive Plan 5-25

5.2.8.2 Cultural Resource Interpretive Plan Outline..... 5-26

5.2.9 Endangered Species Management Plan 5-38

5.2.10 Commercial Activity Management Plan..... 5-39

5.3 ALT-2: MULTI-NODE CAMPING/ACCESS ALTERNATIVE..... 5-39

5.3.1 Vision for Multi-Node Camping/Access Alternative..... 5-39

5.3.2 Objectives of Multi-Node Camping/Access Alternative 5-40

5.3.3 Principal Features of Multi-Node Camping/Access Alternative..... 5-40

5.3.3.1 Additional Infrastructure Serving Keawaiki Bay 5-41

5.3.3.2 Additional (Relative to ALT-1) Operations and Management..... 5-43

5.3.3.3 Park Maintenance Activities Not Included in ALT-1..... 5-44

5.3.3.4 Trail Management Not Included in ALT-1 5-44

5.4 ALT-3: PARK RESERVE ALTERNATIVE 5-44

CHAPTER 6 – MANAGEMENT PROGRAM MODULES..... 6-1

6.1 VEGETATION MANAGEMENT AND UNGULATE CONTROL 6-1

6.1.1 Vegetation Restoration and Management..... 6-1

6.1.2 Feral Ungulate Control 6-2

6.2 ARCHAEOLOGICAL AND CULTURAL INTERPRETATION 6-3

6.3 POND RESTORATION 6-4

6.3.1 Anchialine Ponds 6-4

6.3.2 Fish Ponds..... 6-4

6.4 LORETTA LYNN HOUSE RENOVATION..... 6-5

6.5 FISHERIES MANAGEMENT 6-6

6.6 STARLIGHT RESERVE 6-6

CHAPTER 7 – PARK MANAGEMENT AND BUDGET 7-1

7.1 CAPITAL IMPROVEMENTS..... 7-1

7.2 PARK OPERATIONS AND COSTS 7-2

7.2.1 Staffing 7-2

7.2.1.1 State Parks Staffing 7-2

7.2.1.2 DLNR Technical Staff..... 7-2

7.2.1.3 Curator Program Staff, Docents, and Volunteers 7-2

7.2.2 Park Safety and Security 7-3

7.2.2.1 Gates.....7-3
 7.2.2.2 Natural Hazard Warning and Fire Plan7-3
 7.2.2.3 Emergency Telecommunications7-3
 7.2.3 Park Maintenance7-3
 7.2.3.1 Restroom Facilities.....7-3
 7.2.3.2 Solid Waste Storage, Collection, and Disposal7-3
 7.2.3.3 Annual Park Maintenance and Replacement Costs7-4
 7.3 COMMERCIAL USES.....7-4

CHAPTER 8 – ENVIRONMENTAL ASSESSMENT 8-1

8.1 BACKGROUND SUMMARY8-1
 8.2 TOPOGRAPHY, GEOLOGY, AND SOILS.....8-1
 8.2.1 Construction Period Impacts.....8-1
 8.2.2 Operational Impacts8-2
 8.3 CLIMATE AND MICRO-CLIMATE.....8-2
 8.4 HYDROLOGY8-2
 8.4.1 Impacts on Surface Water Features8-2
 8.4.2 Impacts to Groundwater.....8-2
 8.5 AIR QUALITY8-3
 8.5.1 Construction Period Impacts.....8-3
 8.5.2 Operation and Maintenance Period Impacts8-3
 8.6 TERRESTRIAL AND AVIAN BIOTA.....8-3
 8.6.1 Probable Impacts to Botanical Resources8-3
 8.6.2 Probable Impacts to Avian and Mammalian Resources8-4
 8.6.3 Probable Impacts to Invertebrate Resources8-5
 8.7 AQUATIC RESOURCES8-5
 8.7.1 Probable Impacts to the Nearshore and Marine Environment8-5
 8.7.2 Probable Impacts to Nearshore and Marine Biota8-5
 8.7.3 Probable Impacts to Anchialine Ponds8-6
 8.8 SCENIC RESOURCES8-7
 8.9 EXISTING INFRASTRUCTURE.....8-7
 8.9.1 Probable Impacts to Existing Roadways.....8-7
 8.9.2 Probable Impacts to Existing Trails.....8-8
 8.9.3 Probable Impacts to Existing Structures8-8
 8.9.4 Probable Impacts to Electrical and Communications Facilities.....8-8
 8.9.5 Probable Impacts to Other Public Infrastructure.....8-9
 8.10 HISTORICAL AND ARCHAEOLOGICAL IMPACTS8-9
 8.10.1 Improvements with Potential to Impact Archaeology and Mitigation8-9
 8.10.1.1 Queen Ka‘ahumanu Highway Kīholo Bay Access Road Modifications8-9
 8.10.1.2 Keawaiki Bay Access Road8-10
 8.10.1.3 Proposed New Campsites8-10
 8.10.2 Increased Visitor Presence.....8-10
 8.11 CULTURAL IMPACT ASSESSMENT.....8-11
 8.11.1 Regulatory Framework8-11
 8.11.2 Summary of Previous Research.....8-12
 8.11.2.1 Archaeological Research.....8-12
 8.11.2.3 Cultural and Historical Research.....8-14
 8.11.3 Consultation Methodology8-14
 8.11.4 Interview Selection Process8-15
 8.11.5 Ethnographic-Oral History Methodology8-15
 8.11.6 Biographical Information of Interviewees8-17
 8.11.7 Historical and Archival Research8-18
 8.11.8 Confidential Information8-18
 8.11.9 Analysis of Impacts8-18
 8.11.10 References Cited8-20

CHAPTER 9 – RELATIONSHIP TO EXISTING PLANS, POLICIES, AND CONTROLS.... 9-1

9.1 FEDERAL LAW 9-1

 9.1.1 Americans with Disabilities Act of 1990 9-1

 9.1.2 Discussion 9-1

9.2 STATE OF HAWAI‘I 9-1

 9.2.1 Hawai‘i State Plan 9-1

 9.2.2 State Functional Plans 9-2

 9.2.3 Hawai‘i 2050 Sustainability Plan 9-4

 9.2.4 Coastal Zone Management (CZM) Program 9-6

 9.2.4.1 Recreational Resources 9-6

 9.2.4.2 Historic Resources 9-7

 9.2.4.3 Scenic and Open Space Resources 9-7

 9.2.4.4 Coastal Ecosystems 9-7

 9.2.4.5 Economic Uses 9-8

 9.2.4.6 Coastal Hazards 9-8

 9.2.4.7 Managing Development 9-8

 9.2.4.8 Public Participation 9-8

 9.2.4.9 Beach Protection 9-9

 9.2.4.10 Marine Resources 9-9

 9.2.4.11 Kīholo State Park Master Plan Consistency with CZM Program 9-9

 9.2.5 Hawai‘i Revised Statutes Chapter 205 State Land Use Law 9-10

 9.2.5.1 §205-2 Districting and Classification of Lands 9-10

9.3 HAWAI‘I COUNTY 9-11

 9.3.1 County of Hawai‘i General Plan 9-11

 9.3.2 Special Management Area (SMA) HRS §205A-26 9-13

9.5 REQUIRED APPROVALS 9-15

CHAPTER 10 – ANTICIPATED DETERMINATION 10-1

10.1 SIGNIFICANCE CRITERIA 10-1

10.2 FINDINGS 10-2

 10.2.1 Irrevocable Loss or Destruction of Valuable Resource 10-2

 10.2.2 Curtails Beneficial Uses 10-2

 10.2.3 Conflicts with Long-Term Environmental Policies or Goals 10-2

 10.2.4 Substantially Affects Economic or Social Welfare 10-2

 10.2.5 Public Health Effects 10-2

 10.2.6 Produce Substantial Secondary Impacts 10-3

 10.2.7 Substantially Degrade Environmental Quality 10-3

 10.2.8 Cumulative Effects or Commitment to a Larger Action 10-3

 10.2.9 Effects on Rare, Threatened, or Endangered Species 10-3

 10.2.10 Affects Air or Water Quality or Ambient Noise Levels 10-3

 10.2.11 Environmentally Sensitive Areas 10-3

 10.2.12 Affects Scenic Vistas and View planes 10-4

 10.2.13 Requires Substantial Energy Consumption 10-4

10.3 DETERMINATION 10-4

CHAPTER 11 – AGENCIES AND PARTIES CONSULTED 11-1

CHAPTER 12 – REFERENCES CITED 12-1

APPENDIX A. CURATORSHIP AGREEMENT A-1

APPENDIX B. PUBLIC MEETING MATERIALS B-1

APPENDIX C. SURVEY OF TERRESTRIAL INVERTEBRATE RESOURCES AT KĪHOLO C-1

APPENDIX D. BIOLOGICAL SURVEY D-1

LIST OF FIGURES

Figure 1.1	Kīholo State Park Reserve Location Map.....	1-2
Figure 1.2	Vicinity Map.....	1-3
Figure 2.1	Recent Lava Flows in Project Area.....	2-2
Figure 2.2	Hazards from Lava Flows in the Kīholo Area.....	2-3
Figure 2.3	Groundwater Monitoring Network Well Locations.....	2-11
Figure 2.4	Groundwater Levels at USGS monitoring well 2.7 Miles Inland of Kīholo Bay.....	2-12
Figure 2.5	Overall Vegetation Map for Kīholo State Park Reserve.....	2-19
Figure 2.6	Vegetation Map: Southern Portion of Kīholo State Park Reserve.....	2-20
Figure 2.7	Vegetation Map: South Central Portion of Kīholo State Park Reserve.....	2-20
Figure 2.8	Vegetation Map: Northern Portion of Kīholo State Park Reserve.....	2-21
Figure 2.9	Photographs of Vegetation Types.....	2-22
Figure 2.10	Photos of Kīholo Lagoon.....	2-31
Figure 2.11	Herbivorous Fish Abundance and Biomass at Kīholo Bay.....	2-34
Figure 2.12	Hawaiian Islands Humpback Whale National Marine Sanctuary.....	2-42
Figure 2.13	Kīholo Bay.....	2-44
Figure 2.14	Existing 2-Wheel Drive Roadways within Kīholo State Park Reserve.....	2-50
Figure 2.15	Photographs of Existing Road Intersections with Queen Ka‘ahumanu Highway.....	2-52
Figure 2.16	Photographs of Typical 2-Wheel Drive Roads within the Park.....	2-53
Figure 2.17	Typical 4-Wheel Drive Roads within the Park.....	2-54
Figure 2.18	Photographs of Typical Foot Trails within Kīholo State Park Reserve.....	2-56
Figure 2.19	Ala Kahakai National Historic Trail.....	2-57
Figure 2.20	Typical Parking Areas, November 2011.....	2-60
Figure 2.21	Photographs of Former Loretta Lynn House and Surroundings.....	2-61
Figure 2.22	Water System and Service Areas.....	2-63
Figure 3.1	Reinecke Map of Coastal Sites and Features of Pu‘u Wa‘awa‘a-Pu‘u Anahulu.....	3-16
Figure 4.1	Recreational Opportunities at Kīholo State Park.....	4-3
Figure 4.2	Ala Kahakai Corridor through Kīholo State Park.....	4-5
Figure 5.1	Principal Features of the Focused Camping Alternative: Kīholo Bay Area.....	5-5
Figure 5.2	Proposed Queen Ka‘ahumanu Highway – Kīholo Bay Access Concept.....	5-9
Figure 5.3	Prototypical Campsites: Kīholo Bay.....	5-11
Figure 5.4	Expanded Camping Opportunities at Kīholo Bay.....	5-12
Figure 5.5	Design Concept for Trash Bin Enclosure.....	5-19
Figure 5.6	Design Concepts for Portable Toilet Enclosures.....	5-19
Figure 5.7	Location of Interpretive Site 1.....	5-29
Figure 5.8	Site 1: South Kīholo Bay Cattle Ranching Features.....	5-29
Figure 5.9	Location of Interpretive Site 2.....	5-31
Figure 5.10	Site 2: High Status Residence and Hōlua near Central Kīholo Bay.....	5-32
Figure 5.11	Location of Interpretive Site 4.....	5-33
Figure 5.12	Site 4: Hōlua and High Status Residential Complex.....	5-34
Figure 5.13	Location of Interpretive Site 5.....	5-35
Figure 5.14	Site 5: King’s Trail Petroglyph Field and Abrading Pits.....	5-36
Figure 5.15	Location of Interpretive Site 6.....	5-37
Figure 5.16	Site 6: Salt Pans at South Kīholo Bay.....	5-38
Figure 5.17	Location of Interpretive Site 7.....	5-38
Figure 5.18	Conceptual Layout of Keawaiki Bay Campsite and Access Road.....	5-41
Figure 5.19	Photographs of Existing Conditions at Keawaiki Bay.....	5-42
Figure 8.1	General Question Outline for Oral History Interviews.....	8-16

LIST OF TABLES

Table 1.1	State Parks Classification System.....	1-8
Table 1.2	Pu‘u Wa‘awa‘a Advisory Council Management Plan Objectives Related to the Kīholo State Park Reserve	1-11
Table 1.3	Initial Public Consultation Meetings/Discussions	1-17
Table 1.4	Kīholo State Park Reserve Public Meeting in Kona, September 26, 2011	1-21
Table 1.5	Kīholo State Park Reserve Public Meeting in Hilo, September 27, 2011	1-22
Table 2.1	Destructive Earthquakes in Hawai‘i County Since 1868	2-5
Table 2.2	Climatologic Averages: Keahole Airport: January 1998 to December 2008	2-8
Table 2.3	Sustainable Yield and Pumpage – Hualālai Aquifer Sector Area	2-12
Table 2.4	DOH Guidance on Short-term Sulfur Dioxide (SO ₂) Advisory Levels.....	2-14
Table 2.5	List of Flowering Plants (Dicotyledones) from Kīholo State Park Reserve.....	2-17
Table 2.6	Avian Species Detected Within Kīholo State Park Reserve.....	2-25
Table 2.7	Invertebrates: Kīholo State Park Reserve.....	2-28
Table 2.8	Nearshore Water Quality in the Kīholo Area	2-32
Table 2.9	Mean Biomass and Abundance for Fish Species at Kīholo.....	2-34
Table 2.10	WHAP Monitoring Sites with Corresponding Coordinates and Depth.....	2-38
Table 2.11	Relative Abundance of Fish at WHAP Sites 05, 06, and 07	2-40
Table 2.12	Molluscan Assemblages Described by Young et al. in April, 1977	2-41
Table 2.13	Substrates and Associated Macrobenthos of Kīholo Lagoon.	2-46
Table 3.1	Archaeological Sites Reported by Reinecke in 1930	3-15
Table 3.2	Sites Recorded During 1999 Archaeological Survey	3-17
Table 3.3	Data Files from Archaeological Field Work for Kīholo State Park Reserve.....	3-19
Table 3.4	Summary of Feature Types at Kīholo State Park Reserve.....	3-19
Table 3.5	Sites Suitable for Visitation.....	3-42
Table 3.6	Sample Kīholo Archaeological Reconnaissance Site Data for Burial Site.....	3-44
Table 4.1	Kīholo Camping Statistics: FY2012.....	4-2
Table 5.1	Summary of Master Plan Alternatives.....	5-2
Table 5.2	Types of Caves Present at Kīholo State Park Reserve	5-22
Table 5.3	Sites Selected for Visitation and Interpretation	5-28
Table 6.1	Requirements for Successful Ungulate Population Control	6-2
Table 6.2	Summary of Animal Removal Techniques from Fenced or Isolated Population	6-3
Table 6.3	Starlight Reserve Categories	6-7
Table 7.1	Capital Improvement Cost Estimates	7-1
Table 7.2	Operating Cost Budget: Personnel	7-2
Table 8.1	Guidelines for Assessing Cultural Impacts.....	8-13
Table 8.2	September 6 and 7, 2011 Oral History Interviewees and Attendees	8-17
Table 9.1	Relevant Objectives, Policies, and Actions in State Functional Plans	9-3
Table 9.2	Relevant Provisions of the <i>Sustainability Plan</i>	9-5
Table 9.3	Hawai‘i County General Plan Goals and Objectives.....	9-12
Table 9.4	HRS §205A-26 Special Management Area Guidelines.....	9-14
Table 9.5	Required Approvals and Permits for Kīholo State Park Master Plan.....	9-15
Table 11.1	Agencies, Organizations, and Individuals Being Asked to Comment.....	11-2

CHAPTER 1 – INTRODUCTION

This document contains the Pre-Final Master Plan and Draft Environmental Assessment for Kīholo State Park.¹ The report draws upon the Background Research, Alternative Visions, and Framework Master Plan documents. It summarizes the data and analyses that have been conducted, identifies interpretive themes appropriate to the park’s resources, and documents community and public input received in the planning process. An integral aspect of this report is a discussion of fundamental development alternatives under consideration, presenting advantages and disadvantages in the light of the goals and objectives which have been established for Kīholo State Park. The Pre-Final Master Plan includes implementation strategies, resource management policies and plans, and cost estimates. The Final Master Plan will be developed in accordance with its companion document, the Kīholo State Park Final Environmental Assessment (FEA).

1.1 BACKGROUND

1.1.1 ESTABLISHMENT OF THE KĪHOLO STATE PARK RESERVE

On January 25, 2002 the Board of Land and Natural Resources transferred responsibility for State managed lands within the ahupua‘a of Pu‘u Wa‘awa‘a and Pu‘u Anahulu from its Land Division to the Divisions of Forestry and Wildlife (DOFAW) and State Parks. The portion that was made the responsibility of the Division of State Parks was designated the Kīholo State Park Reserve.

The Kīholo State Park Reserve is comprised of 4,362 acres and includes an 8-mile long wild coastline along the Kona Coast of the Island of Hawai‘i (see Figure 1.1 and Figure 1.2). The boundaries of the reserve are defined by Queen Ka‘ahumanu Highway on the east, the Pu‘u Wa‘awa‘a/Ka‘ūpūlehu district boundary on the south, the shoreline on the west, and the Pu‘u Anahulu/‘Anaeho‘omalu *ahupua‘a* boundary on the north.² The area is identified by TMKs: 7-1-02: 02 and 08 and 7-1-03: 02 and 07. Kīholo Bay and the surrounding land area contains noteworthy natural, cultural, and scenic resources that includes the extensive coastal wildland environment with beaches at Kīholo Bay and Keawaiki Bay, anchialine ponds, the Ala Kahakai (the national, historic coastal trail), lava tubes and flows, and archaeological features. The area is also a notable foraging and nesting area for the *honu* (green sea turtle).

Subsequent to the Board’s action, DOFAW and State Parks worked both internally and with the Pu‘u Wa‘awa‘a Advisory Council (PAC) to prepare a management plan for the area. The PAC’s management plan, which was issued on July 15, 2003, included Pu‘u Wa‘awa‘a and the lands of Pu‘u Anahulu *makai* of Queen Ka‘ahumanu Highway (i.e., the portion of the *ahupua‘a* that is within Kīholo State Park Reserve). The plan was intended to provide the basis and guidelines for managing the area in a manner that emulates the traditional Hawaiian concept of *ahupua‘a* management.

¹ In terms of nomenclature, this report refers to the park in the past as “Kīholo State Park Reserve” reflecting its longstanding designation as a Park Reserve. In referring to the park in the future, we name it “Kīholo State Wilderness Park” reflecting its intended future designation as a Wilderness Park. Finally, where the report discusses the park in general terms, it refers to it as “Kīholo State Park”. For a discussion of the meaning of Reserve versus Wilderness classifications, please see Section 1.3 and Table 1.1.

² Hawaiian is both the language of Hawai‘i and, per the Hawai‘i State Constitution, an official language of the State of Hawai‘i. As such, Hawaiian language is used liberally throughout this document. Diacritical markings are used by the authors of this document, but where Hawaiian language appears in cited sources, the use or non-use of diacritical markings is used in a manner true and consistent to the original text.

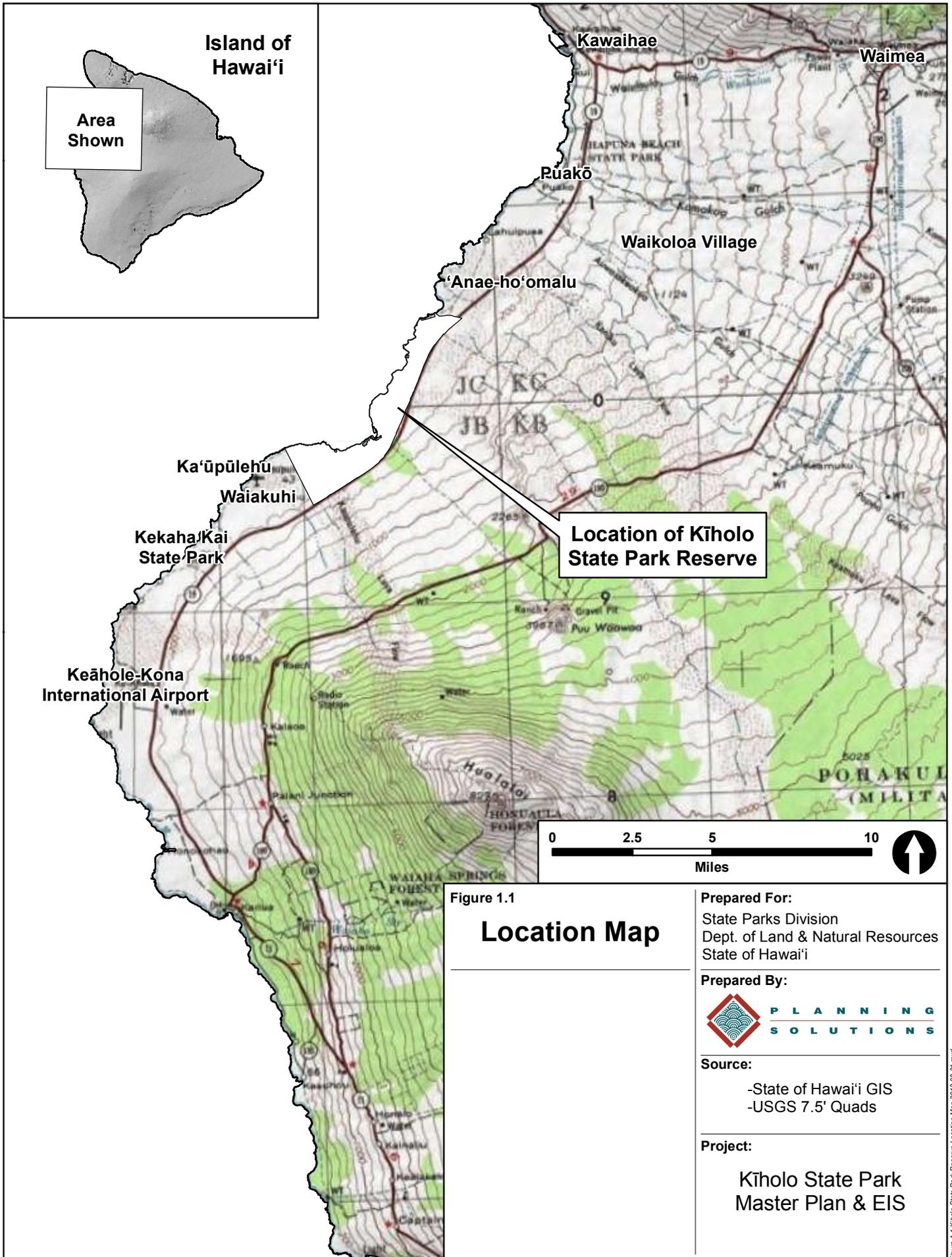


Figure 1.1

Location Map

Prepared For:
 State Parks Division
 Dept. of Land & Natural Resources
 State of Hawai'i

Prepared By:



Source:

- State of Hawai'i GIS
- USGS 7.5' Quads

Project:

Kīholo State Park
 Master Plan & EIS

Figure 1.2

Vicinity Map

Legend:

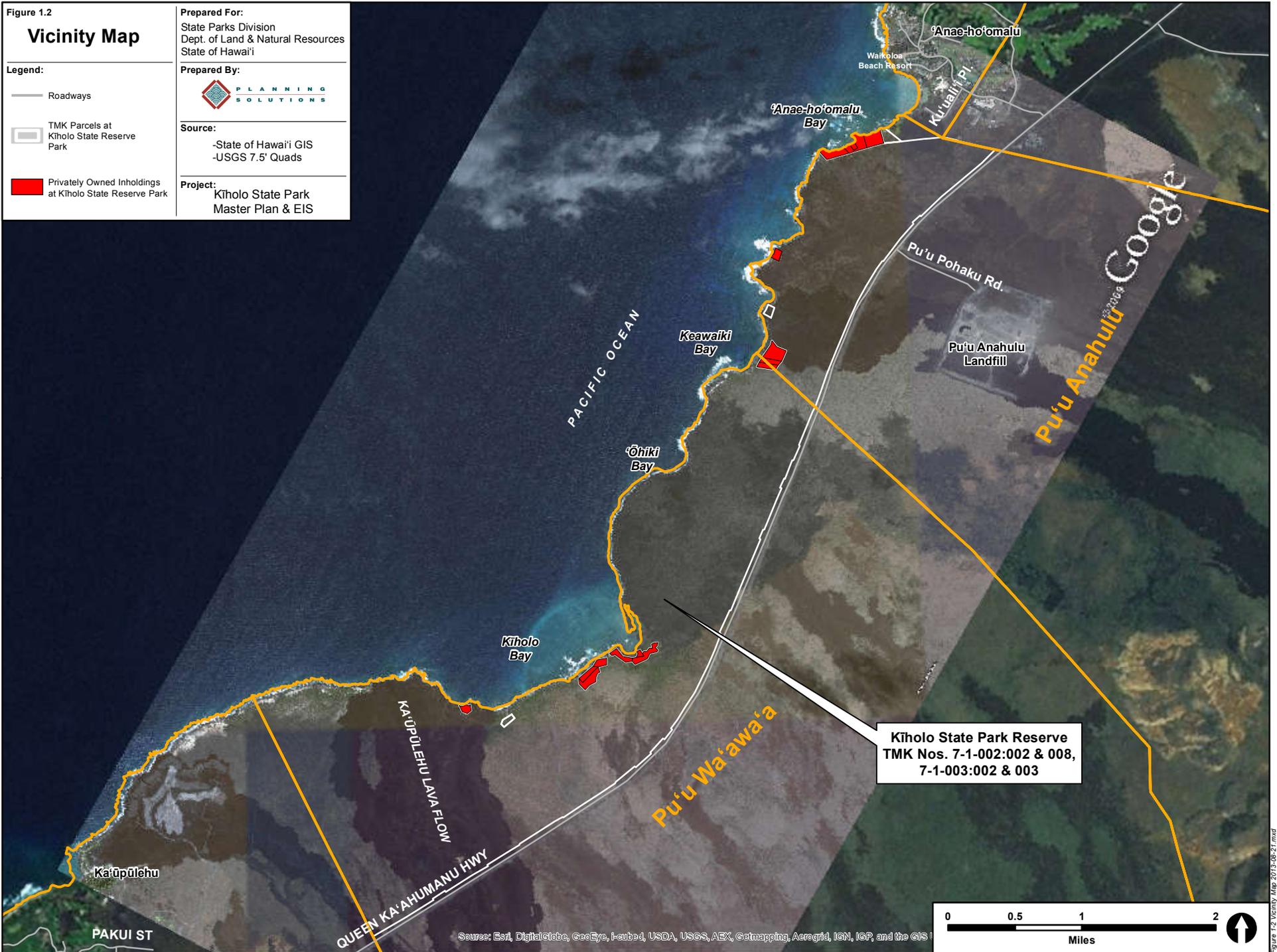
-  Roadways
-  TMK Parcels at Kiholo State Reserve Park
-  Privately Owned Inholdings at Kiholo State Reserve Park

Prepared For:
 State Parks Division
 Dept. of Land & Natural Resources
 State of Hawai'i

Prepared By:


Source:
 -State of Hawai'i GIS
 -USGS 7.5' Quads

Project:
 Kiholo State Park
 Master Plan & EIS



Source: Esri, DigitalGlobe, GeoEye, I-cubed, USDA, USGS, AEX, Getmapping, Aergrid, IGN, IGP, and the GIS

1.1.2 KĪHOLO STATE WILDERNESS PARK AND ITS RELATIONSHIP TO THE REGION

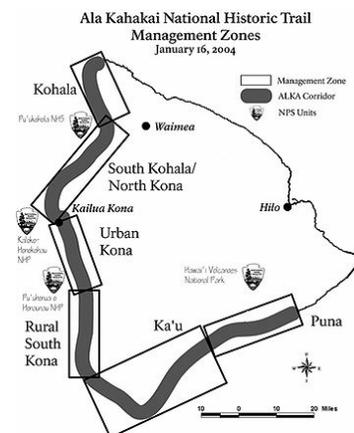
Presently, Kīholo State Park is designated according to State Parks' system of classification, as a "Park Reserve" (i.e., an area which has been set aside for park purposes, but which is not currently developed for use as a park). State Parks has now made the determination that Kīholo shall now be developed as a "Wilderness Park" area with a natural, primitive character without human habitation and offering passive wilderness recreation opportunities such as hiking and camping (see Section 1.3 for additional information). Kīholo State Park is one of a string of coastal parks on the Kona coast maintained by the Division of State Parks. The park environment and amenities will provide the community and visitors with recreational resources while preserving and protecting the natural and cultural heritage of the area for future generations. Maintaining the area as a wilderness will ensure access to open space for the growing communities of the Kona Coast and help meet the increasing demand for recreational opportunities.

Within this regional context, Kīholo State Park is one of two completed wilderness parks on the Kona Coast (the other is Kekaha Kai State Park). These areas will emphasize a careful balance between public demand for recreational space and sustainable management of natural and cultural resources. The diverse biota and culturally significant resources and artifacts within the park will be preserved while modern facilities and amenities within the park will be limited to specific nodes where their impact and maintenance can be more carefully managed.

The relatively pristine, wide-open natural spaces which the park encompasses will be protected and enhanced to the extent practicable, with recreational uses limited to passive uses compatible with an untouched natural environment, such as hiking, camping, and beach-going. Access to many areas of the park will remain unimproved or be carefully managed for low impact, with minimal modification to the landscape. This is intended to provide contrast with the continued and increasing development in the Kona region, allowing residents and visitors to enjoy an environment which is timeless and emphasizes the solace and beauty of an untouched, endemic Hawaiian wilderness.

Linking Hāpuna Beach State Recreation Area, Kīholo State Park, Kekaha Kai State Park, and the remainder of the parks, beaches, and other features of the Kona Coast is the Ala Kahakai National Historic Trail (Ala Kahakai). The Ala Kahakai is envisioned as a continuous 175-mile coastal trail. Kīholo State Park is within the South Kohala/North Kona Management Zone, a 35-mile long segment of the coastline stretching from Kawaihae to Kailua-Kona. When completed, the Ala Kahakai will link together many national, state, and county parks into a continuous recreational network around much of the island. Parks in this network will include:

- Pu'ū Koholā Heiau National Historic Site,
- Spencer Beach County Park,
- Hāpuna Beach State Recreation Area,
- 'Anaeho'omalū Park,
- Kīholo State Wilderness Park,
- Kekaha Kai State Park,
- Natural Energy Laboratory Hawai'i (NELH) Park,
- Kaloko-Honokōhau National Historic Park; and
- Old Kona Airport State Recreation Area.



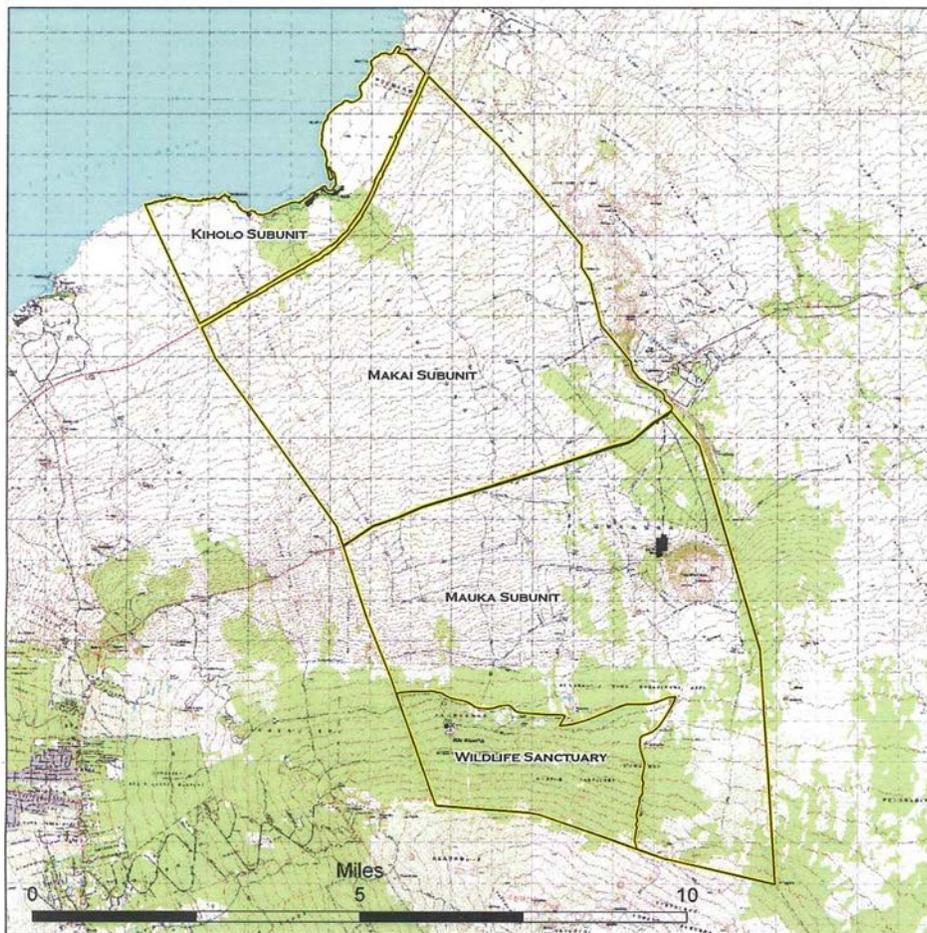
1.1.3 HAWAII EXPERIMENTAL TROPICAL FOREST (HETF)

In March 2007, DOFAW and the USDA Forest Service Institute of Pacific Islands Forestry established the Hawaii Experimental Tropical Forest (HETF). According to HETF:

The HETF's mission is to provide landscapes, facilities, and data/information to support research and education activities contributing to a better understanding of how to conserve and manage the biological diversity and functioning of tropical forest and stream ecosystems as well as to understand the human dimensions of natural resources conservation and management.

The HETF is currently made up of two units, the Laupāhoehoe Experimental Forest Unit and the Pu'u Wa'awa'a Experimental Forest Unit (see Figure 1.3 for the unit and subunit boundaries). Both experimental forest units are located on lands managed by the DLNR and are administered by DOFAW and the USDA Forest Service under a 35-year Cooperative Agreement establishing HETF. The Pu'u Wa'awa'a Experimental Forest Unit incorporates a number of land designations spanning multiple agencies within DLNR which include State Parks and the Kīholo State Park Reserve.

Figure 1.3. Hawaii Experimental Tropical Forest: Pu'u Wa'awa'a Unit



Source: http://www.state.hi.us/dlnr/dofaw/pubs/FW-070514_Hawaii_Tropical_Experimental_Forest_Official_map.pdf

HETF is managed under a cooperative agreement between the U.S. Forestry Service and the State of Hawaii Department of Land and Natural Resources. The intent of the agreement is that the two

agencies will work cooperatively to share expertise when making decisions, with the DLNR holding the final authority with regard to management activities. The goals of HETF – research, education, and demonstration – are wholly consistent with management of Kīholo State Park as a public wilderness and allow for the development of research programs spanning from the shoreline to the uplands of Pu‘u Wa‘awa‘a and Pu‘u Anahulu which can enhance management efforts within the park. State Parks will continue to meet regularly with HETF personnel to discuss and plan for continuing efforts towards this objective.

State Parks is committed to managing the lands under its control in a manner that is sensitive to, and protective of, the ongoing research and education activities conducted by the HETF. Facilities and activities that are proposed as part of the area’s development as a State Wilderness Park will be carried out with the HETF’s needs in mind. As a wilderness park, Kīholo provides solitude, is remote with limited access and minimal park facilities for health and safety (e.g., portable toilets) and offers a sense of unconfined space. Its natural character primarily lends itself to passive recreational activities like hiking and primitive camping.

1.2 HAWAIIAN LAND USE AND AHUPUA‘A CONCEPTS

As noted above, the Board of Land and Natural Resources, DLNR’s Division of Forestry and Wildlife, and the Division of State Parks collaborated internally and with the Pu‘u Wa‘awa‘a Advisory Council to prepare a *Management Plan for the Ahupua‘a of Pu‘u Wa‘awa‘a and the Makai Lands of Pu‘u Anahulu*. This plan called for management of the area in a manner which is consistent with Hawaiian concepts of land use management and the *ahupua‘a* land-unit. An *ahupua‘a* was the primary traditional land division in pre-contact Hawai‘i and was incorporated in the old tax and land management systems of the Hawaiian Kingdom. The *ahupua‘a*, a section of land typically running from *mauka* central mountains down *makai* towards the seashore (including adjacent waters), was an integrated social and economic unit, obeying principles of cooperation and sustainable resource allocation and management. The *ahupua‘a* was managed by a *konoiki* on behalf of the ruling *ali‘i*, ensuring effective operation of the unit.

Kīholo State Park Reserve encompasses all of the lands in the *ahupua‘a* of both Pu‘u Anahulu and Pu‘u Wa‘awa‘a that lie *makai* of Queen Ka‘ahumanu Highway.³ Those *ahupua‘a* are two of twenty three *ahupua‘a* within the *‘okana*, or sub-district of *Kekaha-wai-‘ole* (the waterless land of Kekaha). The settlement and use patterns in each *ahupua‘a* depended on the available resources, but typically involved coastal and upland uses that complimented each other. Because of the arid conditions prevailing along the Kona Coast, lateral resource sharing was more common than in other parts of the Hawaiian Islands, and the *ahupua‘a* of Pu‘u Anahulu and Pu‘u Wa‘awa‘a were closely bound together historically, and were collectively referred to as Nāpu‘u (lit. “the hills”), a reference to the volcanic vents which dot the landscape.

The harsh, sun-dried, and volcanic conditions in the area resulted in relatively small and dispersed patterns of human settlement, clustered around sources of fresh water and canoe landings, allowing access to the abundant fishing grounds off the coast. A broad swathe of uninhabited, or sparsely inhabited, open area on the lower slopes of these *ahupua‘a* divided the coastal zone from the forested uplands, located in the precipitation zone. Trails running *mauka-makai*, as well as laterally across *ahupua‘a*, connected these areas and allowed for the circulation of goods and people. Each of the *ahupua‘a* on the Kona Coast had one or more coastal settlements, except in a few areas where conditions were inhospitable, and the sizes of coastal settlements varied with the geography and available resources. Kīholo State Park Reserve contains the remnant sites of all the former coastal settlements of Pu‘u Anahulu and Pu‘u Wa‘awa‘a, including Wainānālī‘i and Kīholo.

³ Altogether, Pu‘u Wa‘awa‘a includes approximately 40,000 acres of land and Pu‘u Anahulu contains 86,945 acres of land.

By maintaining and improving the traditional- and Kingdom-era trails which served the native people, and structuring planning efforts in a unified manner which respects the ancient connections between Pu‘u Anahulu and Pu‘u Wa‘awa‘a, Hawaiian concepts of land management and the integrity of the ahupua‘a are respected and incorporated into this document.

1.3 THE WILDERNESS PARK CONCEPT

The Hawai‘i State Parks system classifies and designates areas based on an evaluation of the kinds of park resources, the level of development that is appropriate, public use and resource management, interpretive opportunities, and recreational potential. The classification system used is shown in Table 1.1 below. The Division of State Parks (State Parks) has determined that the present park planning process should consider only those recreational and other activities that are consistent with Kīholo State Park Reserve becoming a “State Wilderness Park”. The primary purpose of the wilderness park designation is to ensure that the natural, historical, and cultural resources are preserved and enhanced for future generations to experience the area’s natural beauty and significant cultural sites. As such, the alternatives developed in this Master Plan Framework report reflect minimal facility development and encourages sustainable resource development.

Consistent with the wilderness park designation and the attendant concepts of sustainable resource management, the overall park plan anticipates low-intensity use. Informally defined for the purpose of park planning, low-intensity uses are those which require minimal modification of current park conditions, allow for sustainable management of natural and cultural resources, and do not require a high level of security and facility maintenance. The alternatives differ from one another to the extent by which the changes that have already occurred are remediated as well as the creation and implementation of programs that are designed to educate park users about the importance of protecting the natural and cultural resources that are within the park boundaries.

Despite the proposed wilderness designation, Kīholo State Park is neither remote nor untouched by development. Part of its appeal is that it provides open space in proximity to developed areas along the Kona Coast, and the site is relatively accessible, with Queen Ka‘ahumanu Highway (the largest and most heavily travelled corridor in West Hawai‘i) forming the eastern boundary of the park. At the northern end of the park are the developments at ‘Anaeho‘omalū, Puakō, and Waikoloa, and to the south, Ka‘ūpūlehu. In addition, there are several longstanding, privately-owned inholdings in the park which dot the shoreline, tempering the isolation felt elsewhere in the park.

Equally so, there are rugged, uninhabited, and largely untouched portions of the park where human development is undetectable and the distinctly Hawaiian coastal ecosystem functions much as it has for centuries. Kīholo State Park is a place where residents and visitors can come to connect with the natural elements of sun, water, wind, lava, and the living plants and animals that comprise Kīholo’s most precious heritage. Also, the large park size allows opportunities for the experience of solace and separation from nearby urban development, which is an essential part of a wilderness experience.

Natural land forms, flora, fauna, and wide open spaces are at the heart of the Hawaiian wilderness experience. The park is rich with many such resources and all planning alternatives presented in this document will incorporate measures to protect and manage them while making them available to the public. Examples of the natural bounty which this Master Plan highlights include:

- Sandy beaches at Keawaiki and Kīholo contrast with striking sea cliffs at Kapalaoa and Hou Point.
- Dark lava flows and coastal pockets of dryland and strand vegetation which create unusual variety in what at first looks like a barren environment.
- Kīpuka, isolated islands of vegetation created as lava flowed around sections of the coastline.
- Anchialine ponds, many of which are associated with traditional *mo‘olelo* (legends) and uses.
- Kīholo Lagoon, which now provides sanctuary to many fish and sea turtles.

Table 1.1 State Parks Classification System

<i>Classification</i>	<i>Characteristics</i>	<i>Examples</i>
State Historical Parks (SHP)	Areas established to preserve a complex of historical, cultural, or archaeological sites which are either unique or good examples for interpreting themes of statewide or national significance.	Kealakekua Bay SHP, Hawai‘i and Russian Fort Elizabeth SHP, Kaua‘i.
State Monuments (SM)	Natural and cultural features that illustrate Hawai‘i’s unique geological or cultural history.	Diamond Head SM, O‘ahu and ‘Īao Valley SM, Maui.
State Parks (SP)	Areas with a diversity of resources, including outstanding scenic and natural features, historical and archaeological sites, and geological resources.	Kōke‘e and Waimea Canyon SP, Kaua‘i and Kekaha Kai SP, Hawai‘i.
State Recreation Areas (SRA)	Areas selected and developed to provide outdoor recreation opportunities.	Hāpuna Beach SRA and Mālaekahana SRA
State Recreation Piers (SRP)	Piers adapted for recreational fishing.	Ahukini SRP and Waimea SRP, Kaua‘i.
State Waysides (SW)	Areas along highways selected for their scenic or historic significance.	Nu‘uanu Pali SW, O‘ahu, Kaumahina SW, Maui, and Manukā SW, Hawai‘i.
State Park Reserves (SPR)	Areas acquired and set aside for park purposes, but not currently developed or improved for public use.	Kīholo SPR, Hawai‘i and Pūpūkea-Paumalū SPR, O‘ahu.
State Historic Site (SHS)	Individual historic, cultural, or archaeological sites of statewide or national significance.	Pu‘u O Mahuka Heiau SHS and Kūkaniloko Birthstones SHS, O‘ahu; Haleki‘i-Pihana Heiau SHS, Maui; Kamo Point SHS, Hawai‘i.
State Scenic Shoreline (SSS)	Coastal areas set aside to preserve the scenic corridors and may include wildland and shoreline recreational opportunities, access to viewpoints, and historic/archaeological sites.	Ka Iwi SSS
State Wilderness Park (SWP)	Areas possessing a natural, primitive character without human habitation and offering passive wildland recreation, such as hiking and primitive camping. Wilderness parks should be of a large size so as to provide solitude in a natural setting and a sense of unconfined space. Wilderness parks tend to be remote with limited access and minimal park facilities for public health and safety, such as self-composting toilets.	Nā Pali Coast SWP, Kaua‘i and the proposed Kīholo SWP.
Notes: In the case of several parks, their official designation has been enacted through legislation (Chapter 6E, HRS), such as ‘Iolani Palace State Monument, Sand Island State Recreation Area, Diamond Head State Monument, and the Kohala Historical Sites State Monument. In most cases, the park nomenclature is assigned by the Division of State Parks based on the 1965 criteria.		
Source: Board of Land and Natural Resources of the State of Hawai‘i action on January 24, 2003, revising the nomenclature used for the State Park System.		

In addition to this natural abundance, the pre-contact cultural landscape, which was inextricably linked with the land and sea, will be highlighted through interpretive works and careful management of cultural resources.

Park facilities and amenities will be carefully planned to minimize their impact on the wilderness landscape. Paved and graded areas such as roads and parking areas will be buffered with appropriate native vegetation, and generally kept to a minimum except where necessary to accommodate the requirements of the Americans with Disability Act (ADA) of 1990, as amended, and emergency and maintenance requirements. Comfort stations and other park amenities will be clustered around specific nodes designated for higher levels of use to minimize visual impacts and to preserve the relatively undeveloped park environment. All facility designs will seek to blend structures into the landscape with appropriate scale, form, colors, and materials.

Camping, historically, has been a major way the public has enjoyed the wilderness experience at Kīholo and all alternatives considered in this Pre-Final Master Plan will seek to balance the demand for camping sites and amenities with the principal of sustainable resource management and the requirements of security and maintenance. Kīholo State Park will provide campsites at one or more defined “nodes” or locations, available to backpackers and other park visitors. The length of camping permits and the number of campsites will be contingent on available park resources and personnel. Camping facilities will be generally unimproved, with only portable toilets and trash receptacles, except where necessary to accommodate disabled campers.

1.4 INTERPRETIVE OPPORTUNITIES

All planning alternatives under consideration incorporate interpretive efforts designed to educate park visitors about the natural and cultural heritage of Pu‘u Wa‘awa‘a and Pu‘u Anahulu. Educating park visitors about the geology, ecology, and marine biology of the area and the culture and history of the place could take many forms, from guided tours to self-guided interpretive placards and trails. But regardless of form, interpretive programs will enrich the park experience and invite a greater degree of stewardship from the community. Kīholo State Park is an ideal place to interpret themes of island geology and volcanics, the special character of arid Leeward environments, the cultural adaptation it fosters, and the unique nature of Hawai‘i’s marine and anchialine ecosystems.

As planners and the public have become increasingly aware of the often deleterious impact human development has on the natural environment, a greater appreciation for the land use and management of old Hawaiian *ahupua‘a* system has emerged. Habitat protection and the careful management of native and/or endangered species can form the core of interpretive programs which emphasize the fluid interrelationship between natural processes on land and in the sea. In addition, the establishment of the Hawai‘i Experimental Tropical Forest (HETF) creates new opportunities for valuable research opportunities to study the impacts of land use and management strategies to better inform future management decisions.⁴ The HETF also provides a repository of information associated with research carried out in, and applicable to, the Kīholo area.

The interaction of the natural and human environment as a core feature of native Hawaiian culture can form another axis for cultural-interpretive efforts. Dryland gardening and traditional agricultural practices could be taught by native practitioners. Representatives from the adjacent HETF could give interpretive talks about how research today is informed by native Hawaiian knowledge. The fishing, canoeing, net-making, and navigational skills which were crucial to the native Hawaiian subsistence economy could be shared through signs, seminars, tours, or other curriculum developed by knowledgeable practitioners. Another interpretive theme could be traditional Hawaiian games; in the pre-contact era, Kīholo was known for its *hōlua* (sledding) and one such sledding course remains within the park. However, regardless of the specific programs which are selected, technical experts,

⁴ HETF Annual reports are available online at: <http://www.fs.fed.us/psw/ef/hawaii/>

native practitioners, and respected *kūpuna* should all become part of the *‘ohana* associated with the park, a living resource for perpetuation of the endemic culture of the islands. Central to the vision for Kīhōlo State Park is a *hui* that will embrace the park and act as stewards, working with State Parks to ensure the long-term success of the park and care for its resources.

1.5 INTERIM MANAGEMENT PLAN 2000-2006

At its January 25, 2002 meeting, the State of Hawai‘i Board of Land and Natural Resources approved and recommended to the Governor the issuance of an executive order setting aside the coastal lands within the ahupua‘a of Pu‘u Anahulu and Pu‘u Wa‘awa‘a that are *makai* of Queen Ka‘ahumanu Highway, to its Division of State Parks for a State Park Reserve. As the Board envisioned it, the park reserve would be developed as a wilderness park encompassing the entire eight-mile long wild coastline stretching from Pu‘uwa‘awa‘a northward through Pu‘u Anahulu to the southern end of ‘Anaeho‘omalū Bay. In taking this action, the Board recognized that the property comprised a coastal wildland environment with extensive natural, cultural and recreational resources. In addition, it judged that a wild coastline park at Kīhōlo would insure retention of the natural open space and the open coastal views from the highway. When it took this action, the Board also adopted a draft management plan covering the 2002-2006 period. Finally, the Board also required the establishment of an Ahupua‘a Advisory Council (see Section 1.6.1) to act in an advisory capacity to the Department of Land and Natural Resources with respect to the overall management of the ahupua‘a of Pu‘u Wa‘awa‘a and the *makai* lands of Pu‘u Anahulu.

At the time the Board acted, five interim management options had been identified in the *Draft Management Plan for the Ahupua‘a of Pu‘uwa‘awa‘a and the Makai Lands of Pu‘uanahulu*. They were: (i) continued public use with the then-existing low level of DLNR management; (ii) increased DLNR management presence through additional monitoring and enforcement of applicable regulations and the installation of new interpretive and educational signage; (iii) increasing the Department’s presence by converting the former Loretta Lynn house into a DLNR interpretive center/office/field station, thereby allowing division staff to periodically work in the area, interpret and educate the public, monitor resources and public use, and provide assistance to the public when needed; (iv) increasing the level of management by establishing a partnership with a nonprofit group that could provide interpretation, education, and other park-related services; and (v) full development as a State Wilderness Park. The Division of State Parks recommended that option 2, 3, or 4 be considered as interim management options, with Option 3 as its preferred option.

As discussed elsewhere in this report, subsequent to 2006, the Department has moved forward with two of the options identified in the interim plan. One was to begin preparation of a master plan that could guide the property’s development as a State Wilderness Park. The other is to establish a partnership with the nonprofit organization Hui Aloha Kīhōlo.

1.6 THE ROLE OF THE COMMUNITY

1.6.1 PU‘U WA‘AWA‘A ADVISORY COUNCIL

Subsequent to the DOFAW and State Parks collaboration on the Interim Management Plan both agencies worked with the Pu‘u Wa‘awa‘a Advisory Council to develop a management plan for Pu‘u Wa‘awa‘a and the lands of Pu‘u Anahulu *makai* of Queen Ka‘ahumanu Highway. This partnership produced a management plan which laid out a series of 62 objectives, some of which are summarized in Table 1.2, below.

Table 1.2 Pu‘u Wa‘awa‘a Advisory Council Management Plan Objectives Related to the Kīholo State Park Reserve

<i>Objective</i>	<i>Description/Discussion</i>
Objective 18. Manage Fisheries Resources at Kīholo Bay	Kīholo Bay is presently a Fisheries Management Area where gill netting is banned. The plan assigns responsibility for steering future fisheries management to the West Hawai‘i Fisheries Council. It noted that current recommendations include the banning of reef spear fishing using scuba tanks and the posting of educational and regulatory signage for fisheries management.
Objective 19. Continue sea turtle protection and research in the Kīholo Bay area	Noting that Kīholo Bay is commonly used by sea turtles for feeding and basking, the report recommended that the State continue to encourage the present research and protection activities, and post educational signage.
Objective 20. Protect anchialine pool resources in the coastal regions	The report observed that anchialine pools are among the most important biological resources within the Kīholo State Park Reserve. It noted that pools are infested with non-native fish species that severely depress populations of native crustaceans and change their algal and other biological characteristics; that other uses of pools, such as swimming and bathing, could degrade water quality; and that the pools also have cultural significance as waterholes. It recommended that an anchialine pool inventory be conducted, that monitoring be initiated, and that restoration of some pools to resemble their pre-contact condition be carried out.
Objective 21. Control feral ungulate populations makai of the Queen Ka‘ahumanu Highway	The report notes that feral goats are a past and present pest in the area and that the reduction in hunting that will occur when Kīholo State Park Reserve is converted into a Wilderness Park, will allow the goat population to expand. This expansion will result in the rapid and severe damage to both native and Polynesian-introduced plants and archaeological sites, including caves. Consequently, it recommended ungulate control below Queen Ka‘ahumanu Highway using special public hunts, staff control, and fencing of small sensitive sites to exclude ungulates.
Objective 22. Protect biological cave resources	The plan identifies lava tubes as important cultural, biological, geological, aesthetic, recreational and educational resources and values, noting that they provide important habitat and natural protection from grazing ungulates for many species. The plan calls for selected caves, having biologically and culturally sensitive resources, to be blocked to prevent general public access (cultural and research access would be permitted by the State through issuance of Special Use Permits).
Objective 42. Survey and develop historic trails within and adjacent to the ahupua‘a for public use	Noting that current map data for historic trail locations are incomplete, the plan recommends a comprehensive survey of the historic trails. The report recommends that historic trails be surveyed utilizing global positioning technology, that required Cultural Mitigation Plans be drafted, and that interpretive trail and access road signage and brochures be produced.
Objective 43. Document Current Public Use of the Kīholo Bay Area	The plan calls for the state to document public use of the Kīholo Bay area and this has been done during preparation of the Master Plan.
Objective 46. Manage short- and long-term ecotourism activities	The plan recommends that the Pu‘u Wa‘awa‘a Advisory Council convene an Ecotourism Subcommittee with the mandate to develop requirements and guidelines for development of activities such as guided interpretive hikes with 4-wheel drive support, bird watching, horseback riding, caving, multi-day hiking, camping, beach excursions, snorkeling, kayaking, and integrated trekking tours with other landowners.
Objective 47. Fund and hire permanent field staff to manage trails and access	The plan recognizes that adequate staffing is needed to manage Kīholo’s resources properly and recommends that qualified individuals be hired. It projects a need for three positions to oversee service-related management activities (including gate operation and trash removal) in Kīholo State Park Reserve.

<i>Objective</i>	<i>Description/Discussion</i>
Objective 48. Conduct a comprehensive cultural and archaeological survey	The plan calls for conducting a comprehensive archaeological inventory survey that will provide land managers the knowledge they need to effectively manage such resources and to mitigate potential impacts to cultural and archaeological resources while implementing other management objectives. The work that has been done in support of the park Master Plan fulfills this objective.
Objective 49. Protect and Restore Cultural Sites	Noting that the lack of a comprehensive cultural survey has limited preservation and restoration for cultural sites, the report recommended completion of such a survey and its use to identify less sensitive sites for educational purposes as well as for traditional cultural practices. The archaeological, historical, and cultural surveys being conducted during preparation of the Master Plan are directed at this objective.
Objective 50. Establish protocol for sustainable traditional and cultural gathering	The report called for sensitivity to and accommodation of traditional and cultural rights for both native Hawaiian and local communities as they relate to gathering. It called on all concerned to take advantage of the opportunity to demonstrate new natural resource stewardship models in Pu'u Wa'awa'a and the makai area of Pu'u Anahulu that respect the rights of native Hawaiians and local communities while also re-establishing the responsibilities attached to those rights in a culturally appropriate fashion.
Objective 51. Fund and hire an education center staff to initiate education and volunteer programs	The report called for establishing an interactive education program and center whose curriculum focused on native Hawaiian culture, restoration of native and Polynesian-introduced plants and animal communities, science and research, livestock grazing practices, and ecotourism activities. It also emphasized community volunteer participation throughout the ahupua'a, including Kīholo State Park Reserve.
Objective 56. Upgrade Cultural and Environmental Education facilities	Noting that all DLNR divisions have an interest in the management of coastal resources in the Kīholo Bay area, the report recommended using the former Loretta Lynn residence as a DLNR interpretive center and DLNR staff office as a means of facilitating implementation of many of its objectives. Accordingly, it recommended upgrading the structure to meet County code, painting it, and equipping the facility with utilities, ADA accessible ramps, and interpretive kiosks and learning stations with a focus on the resources of the Kīholo Bay area.

Source: Compiled by Planning Solutions, Inc.

1.6.2 HUI ALOHA KĪHOLO

The second organization that is intimately involved in activities within the Kīholo State Park Reserve is Hui Aloha Kīholo. It is a 501(c)(3) nonprofit community organization that was formed in response to a growing number of important issues and concerns occurring in and around Kīholo Bay. It is comprised of over 90 community members from West Hawai‘i who joined together to help protect, enhance, and perpetuate the Hawaiian culture and natural landscape of the Kīholo area through collaborative management and active caretaking. Many of the individuals have a connection to Kīholo through lineage, family history, residence, and a wide variety of recreational pursuits.

The organization has demonstrated their concern and dedication by coordinating several volunteer work days since 2007 that have resulted in the establishment of off-beach parking areas; noxious weed removal from Waiaalepī anchialine pool; improvements along the shoreline trail; removal of several tons of trash and marine debris; visitor counts and observations of park use; and posting signs that promote respect for the resources of the Kīholo State Park Reserve.

The Division of State Parks and the Historic Preservation Division established the framework for its existing curatorship program in 1987. The aim of this program is to:

- (1) Better maintain significant cultural and natural resources and protect them from vandalism, natural factors, and unintentional human actions that will damage these resources.
- (2) Provide the State’s citizens greater access to view and understand the importance of Hawai‘i’s natural and cultural resources, and their significance to the State’s past history and natural environment. Site improvements even if included in the curatorship agreement require pre-approval from State Parks.

On August 28, 2009, the State of Hawai‘i Board of Land and Natural Resources authorized a curatorship agreement between Hui Aloha Kīholo and State Parks. The agreement, which went into effect on December 23, 2009, acknowledges the specific role of the group and formalizes its partnership with the State in the stewardship of Kīholo State Park Reserve.⁵ The responsibilities of the Hui Aloha Kīholo focus on Kīholo Bay from the northern end at Hou Point (Kalaehou) to the southern end at Manō Point (Kalaemanō). Specifically, under the curatorship agreement, the curator’s role is to help protect the sites and resources under its jurisdiction and to help provide public access for all the State’s citizens and visitors. The agreement makes it clear that the curator is not the owner of the site and cannot restrict access. It also stipulates that the curator cannot disseminate information or install interpretive devices on the property without the prior approval of State Parks and cannot undertake site improvements unless these tasks are covered in the curator agreement or in later amendments to each agreement and obtain pre-approval from State Parks.

Under the terms of the agreement, the curator has a number of responsibilities. These include:

- Coordinating all actions and activities with State Parks and submitting an annual report of its activities and volunteer hours under this agreement to State Parks.
- Maintaining the coastal and public use areas of Kīholo by clearing selected vegetation and removing litter.
- Helping to coordinate volunteer efforts from other organizations or individuals.
- Conducting regularly scheduled workdays and monitoring the site on a monthly basis to assess the condition of the park resources and prevent vandalism and damage and notifying State Parks if any damage is found.

⁵ The term of this agreement is for five (5) years after its effective date. Either party may terminate this agreement after providing the other party with thirty (30) days written notice. This agreement may be amended only in writing signed by both parties to the agreement.

- Preparing and installing interpretive devices and park information, contingent upon approval of specific interpretive plans by State Parks.
- Carrying out restoration work, as needed, contingent on approval of specific restoration plans by State Parks and the State Historic Preservation Division.

The curatorship agreement specifically prohibits commercial activity, including the sale of any items or advertising of commercial products. It also precludes fund-raising activities; the possession or consumption of alcoholic beverages or illegal drugs; temporary or permanent residence; any significant disruption to normal park usage; and/or site improvements unless otherwise approved.

The agreement also assigns a number of responsibilities to the Division of State Parks. Specifically, it provides that DLNR will:

- Continue to manage and be responsible for the area covered by this agreement, to issue permits, including commercial permits, conduct archaeological research and other investigative activities, install interpretive devices and regulatory signs, and implement management plans.
- Share with the curator the information in its possession relating to the park, including but not limited to archaeological and historical information, surveys conducted of archaeological sites or features which are not of a confidential nature, draft environmental assessments and impact statements, and plans regarding existing or proposed future uses of lands within the park.
- Assist the curator with large clearing and hauling projects and with herbicide use as is practical.
- Obtain concurrence from the State Historic Preservation Division to proceed with proposals that could have an effect on historic properties and for submitting for review and approval any reports or plans.

1.7 PLANNING PRECEPTS

Certain foundational precepts have guided the preparation of this report. They include the following:

- Maintenance of the long-term sustainability of Kīholo's physical, scenic, historic, cultural, and natural resources.
- Preservation and maintenance of the historic and archaeological features of Kīholo.
- Recognition of the rights and contributions of the individuals whose homes are surrounded by the Kīholo park lands;
- Preservation of the unique physical resources of the shoreline and upland regions.
- Restricting vehicular access to a few specified locations and hours.
- Management of ecosystems with an eye to preventing further loss of native species and, where possible, restoring those ecosystem values most critical to long-term stability.

These basic assumptions are in keeping with the State's intention of developing Kīholo as a State Wilderness Park. None of the alternatives explored in this Master Plan involve substantial physical development on the property and all would conform to the basic planning precepts identified above, providing space and infrastructure (e.g., road access, sanitation facilities, etc.) for low-intensity recreational use.

1.8 ORGANIZATION OF THE REPORT

Background information about park resources, activities, operations, management, and issues and opportunities was obtained through research of existing documentation, field investigations, agency comments, and public input. The results of these investigations and analyses are presented in Chapters 2 and 3 of this report. Chapters 4, 5, and 6 use this information to identify opportunities for park development, master plan alternatives for consideration, and program modules that can be

implemented regardless of which alternative is selected. More specifically, the remainder of the report is organized as follows:

Chapter 2, which focuses on the physical environment and public infrastructure, is divided into the following main parts:

- Section 2.2 – Physical Environment (Topography, Geology, and Soils, Climate, Hydrology, Air Quality).
- Section 2.3 – Terrestrial and Avian Biota.
- Section 2.4 – Aquatic Resources.
- Section 2.5 – Scenic Resources.
- Section 2.6 – Existing Infrastructure.

Chapter 3, which addresses Cultural Resources, is divided into the following main parts:

- Section 3.2 – Traditions and Legendary Sites.
- Section 3.3 – Post-Contact History of Kīholo.
- Section 3.4 – Oral Historical Accounts from the Families of Nāpu‘u.
- Section 3.5 – Opportunities & Constraints Relevant to the Master Plan.

Chapter 4, identifies recreational and educational opportunities at the park in the following categories:

- Section 4.1– Camping Opportunities.
- Section 4.2 – Hiking Opportunities.
- Section 4.3– Biking Opportunities.
- Section 4.4 – Picnicking.
- Section 4.5 – Lava Tubes.
- Section 4.6 – Ocean Recreation Opportunities.
- Section 4.7 – Interpretive and Educational Program Opportunities.

Chapter 5, describes the Master Plan Alternatives and is divided into the following sections:

- Section 5.1 – Introduction.
- Section 5.2 – ALT-1: Focused Camping/Access Alternative.
- Section 5.3 – ALT-2: Multi-Node Camping/Access Alternative
- Section 5.4 – ALT-3: Park Reserve Alternative.

Chapter 6, presents “Management Program Modules”. These are program elements that can be implemented in combination with any of the physical master plan alternatives. It is divided into the following main parts:

- Section 6.1 – Vegetation Management and Ungulate Control.
- Section 6.2 – Archaeological and Cultural Interpretation.
- Section 6.3 – Pond Restoration.
- Section 6.4 – Loretta Lynn House Renovation.
- Section 6.5 – Fisheries Management.

Chapter 7, which addresses Park Management, is divided into the following main parts:

- Section 7.1 – Capital Improvements;
- Section 7.2 – Park Operations and Costs;
- Section 7.3 – Commercial Uses.

Chapter 8, discusses the impacts that implementation of the park Master Plan could have on the environment. It is divided into the following main parts:

- Section 8.2 – Topography, Geology, and Soils;
- Section 8.3 – Climate and Micro-Climate;
- Section 8.4 – Hydrology;
- Section 8.5 – Air Quality;
- Section 8.6 – Terrestrial and Avian Biota;
- Section 8.7 – Aquatic Resources;
- Section 8.8 – Scenic Resources;
- Section 8.9 – Existing Infrastructure
- Section 8.10 – Historical and Archaeological Impacts; and
- Section 8.11 – Cultural Impact Assessment.

Chapter 9, discusses the extent to which the master plan alternatives are consistent with State and County land use plans and policies.

Each of the main headings in Chapter 2 concludes with a summary of the opportunities and constraints (if any) that the results of the background research indicate are present with respect to development of Kīholo State Park Reserve. A similar discussion of opportunities and constraints related to cultural resources is presented at the end of Chapter 3 (in Section 3.5) of the report. These chapters originally formed part of the Background Research Report and have been revised and adapted to meet the requirements of this document.

1.9 INITIAL ISSUE IDENTIFICATION AND COMMUNITY CONTACTS

1.9.1 ISSUE IDENTIFICATION: INDIVIDUAL CONSULTATIONS

Planning Solutions, Inc. sought input from numerous individuals and organizations while it conducted the background research. It began by reviewing Division of State Parks files for relevant correspondence and reports. It then met with State Parks staff and with representatives of Hui Aloha Kīholo, the nonprofit community organization that is helping State Parks manage Kīholo under a 5-year curatorship agreement signed on December 23, 2009 (see Appendix A for the agreement). In May of 2011, planners had one-on-one conversations with a number of stakeholders and interested parties (see Table 1.3). The purpose of the meetings was to provide a forum where each could speak freely, something that is not always possible in meetings with larger groups.

Table 1.3 Initial Public Consultation Meetings/Discussions

<i>Contact Name and Affiliation:</i>	<i>Date of Contact</i>
Marni Herkes: President, Kona, Kohala Chamber of Commerce, Community Leader, Hui Laulima O Kekaha Kai Board member (Kua Bay, Kūki’o shoreline), Saddle Road Task Force, etc.	May 31, 2011
Leslie Kurisaki: Project Lead, Waimea Greenways project – Kimura International	May 31, 2011
Mr. Mike Donoho: Kukui Planning Company, Former Big Island DOFAW biologist, consultant to Hui Aloha Kīholo	May 31, 2011
Mrs. Jennifer Hind Mitchell: President, Hui Aloha Kīholo	May 31, 2011
Dr. Steve Montgomery, PhD.: Entomologist, former LUC commissioner, Environmental Leader- Hawai‘i Conservation Council	May 31, 2011, June 1, 2011
Mr. Angel Pilago: Hawai‘i County Council, District 8, Community Leader	Various
Mr. Robert Lindsey, Jr.: Vice Chair, Committee on Asset and Resource Management Trustee, Hawai‘i Island (OHA Board of Trustees)	May 31, 2011, June 1, 2011
Mr. Rob Pacheco: President, Hawai‘i Forest and Trail, Land Board member, community, ecotourism and environmental leader	May 31, 2011
Ms. Debbie Ward: Sierra Club of Hawai‘i, Mauna Kea Management, Board Environmental Committee among other such groups	June 1, 2011
Mr. Bobby Command: Executive Assistant to the Mayor – Hawai‘i County	Various
Mr. Pete Hoffmann: Hawai‘i County Council, District 9, and Vice Chair of Council - Community Leader	May 31, 2011
Ms. Anita Manning: Former B.P. Museum V.P., Assistant Dir., Collections, Management & Corp. Secretary, Environmental Leader- Hawai‘i Conservation Council,	May 31, 2011
Note: Contacts were made by telephone and in-person by Mr. Reginald David. Individuals were provided a brief description of the area and purpose of the master plan at or prior to the discussions.	
Source: Compiled by Planning Solutions, Inc. based on information from RANA Biological Consulting, Inc.	

1.9.1.1 Lack of Management and Resources

In general, the issues that were raised were ones familiar to State Parks staff. However, what became clear was widespread concern that the State lacked the financial and staff resources needed to properly manage even its existing facilities and that good intentions for Kīholo were unlikely to result in positive results unless additional (and it was generally agreed that this meant “outside”) resources could be brought to bear. Many of those contacted indicated that the State’s track record when it came to delivering on promises was poor. Conditions at Hāpuna Beach State Recreation Area and Kekaha Kai State Parks (operated by the Division of State Parks) and at Kahalu‘u Beach Park and Spencer Beach Park (operated by the County of Hawai‘i) were all cited as examples of places that did not live up to their potential under the current system of management. Some individuals have noted that several groups had felt compelled to take independent initiative by carrying out maintenance on park property, often based on curatorship agreements wherein private groups form an agreement with State Parks to participate in park upkeep. Others individuals have offered criticism on the sometimes difficult process of obtaining curatorship agreements.⁶

Another feeling voiced by a number of those contacted was the upset (which some expressed as anger, frustration, and despair) that many had come to feel over the destruction of natural and cultural resources during the decade that Kīholo had been an unmanaged state park reserve. The over-use and misuse that had occurred prior to the beginning of the Hui Aloha Kīholo curatorship and the October 2011 clean-up had led many long-time users to stay away from Kīholo because of what had been allowed to happen on the property and the impacts to the resources.

⁶ This was the key reason given by one group that was initially very interested in the role for ultimately deciding not to sign on as curator of the Kekaha Kai Park.

Questions related to the most practical and equitable approaches to managing (which most interpreted as “limiting”) access, camping, parking, etc., were the ones that people had the most divergent views over. The list of potential solutions ran the full gamut from lock it up and throw away the key, to turn it over to a concessioner to develop appropriate infrastructure. Another view expressed by a substantial number of the individuals who were contacted was that if it were the only way to assure proper management and upkeep, then perhaps park user fees should be established. Others disagreed with this, some quite strongly. Those who were in favor of fees, possibly on a system wide (or at least island wide) basis, pointed to some mainland park systems and to the National Park Service model, where entrance fees (or annual passes) are charged.

1.9.1.2 State Parks Management

There is also a perception by some – one that is belied by the curatorship agreement between the State and Hui Aloha Kīhōlo – that State Parks micromanages the planning process, is not a team player, and is not good at partnering with other groups and agencies in the management and operation of the State Parks facilities on the island. Several felt that State Parks was only willing to cooperate with other organizations that wanted to do on-ground work that would improve recreational facilities if the entities doing the work took all responsibility and provided the bulk of the money and labor. Even under those circumstances, it was felt by some that State Parks micromanaged groups’ activities to the point that volunteer boards and implementers cut off their relationship.

Those interviewed expressed a near-universal belief that it was critical for the master planning for the park to take a realistic view about what can be done given the resources that are likely to be made available for the purpose and to gear the recommendations to that. They did not want to see a plan that promises more than the State can reasonably be expected to deliver in these tight economic times. The individuals who held these opinions emphasized the value in partnering with other groups to make things happen and asked that State Parks trust community groups and allow them more ownership of the process than has been done in the past. They felt these organizations could and would help make things happen that the State could not manage on its own.

1.9.1.3 Enforcement

The need for better enforcement of park rules is also an issue raised by many of those contacted. The County only has two police officers on patrol in the entire district after dark, and their other duties virtually preclude them from conducting any patrols within the park. Consequently, there was wide agreement that if rules are to be better enforced within the park boundaries, DOCARE will have to be ready and willing to step up its enforcement presence. This is a point on which DLNR is in agreement, and the internal (to the Department) discussions that took place during formulation of the Interim Management Plan led DOFAW to commit to providing the needed support if the voluntary supervision provided under the curatorship agreement proves insufficient in certain instances.

1.9.2 ISSUE IDENTIFICATION: STATE PARKS

Based on its many years of dealing with Kīhōlo State Park Reserve, the Division of State Parks was able to provide a comprehensive summary of what it perceived as the most appropriate direction to take and/or most important issues to be resolved during the master planning process. Those are summarized below.

1.9.2.1 Vehicular Access

State Parks would prefer to focus public road access in the area closest to Kīhōlo Bay because there is an existing road to it and it has the highest intensity of use. At the same time, the road system needs changes in order to prevent people from driving on the beach. Vehicular access to other portions of the Kīhōlo State Park Reserve is not a priority, but improved trail (i.e., foot) access to areas such as Keawaiki will be considered. State Parks preference is to encourage people to park on the highway and walk down to the shoreline as a means of controlling (i.e., limiting) the intensity of use. Directing park users to existing parking areas at ‘Anaeho‘omalū and directing them onto the existing

trail network (e.g., the King's Trail or the shoreline trail) would be the principal means of accessing the northern end of the park.

Kīholo Bay is the main area currently being used by the public and the most accessible portion of the park, but the entry road is not well marked from the highway. As a result, those unfamiliar with the area sometimes have a difficult time finding their way. Plans should ultimately provide for readily identifiable pedestrian and vehicular routes that reduce the confusion.

1.9.2.2 Hiking and Boating Trails

Currently, there are over 40 miles of named trails throughout the park reserve. Any new trails should be designed to meet trail design standards. For a wilderness park such as is envisioned at Kīholo, not all trails need to be "accessible" as called for in the Americans with Disabilities Act (ADA) of 1990, as amended. However, the goal is to have at least one parking/picnic area adjacent to the beach at Kīholo that is ADA compliant. In addition to the parking stall, this could include a concrete pathway that leads to beach/picnic tables, a toilet, and a campsite.

The opportunity exists to increase hikers' use of the coastal trail and/or to develop boat landings that could be part of a water-trail along the coastline. This is the "Bluewater Trail" concept developed as part of the State of Hawai'i's "Recreational Renaissance".⁷ This would support kayaking along the coast with two or more stops in Kīholo (Keawaiki Bay and Kīholo Bay). The concept would also make camping possible in areas accessible only by kayaks and canoes. It would be a recreational opportunity that could help generate revenue for the state. Usage of such a boating "trail" is likely to be relatively light, but it would add another type of recreational opportunity.

State Parks wants to accommodate the plans that the National Park Service (NPS) is developing for the King's Trail (Ala Kahakai) and is having ongoing discussions with them. The NPS, in turn, is quite interested in assisting by providing resources and interpretation where it is appropriate. The master plan should do its best to accommodate the trail.

1.9.2.3 Camping

At the time work on the Master Plan began, there was no means of obtaining legal permission to camp anywhere within the Kīholo State Park Reserve. Notwithstanding that, the area was being intensively used for that purpose, with hundreds of people spending the night on busy weekends and holidays. The beach was being used to access the campsites, and vehicles were being driven everywhere.

That changed on October 1, 2011, when the Division of State Parks officially closed the area to vehicles for a cleanup (pedestrian access from the highway continued). The cleanup was carried out in collaboration with Hui Aloha Kīholo, the non-profit community organization that has a Curatorship Agreement with the Division for Kīholo State Park Reserve. Hui Aloha Kīholo, together with State Parks staff, removed discarded debris and rubbish, installed new gates, created natural and constructed vehicle barriers, clarified and cleared existing footpaths, and erected signs.

Kīholo State Park Reserve reopened in mid-November, 2011, but its use is now being controlled under an "interim camping management plan" that was adopted by the Board of Land and Natural Resources at its October 28, 2011 meeting. This interim management is designed to help preserve the resources that qualified Kīholo to be designated as a State Park Reserve while the Master Plan/Environmental Assessment process is completed. It includes a permit system that allows the Division of State Parks to issue camping permits as provided for in HAR §13-146-51. The maximum

⁷ Announced in 2009, the "Recreational Renaissance" was conceived as a re-birth in the way Hawai'i cares for its land and ocean recreational spaces, its natural and cultural resources, and the people who use its State Parks, small boat harbors, boat ramps, hiking trails, natural area reserves, forest reserves and beaches. The program's goal is "to restore, reinvigorate and preserve our parks, trails, and ocean recreation facilities; enhance our environmental and cultural assets; provide safe outdoor spaces for residents and visitors to enjoy; and maintain our recreational infrastructure."

authorized use under this Interim Management Plan is 80 people per night (maximum of 10 people at each of eight campsites), on weekend nights only.

1.9.2.4 Lava Tubes

Proper management of access to lava tubes is challenging because of the large number of tubes and the absence of an effective means of limiting access. Those containing water features are of particular concern, as they represent a special hazard and are sought out by visitors. While state law prohibits public entry into the caves without the landowner's permission, the lack of fencing or adequate staffing makes this impossible to enforce. No trail development or signage should be planned that would route people near the most sensitive features (e.g. caves with human remains). To the extent practical, trail use should be managed by encouraging people to take advantage of resources that are the least sensitive rather than by trying to establish and enforce restrictions on approaching the most sensitive, which will most likely be closed or gated.

1.10 PUBLIC MEETINGS

State Parks has conducted two public meetings for the Master Plan for Kīholo State Park Reserve. The first was held on Monday, September 26, 2011 from 5:00 p.m. to 7:30 p.m. at the Natural Energy Laboratory of Hawai'i Authority Gateway Center in Kailua-Kona. The second was held from 5:30 to 7:30 p.m. on Tuesday, September 27, 2011 in the State Office Building in Hilo. The meetings provided an opportunity for the general public to share their thoughts, issues, and concerns about Kīholo State Park Reserve and to get involved with the master planning process.

The presentation materials used for the two meetings are reproduced in Appendix B. Major issues raised and opinions expressed are summarized in Table 1.4 and Table 1.5.

Table 1.4 Kīholo State Park Reserve Public Meeting in Kona, September 26, 2011

<p><i>This was a well-attended meeting of 50-60 people. Most in attendance were supportive of getting the Park under control, though many had concerns as to how that was going to be done, and how it would affect their use of the Park. Many in attendance indicated that they have personal ties to the land or are long term users of the area. The following key points were voiced:</i></p>
<ul style="list-style-type: none"> • The situation under current operating conditions is not acceptable.
<ul style="list-style-type: none"> • Inadequate facilities, restrooms, and garbage collection, storage, and disposal.
<ul style="list-style-type: none"> • Rowdy, noisy, disrespectful campers have been allowed to disturb other users.
<ul style="list-style-type: none"> • Limiting camping to a fixed and low number of sites (each for up to 10 people) is too restrictive.
<ul style="list-style-type: none"> • Limit should be based on the number of campers rather than camp site numbers.
<ul style="list-style-type: none"> • Park can support many more camp sites than 8 or 10.
<ul style="list-style-type: none"> • Very pleased that squatters have finally been moved out.
<ul style="list-style-type: none"> • Cultural and traditional practices are impacted negatively by volume of usage and ungoverned behavior of users.
<ul style="list-style-type: none"> • Conditions have improved greatly since Hui Aloha Kīholo started to have a uniformed presence; the improvement is much appreciated.
<ul style="list-style-type: none"> • Stopping vehicles from driving on the beach is a very good thing.
<ul style="list-style-type: none"> • Real problem is not limited to Kīholo; it is the shortage of beach camping opportunities along the entire Kona Coast and elsewhere on the Island.
<ul style="list-style-type: none"> • The number of proposed camping permits and spaces is too low.
<ul style="list-style-type: none"> • Some voiced concerns over the camping permit reservations process.
<ul style="list-style-type: none"> • Limiting camping to weekends and holidays was not enough to fulfill obvious need and does not recognize that resort industry workers usually are not free on weekends.
<ul style="list-style-type: none"> • Charge fees, don't make them too low, and use fee monies to support Park.
<ul style="list-style-type: none"> • Make sure any fees go to the Park not the State's general fund.
<ul style="list-style-type: none"> • When can we reserve camping spaces – already tried and can't get onto the state site.
<ul style="list-style-type: none"> • Issues raised over open camping spaces and how to pay for them if you get there and no one has booked them.
<ul style="list-style-type: none"> • Beware of the severe limits on campsites during the proposed Interim Management Plan's implementation as they may last for years or become the permanent rule.
<ul style="list-style-type: none"> • Most campers will not walk from the Highway down to the beach to camp.
<ul style="list-style-type: none"> • Concession ideas voiced by several (i.e., firewood sales, educational programs, etc.)
<ul style="list-style-type: none"> • Loretta Lynn House – use it for caretaker residence, outreach and park headquarters, education center; use it to make money for the park.
<ul style="list-style-type: none"> • Ask not what Kīholo can do for you, but rather what can you do for Kīholo.
<p>Source: Compiled by Planning Solutions, Inc.</p>

Table 1.5 Kīholo State Park Reserve Public Meeting in Hilo, September 27, 2011

<i>Some of the issues raised were similar to those heard the previous night, but several were different. The following key points were voiced:</i>
<ul style="list-style-type: none"> • Please do not limit camping so much. Provide more days (preferably 7 days per week, but at least more than weekends) and more camp sites (i.e., greater number than 8).
<ul style="list-style-type: none"> • Need to do more with caves. Cavers have a lot of information and they would do more work as volunteers.
<ul style="list-style-type: none"> • NOAA's proposed plan to restock the main Hawaiian Islands with Monk Seals will make the beaches on the Big Island unusable.
<ul style="list-style-type: none"> • State ought to buy the private parcel within which Luahinewai is located. The activities there are harming the pond. People are using the pond for recreation.
<ul style="list-style-type: none"> • State should charge more for use of the camp sites so that it has more money to maintain and secure them. It is not OK to say there is not enough money. Most people will pay higher camping fees if it can be guaranteed that the funds will be used to help maintain the park.
<ul style="list-style-type: none"> • All archaeological sites are degraded by people who have entered them and stolen everything of value. When the Queen Ka'ahumanu Highway was built, the cave looters used it to dig up the cultural deposits and take everything of value. There is nothing left in most of the caves.
<ul style="list-style-type: none"> • If you are going to restrict camping at Kīholo, the State needs to create more camping opportunities at the other State parks. The demand is huge and the State is not doing what it needs to do to satisfy the demand. Other areas where the State can provide camping are at Hāpuna, Kekaha Kai, Mahai'ula, Awake'e, Kaho'iawa and Manini'ōwali.
<ul style="list-style-type: none"> • The State needs to allocate more resources to the park at Kīholo. It should not rely forever on Hui Aloha Kīholo.
<ul style="list-style-type: none"> • The State should take the lead in seeking out additional groups for creating curatorships. The State needs to put more effort in community outreach, finding people in the communities to help care for and maintain the parks. Instead, they sit back and wait for others to come to them.
<ul style="list-style-type: none"> • There should be greater flexibility in the reservation process so that if people show up and there are empty spaces, they can take advantage of them.
<ul style="list-style-type: none"> • The Loretta Lynn house should be put to use. It is a wasted resource as it now stands. Put a ranger in that house, have a concession that sells water, firewood, camp stoves, and tents. Be creative about what it can be used for.
<ul style="list-style-type: none"> • Overnight campers will not, for the most part, walk from the highway to camp sites. Who is going to watch their cars that are parked ¾'s of a mile away at the highway.
<ul style="list-style-type: none"> • Kīholo is not really wilderness. You can see the highway, and so the designation is inappropriate.
<ul style="list-style-type: none"> • Trails go everywhere within the park and the map shows only some of them.
<ul style="list-style-type: none"> • Need to relate trails within the park to the National Park Service's Ala Kahakai.
Source: Compiled by Planning Solutions, Inc.

CHAPTER 2 – NATURAL RESOURCES

2.1 INTRODUCTION

This chapter provides an overview of the existing conditions and resources at Kīholo State Park Reserve and provides an assessment of the condition, value, and management opportunities available to enrich the park experience. The following properties are assessed:

- Section 2.2 discusses the physical environment, including topography, geology, soils, climate, hydrology, and air quality.
- Section 2.3 covers terrestrial biota including plants and animals occurring on parklands.
- Section 2.4 presents an overview of the aquatic environment; the discussion considers water quality and marine and pond biota.
- Section 2.5 describes the scenic resources of Kīholo State Park Reserve, with a focus on those things that are of particular interest to potential park users.
- Section 2.6 describes the existing infrastructure within the Kīholo State Park Reserve and includes roadways and trails, structures, electrical power and telecommunication facilities, water supply, and wastewater treatment and disposal facilities.

2.2 PHYSICAL ENVIRONMENT

2.2.1 TOPOGRAPHY, GEOLOGY, AND SOILS

2.2.1.1 *Topography*

Elevations along the Queen Ka‘ahumanu Highway boundary of Kīholo State Park Reserve generally increase from west to east, rising from approximately 40 feet above sea level near ‘Anaeho‘omalū to nearly 300 feet above sea level at Ka‘ūpūlehu. The slope ranges from very low (a few percent) in most areas near the coast to more than 10 percent in the upper portions of the Ka‘ūpūlehu area.

2.2.1.2 *Geology*

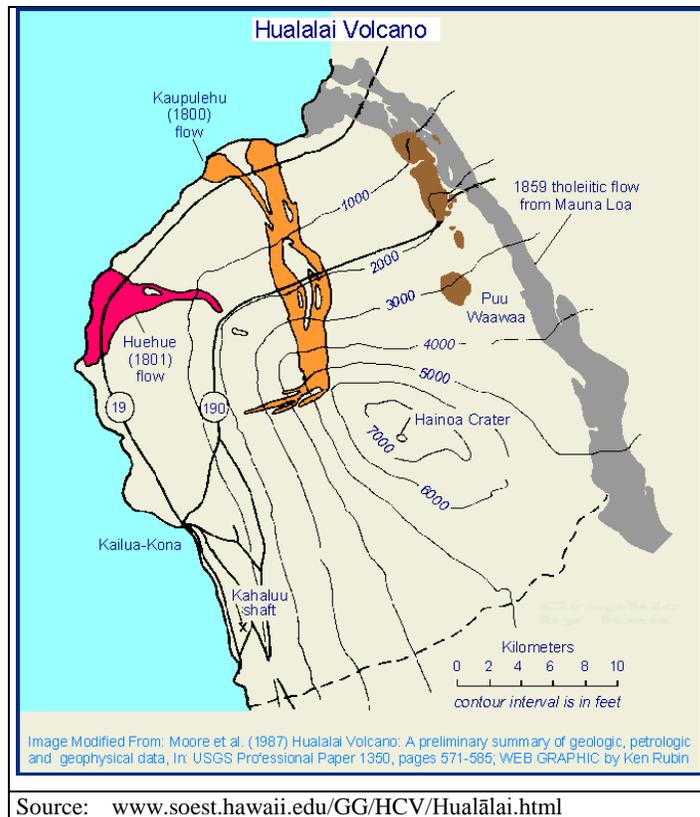
Kīholo State Park Reserve stretches across the lower flanks of two of the five major shield volcanoes that have formed the Island of Hawai‘i.

- *Hualālai*. The southern part of the park is situated on Hualālai; rising 8,271 feet above sea level, it is the westernmost of the five major Big Island volcanoes. Hualālai has a well-developed Northwest rift zone that crosses the project area, and its most recent eruption (in 1800-1801) was from this zone. This eruption produced an estimated 300 million cubic meters of relatively fluid lava, much of which moved downslope from the vents at high velocity; two flows (Ka‘ūpūlehu and Hu‘ehu‘e) reached the sea. The Ka‘ūpūlehu flow was enormous and entered the ocean as two discrete lobes of *a‘a* crossed the southern part of what is now Kīholo State Park Reserve and entered the ocean.⁸
- *Mauna Loa*. As can be seen on Figure 2.1, the surface lavas on the northern portion of Kīholo State Park Reserve are from the Mauna Loa Volcano, with the 1859 lava flow being the most recent. The eruption that produced the flow started with a brief summit eruption, but quickly shifted to an outbreak high (~11,000 feet) on Mauna Loa’s northwest flank. The notable eruption, which continued for approximately 300 days, is the most voluminous eruption in the post-contact period, and produced a 32-mile-long lava flow, the longest in the state. The eruption reportedly produced a glow so bright that it could be seen by people on the south side of Maui and allowed people in

⁸ The 1800-1801 eruption of Hualālai is believed to be concurrent with an eruption at neighboring Mauna Loa volcano. The Hu‘ehu‘e flow from this eruption destroyed the Pa‘aiea fishpond located between Ho‘ona and Mahai‘ula (actually Kaelehuluhulu). Recent mapping of stranded beach and ocean entry deposits within the Hu‘ehu‘e flow shows that this flow extended the coastline out at least one mile and added nearly one-thousand acres to the island (http://hvo.wr.usgs.gov/volcanowatch/1997/97_07_25.html).

Waimea to read by its glow. The flow destroyed a coastal village and fishponds at Wainānālī‘i and Kīholo.

Figure 2.1 Recent Lava Flows in Project Area.



These two major lava flows, together with prior flows, have created a layered and varied landscape of great beauty, with different lava colors reflecting the differences in age, chemical composition, and the impact of subsequent weathering. This underlying complexity merges into an arid polarity of rock and sky, evoking a sense of peace and solace closely tied to nature. These flows are excellent examples of the geological processes that have created the Hawaiian Islands and the native geography of the area, known to the ancient Hawaiian community as Nāpu‘u (lit. the Hills).

Another type of geologic feature present in the Kīholo State Park Reserve are *kīpuka*, oasis-like stands of vegetation which remain isolated and untouched by lava which has flowed around them. Kīpuka are often associated with springs or anchialine pond complexes, and several are located within the project area. These clusters of vegetation form a welcome relief in the hot lava landscape. It is in these *kīpuka* that Hawaiians often created small settlements and rest stops.

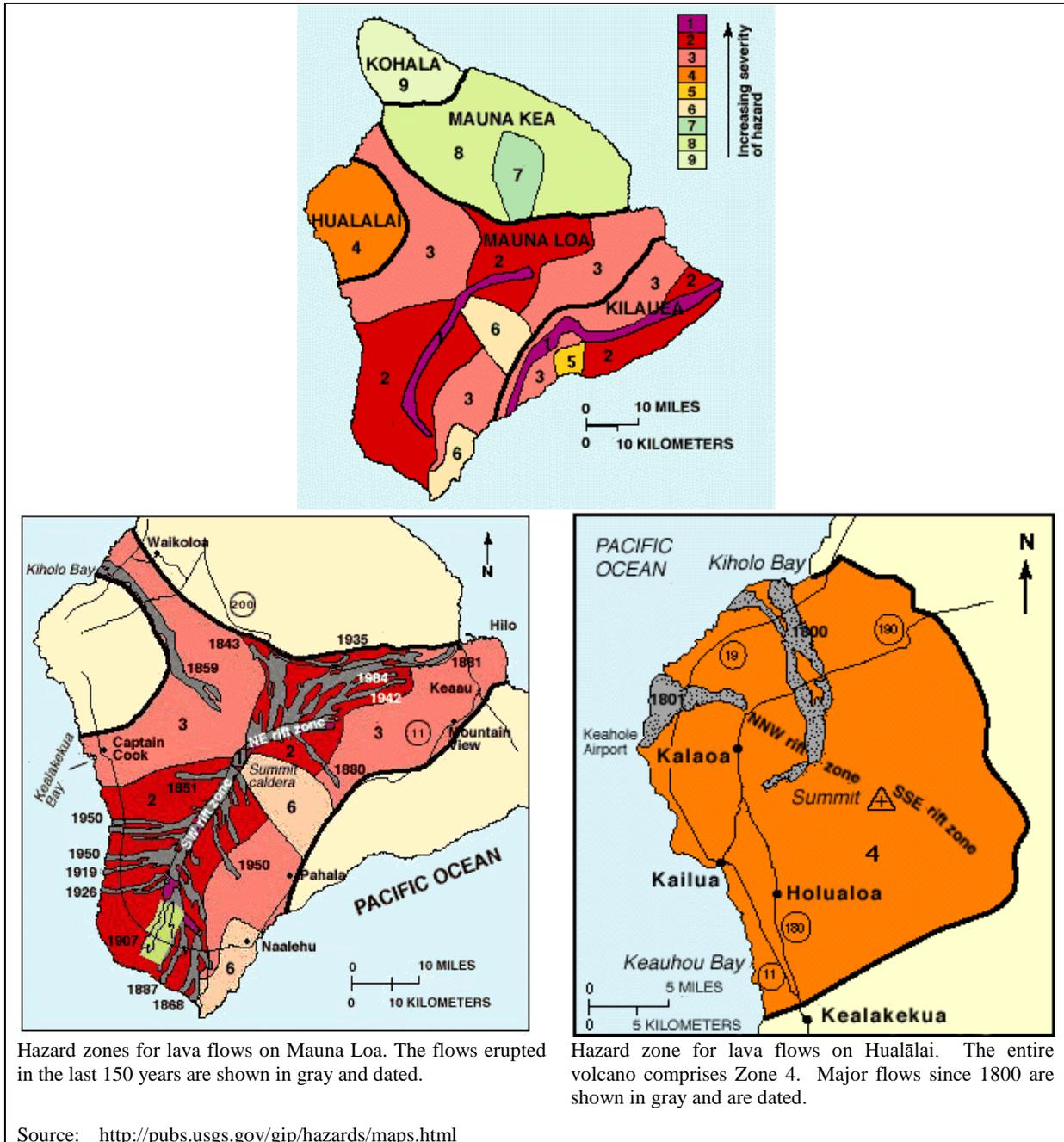
The final major geological feature is the coastline itself. It is a rocky coastline for most of the Park Reserve’s frontage, reflecting the island’s relative youth. Lava flows that have reached the ocean have not yet eroded and form sharp, rocky coastal features. But there are a number of areas, some large and small, where the lava gives way to sand and/or cobbles. These include black and white rock and boulder beaches and classic sandy beaches found in small crescent pockets along the coast, such as Pueo and Keawaiki Bays.

2.2.1.2.1 Hazards from Lava Flows

The U.S. Geologic Survey has rated the hazards from lava flows on the Island of Hawai‘i. It has categorized the Kīholo area as shown in Figure 2.2. Based on a scale of 1 through 9, with “1” being

the highest risk and “9” being the lowest risk, the area south of Kīholo Bay is a “4” and the area to the north of Kīholo Bay is a “3”.

Figure 2.2 Hazards from Lava Flows in the Kīholo Area.



Hazard zones for lava flows on Mauna Loa. The flows erupted in the last 150 years are shown in gray and dated.

Hazard zone for lava flows on Hualalāi. The entire volcano comprises Zone 4. Major flows since 1800 are shown in gray and are dated.

Source: <http://pubs.usgs.gov/gip/hazards/maps.html>

Based on the USGS mapping, the risk from lava flows is in the high-middle of the range for the Big Island. The USGS notes that lava flows are the most common of the direct hazards created by Hawaiian eruptions and poses the greatest threat to property but are sufficiently slow moving that they do not usually constitute a threat to peoples’ lives. The chief threat of lava flows to property owners is that the flows may burn structures and bury land and key infrastructure (e.g., roads and

utilities). The fronts of Hawaiian lava flows generally move more slowly than the speed at which people walk, especially in areas such as Kīholo where the slope is relatively gentle.⁹

2.2.1.2.2 Other Volcanic Hazards

Other volcanic hazards include airborne particles of ash, cinder, and fragile strands of volcanic glass called Pele's hair, and corrosive volcanic gases.

- *Tephra*. Most volcanic eruptions produce fragments of lava that are airborne for at least a short time before being deposited on the ground. These fragments are called “tephra”, and include ash, cinders, and Pele's hair. In Hawai‘i, tephra is usually ejected by lava fountains and poses a serious hazard only in the immediate vicinity of an erupting vent. While windborne tephra can, under certain circumstances be carried tens of miles, this is very unusual. Hence, tephra is not expected to be a significant threat at Kīholo.
- *Volcanic Gases*. Volcanic gases are emitted during all types of eruptions, including ones by inactive eruptive vents and by fumaroles (the name for a vent that may never have produced any lava).¹⁰ Extremely small amounts of mercury and other metals have been detected in gases emitted from vents along the east rift zone of Kīlauea, but none have been found in concentrations large enough to create a direct health hazard. Any hazard posed by volcanic gases is greatest immediately downwind from active vents; the concentration of the gases quickly diminishes as the gases mix with air and are carried by winds away from the source.¹¹ Because the vents likely to affect the Kīholo area are distant, volcanic gases are not a major concern.
- *Explosive Eruptions*. The rare explosive eruptions in Hawai‘i generally are caused by the interaction of magma and ground water. The magnitude of the resulting steam explosion varies from harmless to catastrophic. USGS records indicate that the largest explosive eruption on Hawai‘i in the post-contact period occurred in 1790. Originating at Kīlauea’s summit this eruption produced pyroclastic surges (turbulent clouds of hot gas and rock fragments) that flowed several miles to the southwest at speeds of 30 to 200 miles per hours. Thick deposits of ash exposed at many sites on the island indicate that even larger explosive eruptions occurred in prehistoric times and probably originated from Mauna Kea as well as from Kīlauea. There are no vents with a recent history of explosive eruptions near Kīholo. Hence, while the possibility of such an event occurring cannot be completely discounted, the probability is so low that it is not relevant to park planning.
- *Ground Cracks and Settling*. Ground cracks and settling are commonly associated with volcanic activity; both generally occur near active or recently active volcanic vents as the result of shallow underground movement of magma. The hazard presented by ground cracks and settling associated with eruptions is usually limited to areas near the active vent and thus is overshadowed by the hazard posed by lava flows. Hence, they are not a consideration in the Kīholo area.

2.2.1.2.3 Earthquakes

The Island of Hawai‘i in general and the Kīholo area in particular have both been subject to sizeable earthquakes in the past. The USGS’s summary of destructive earthquakes in Hawai‘i County over the past 150 years is reproduced in Table 2.1.

⁹ The chemical composition of lava can affect how rapidly a flow travels, with some being more fluid and flowing at greater speeds than others. The USGS notes, for example, that the 1800-1801 eruption of Hualālai produced lava flows that appear to have been more fluid than flows from similar eruptions on Kīlauea and Mauna Loa.

¹⁰ The gas plume rising from an active vent on Kīlauea, for example, consists of about 80 percent water vapor with lesser amounts of sulfur dioxide, carbon dioxide, and hydrogen. Small quantities (typically less than 1 percent by volume) of carbon monoxide, hydrogen sulfide, and hydrogen fluoride are also present.

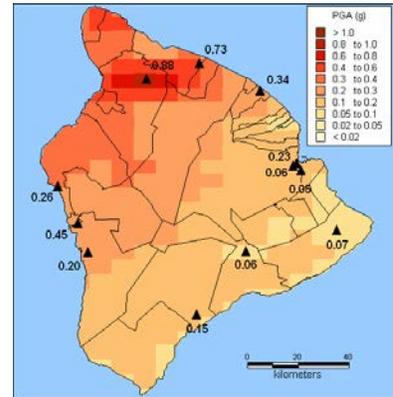
¹¹ Sulfur dioxide gas commonly produced during Hawaiian eruptions can combine with water to form sulfuric acid, which can attack skin, cloth, metal, and other materials. When a volcanic plume mixes with atmospheric moisture, it can lead to acid rain that can significantly retard plant growth downwind of a vent that degasses over a long period of time.

Table 2.1 Destructive Earthquakes in Hawai‘i County Since 1868

<i>Date</i>	<i>Epicenter Location</i>	<i>Maximum Intensity</i>	<i>Magnitude</i>	<i>No of Deaths</i>	<i>Damage</i>
03 28 1868	Southern Hawai‘i	IX	7.0	0	Extensive-Southern Hawai‘i.
04 02 1868	Southern Hawai‘i	XII	7.9	81	>100 houses destroyed, tsunami
10 05 1929	Hualālai	VIII	6.5	0	Extensive-Kona
08 21 1951	Kona	VIII	6.9	0	Extensive-Kona
04 26 1973	North of Hilo	VIII	6.2	0	Extensive-Hilo, \$5.6M
11 29 1975	Kalapana	VIII	7.2	2	Extensive-Hilo, \$4.1M
11 16 1983	Ka‘oiki	IX	6.7	0	>\$6M Extensive-Southern Hawai‘i,
06 25 1989	Kalapana	VII	6.2	0	Southeast Hawai‘i almost \$1M
10 15 2006	Kīholo Bay	VIII	6.7, 6.0	0	NW Hawai‘i, >\$100M
*Note: from USGS Bulletin 2006, <i>Isoseismal Maps, Macroseismic Epicenters, and Estimated Magnitudes of Historical Earthquakes in the Hawaiian Islands</i> by Max Wyss and Robert Koyanagi.					
Source: http://hvo.wr.usgs.gov/earthquakes/destruct/					

The last of the earthquakes listed in the table (October 15, 2006) has been given the name the Kīholo Bay earthquake even though it was centered well off the coast (the epicenter was approximately 7 miles north-northwest of Kalaoa. It was followed by over 50 aftershocks, including a magnitude 6.0 earthquake 7 minutes later. The earthquake originated approximately 18 miles beneath the surface, originating from bending stresses within the Pacific Plate caused by the weight of the overlying islands.¹²

Despite its moderate depth, the earthquake generated high accelerations to the northeast of the epicenter. For example, the instrument at the Waimea Fire Station, measuring 0.88g, recorded a maximum horizontal component of 1.05g. Due to these high PGA values (i.e., the high-frequency content of the ground motion), the earthquake primarily affected acceleration-sensitive components, such as contents and nonstructural elements. The ground motions at longer periods (e.g., periods over 1.0 second), did not follow this same trend. The USGS ShakeMap for spectral acceleration (Sa) at a period of 1.0 second, for example, did not follow this trend, and because of the lack of low-frequency content in the ground motion, the earthquake resulted in relatively low overall levels of building damage.



Source: RMS Event Report: 2006 Kīholo Bay, Hawaii Earthquake Figure 2: USGS ShakeMaps for peak ground acceleration

The team inspecting the area for damage immediately after the earthquake did not report visiting the Kīholo area. However, they did visit the major resort structures along the shoreline to the north, including those at the Waikoloa Beach Resort immediately north of the Kīholo State Park Reserve boundary, and they did not report substantial damage from that location. Kīholo residents reported the kinds of damage to contents that were shaken off of shelves that other residents of the region experienced, but there was no widespread damage. There were reports of significant damage to the nearby Mauna Kea Beach Hotel, which suggests that a similar or stronger earthquake could have the potential to damage manmade structures and natural features within the park.

¹² Risk Management Solutions (2006). *RMS Event Report: 2006 Kīholo Bay, Hawai‘i Earthquake.* http://www.rms.com/Reports/HawaiiEQ_ReconReport.pdf

2.2.1.3 Soils

Soil cover across the Kīholo landscape ranges from virtually non-existent on the recent lava flows to a relatively thin veneer on areas composed of older lavas. The U.S. Soil Conservation Service’s 1972 soil survey report (Sato et al., December 1973) identifies only four different “soil types” within the park boundaries. They are Beaches (BH), a‘a lava flows (rLV), pāhoehoe lava flows (rLW), and rock land (RO). Only the last two support vegetation, and even these have such shallow soils that only the hardiest of plants survive.

2.2.1.4 Topographic, Geologic, and Soils Opportunities and Constraints

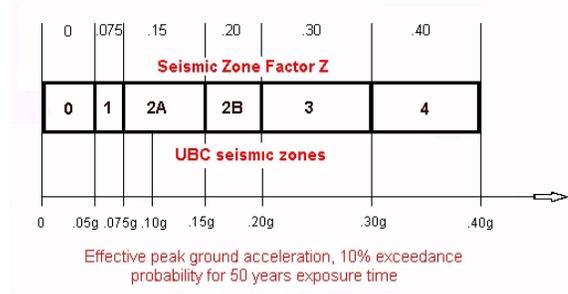
2.2.1.4.1 Topographic, Soils Opportunities and Constraints

On a macro-scale, even the steepest grades within the Kīholo State Park Reserve do not constitute a significant constraint on the development of park infrastructure such as roads and small structures. Similarly, the soils are sufficiently shallow and well drained (except in the vicinity of depressions such as those in which anchialine ponds have formed) that they do not constrain recreational uses or facilities of the sort that are appropriate to the wilderness park. Similarly, soils and topography do not offer major opportunities that need to be taken advantage of.

Geologic Opportunities and Constraints. Geologic factors do deserve serious consideration in the Kīholo State Park Reserve planning process. Two factors, lava flows and earthquakes, are of note.

Lava Flows. Most of the Kīholo area has been overrun by lava flows in relatively recent times, and there is every reason to believe that the eruptions that have produced these flows will continue in the future.¹³ Since there is nothing that can be done to prevent the flows and no way to know where they are likely to occur in the future, there is little that can be done to minimize the risk other than by (i) limiting the amount of capital investment that is made in facilities that cannot be readily and relatively inexpensively replaced and (ii) ensuring that an adequate warning system is in place. Fortunately, this does not represent a major constraint in the development of facilities in the sort of wilderness park that the State envisions for Kīholo. Lava flows would originate sufficiently far away that there would be more than adequate time to evacuate park users from threatened areas and the facilities that are being contemplated do not involve a large capital investment that would be at risk.

Earthquakes (seismicity). Engineers, working with seismologists and architects, classify seismic hazards on the basis of the expected strength of ground shaking and the probability of the shaking actually occurring within a specified time. These are the basis for the seismic design provisions incorporated into the Uniform Building Code (UBC). The UBC has the following six seismic zones, ranging from 0 (no chance of severe ground shaking) to 4 (10 percent chance of severe shaking in a 50-year interval). The shaking is quantified in terms of the g-force it produces (1-g is a unit of force equal to the force exerted by gravity).



In 1992, the USGS evaluated the seismic hazards in Hawai‘i County using a probabilistic approach that combines earthquake rates known from the historical record; information about how strong ground shaking dissipates with increasing distance from the earthquake; and a determination of the probabilities that specified levels of ground motion will occur in a specified time period. The results

¹³ Based on an average recurrence of four flows in the last 1,000 years that have reached that coast, there is a 33 percent chance of one flow per century.

of the analysis led the USGS to place all of the Big Island in Seismic Zone 4. This is consistent with the forces that were recorded during the 2006 Kīholo event discussed previously.

Because complying with the Zone 4 standards is a building code requirement, designing to a lesser standard is not an option. At the same time, while compliance requires a few additional structural provisions, the requirements for the sorts of structures likely to be used within Kīholo State Park Reserve are small. Hence, the earthquake risk situation at Kīholo does not constitute a substantial constraint on park development or use.

2.2.2 CLIMATE

The study area is characterized by low rainfall, high to moderately high evaporation, high temperature, and at times strong winds. A few storms occur during the winter months bringing about widespread rainfall that in some years may account for most of the annual rainfall. Table 2.2 shows the climatologic averages for selected climate parameters at Keahole Airport for the eleven-year period from January 1998 through December 2008. The airport, which is approximately six miles southwest of the nearest park boundary, is generally slightly wetter and slightly more cloudy than Kīholo, but these averages are representative of what can be expected at the park.

2.2.2.1 Temperature

Temperatures in the region are moderate year-round. The average monthly temperature at Keahole Airport, which is approximately 8 miles to the south-southwest, ranges from approximately 75 degrees F in the winter to 81 degrees F in August, the hottest month. Average monthly temperatures at Pu'ukoholā Heiau, which is approximately 9 miles to the north-northeast, tend to be about four degrees hotter. It is likely that temperatures at Kīholo lie somewhere in between the two. The differences are small, however, and for the purpose of this discussion the complete data from Keahole Airport will be used as the basis for the discussion.

The average high temperature during the warmest months (June through October) ranges from 85 to 87 degrees F. The extreme maximum is 97 degrees F, but that is very unusual, and the hottest day during most years is in the low 90s. The lowest average monthly temperatures (~68 degrees F) are in January and February. From time-to-time much lower temperatures occur, with days having low-temperatures in the mid-40s having been recorded in January, May, and June.

2.2.2.2 Rainfall

The mean annual rainfall at Keahole Airport during the 1998-2008 period was approximately 11 inches, and average annual rainfall at Pu'ukoholā Heiau is almost the same. With average monthly rainfall amounts of 0.5 to 0.7 inches, summers are significantly drier than winters (when average monthly rainfall generally ranges from 1.0 to 1.5 inches). Relative humidity tends to be low by Hawaiian standards.

The low rainfall is the result of the area's position in the lee (relative to the northeast trade winds) of high mountains and to the presence of an atmospheric inversion that generally prevails at an elevation of 4,000 to 6,000 feet above sea level with high humidity below the inversion level and drier conditions above.¹⁴ Thus, the trade winds coming generally from an east-northeasterly direction are effectively blocked and trapped and unable to reach the study area. At Kīholo, the sea breeze phenomenon, which brings considerable rain to the region further south, is effective only in raising humidity rather than in increasing rain.

¹⁴ Mauna Kea, Mauna Loa, and Hualālai are 13,796 feet, 13,680 feet, and 8,271 feet above mean sea level, respectively.

Table 2.2 Climatologic Averages: Keahole Airport: January 1998 to December 2008

	<i>Jan</i>	<i>Feb</i>	<i>Mar</i>	<i>Apr</i>	<i>May</i>	<i>Jun</i>	<i>Jul</i>	<i>Aug</i>	<i>Sep</i>	<i>Oct</i>	<i>Nov</i>	<i>Dec</i>	<i>Year</i>
TEMPERATURE (F)													
Avg Max Temp	81.5	81.3	82.3	83.2	83.8	85.0	86.2	87.0	86.7	85.9	84.1	82.3	84.1
Avg Min Temp	68.2	68.0	69.7	70.9	72.1	73.3	74.4	75.2	74.5	73.7	71.7	69.5	71.8
Avg Temperature	74.8	74.7	76.0	77.0	78.0	79.2	80.3	81.1	80.6	79.8	77.9	75.9	77.9
Extreme Max Temp	87	87	88	89	93	90	93	92	92	97	93	89	97
Year of Ext-Max	1999	2002	1999	2005	2002	2002	2000	2000	2000	2000	2001	2005	2000
Extreme Min Temp	44	60	61	65	48	43	69	70	69	67	53	61	43
Year of Ext-Min	1998	1998	2005	2008	2004	2000	1998	1999	1999	1999	2007	1999	2000
Cooling Degree Days	305	273	340	361	402	426	475	498	468	458	387	338	4,731
Avg Number of Days:													
Max Temp \geq 90	0.0	0.0	0.0	0.0	0.1	0.1	0.3	0.9	0.8	0.7	0.3	0.0	3.2
Max Temp \geq 75	31.0	28.2	31.0	30.0	31.0	30.0	31.0	31.0	30.0	31.0	30.0	31.0	365.2
Avg Dew Point Temp	63.2	62.7	64.6	64.2	65.6	66.6	68.1	68.7	68.2	67.0	65.8	64.1	65.7
Avg Wet Bulb Temp	67.5	67.2	68.6	68.8	69.8	70.6	72.1	72.7	72.3	70.9	69.7	68.4	69.9
PRECIPITATION (in)													
Average Monthly	1.58	1.22	0.80	0.55	0.75	0.98	0.47	0.57	0.68	1.20	1.12	1.00	10.92
Maximum Daily	1.83	2.84	2.48	1.14	0.71	1.31	1.42	1.02	1.11	3.17	4.08	3.94	4.08
Year of Ext-Day	2004	2004	2002	2004	200	2004	2006	2004	2000	2006	2000	2007	
Avg Number of Days:													
\geq 0.01	4.3	2.6	3.7	3.5	5.8	5.6	3.8	4.3	5.7	3.5	3.5	2.9	49.4
\geq 0.10	2.3	1.3	1.6	1.1	2.1	2.0	0.8	1.5	1.5	1.5	1.2	1.5	18.3
\geq 0.25	1.8	0.9	0.5	0.6	1.2	0.9	0.4	0.7	0.6	1.0	0.5	0.9	10.2
\geq 0.50	1.1	0.7	0.4	0.5	0.5	0.6	0.2	0.4	0.4	0.6	0.5	0.4	6.2
\geq 1.00	0.6	0.4	0.2	0.1	0.0	0.3	0.2	0.1	0.1	0.3	0.4	0.3	2.8
WIND (mph)													
Daily Avg Wind Speed	8.1	7.8	8.1	8.0	7.8	7.9	7.9	8.0	7.7	7.3	7.3	7.5	7.8
Daily Avg Max 2-Min	16.7	16.8	16.7	16.5	15.8	15.9	16.5	16.6	15.	16.	15.	15.8	16.3
Daily Avg Peak Gust	19.6	19.7	19.4	19.3	18.4	18.5	19.4	19.4	18.5	18.8	18.5	18.4	19.0
Maximum Daily Avg	23.0	25.3	24.7	18.4	14.4	11.8	11.8	11.4	11.7	15.3	20.3	25.0	25.3
Maximum 2-Minute Avg	38	44	39	33	36	29	30	31	25	33	43	41	44
Year of Max 2min-Day	2004	2004	2006	1998	2004	1998	2008	2006	2001	2001	2003	2004	
Maximum Peak Gust	46	54	44	38	41	37	35	36	31	38	51	49	54
Avg Days Peak Gust \geq 30	3.1	2.7	2.5	1.5	0.9	0.5	1.3	1.0	0.3	1.4	1.7	1.7	18.7
Avg Days Peak Gust \geq 40	0.5	0.7	0.5	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.	0.5	2.4
Max 2-Minute \geq 30	1.6	1.7	0.8	0.4	0.1	0.0	0.1	0.1	0.0	0.3	0.7	0.0	5.8
Max 2-Minute \geq 40	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4
Notes: The average number of days with thunderstorms or heavy fog was very low throughout this period of record, with no months reporting more than 4 events over the decade and many months reporting an incidence of zero. No hail was reported. Light fog was reported infrequently (averaging 18.6 days per year). It is possible that these were related to storm events. Heavy Fog = Visibility less than or equal to 1/4 mile; Fog = Visibility greater than 1/4 mile or less than 7 miles; Peak Gust = Maximum 5-second average.													
Source: National Oceanographic and Atmospheric Administration, Copyright ©2009 Western Regional Climate Center - Desert Research Institute - Reno, Nevada. http://www.wrcc.dri.edu/summary/koa.hi.html													

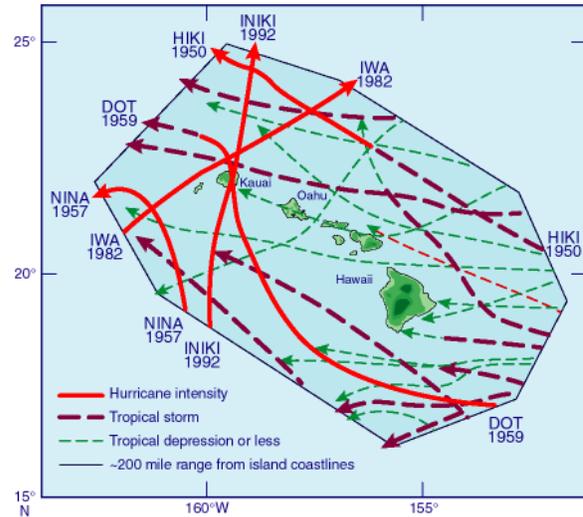
Despite the overall aridity, rare storm events can bring intense rainfall to the Kīholo area. The *Rainfall Frequency Atlas of the Hawaiian Islands* (Cooperative Studies Section, Hydrologic Services Division, U.S. Weather Bureau, 1962, pages 53-57) shows 24-hour rainfall intensities for recurrence intervals of 10, 25, 50, and 100 years to be as follows:

24-Hour Rainfall Amount by Recurrence Interval				
5-year	10-Year	25-Year	50-Year	100-Year
4.0 inches	4.5 inches	4.8 inches	6.1 inches	7.0 inches

Intense local storms are sometimes accompanied by lightning and thunder, but the occurrences tend to be rarer and less violent in comparison with most continental parts of the United States.

The National Weather Service has identified four classes of disturbances that produce major storms. They are:

- Cold Front Storms. Cold fronts that sweep across the islands can bring with them locally heavy showers and gusty winds.
- Kona Storms. Sometimes a storm eddy, or low pressure system, moves past bringing widespread heavy rains, often accompanied by strong winds. These Lows are known as Kona storms. Kona storm rains are usually most intense in an arc, or band, extending from south to east of the storm and well in advance of its center. An entire winter may pass without a single well-developed Kona storm; in other years there may as many as four or five. Kona rains last from several hours to several days.
- Hurricane or Tropical Storm. The third class of disturbance is the true tropical storm or hurricane. These are rare, but may pass close enough to the islands to yield heavy rains, high winds, and large waves. True hurricanes (i.e., storms with sustained wind speeds of 74 mph or higher) are very rare in Hawai‘i, indicated by the fact that only four have affected the islands since 1949, none of which passed directly over the Kīholo area. Even tropical storms (i.e., storms with maximum sustained wind speeds ranging from 39 mph to 73 mph) have generally passed at least 100 miles away from Kīholo.
- Other Lows and Troughs. The National Weather Service’s fourth category of disturbance includes all the instances of severe weather attributable to low pressure systems (Lows and troughs) in the upper atmosphere that are not associated with the foregoing cold fronts, Kona storms and tropical storms or hurricanes. The weather which accompanies these upper Lows or trough – towering cumulus clouds, thunderstorms, intense and widespread rain – often resembles that of a Kona storm and may be mistaken for one, except for the absence of the persistent strong southerly winds that frequently accompany Kona storms.



2.2.2.3 Climate Related Opportunities and Constraints

There are a number of very positive aspects to the climate at Kīholo. First, it is suitable for year-round use; there are relatively few days of rain or other conditions that make it unattractive for outdoor recreation. The afternoon rainfall that affects Kona and the much wetter overall pattern that affect the eastern side of the island are simply absent, and reliably so. Because of this, it is possible to

plan visits to the shoreline well in advance with considerable confidence that the event will not be rained out.

While intense rainfall and winds can occasionally occur, they are very infrequent. None of them impose particular constraints on the kinds of facilities and/or activities that can be established there. Neither do they impose a need for special warning systems or precautions.

The lowland warmth and absence of cloud cover and rainfall do impose some limitations on park use. First, park users need to be careful to come with their own water. There are no local sources of freshwater for them to use for drinking, cooking, or bathing. Second, the low rainfall and warm weather limits the kinds of vegetation that can survive and, therefore, be used effectively for landscaping. As discussed elsewhere, it is also a contributing factor to the damage that feral ungulates can (and do) cause to the existing (and native) flora.

2.2.3 HYDROLOGY

2.2.3.1 Surface Water

The natural drainage net is only slightly developed in the upland areas inland of Kīhōlo. This is due to the relatively low rainfall and to the youthfulness and permeability of the lava flows that are still forming the mountain. There are no intermittent streams in Pu‘uwa‘awa‘a, the area south of ‘Anaeho‘omalū because of recent lava flow cover (lava flow of 1859). No perennial streams are located within Kīhōlo State Park Reserve and none of the intermittent stream gulches reaches the ocean. As a result, no flow data are available.

In 2005, the Commission on Water Resource Management developed hydrologic unit maps for the Surface-Water Hydrologic Units.¹⁵ In this system, Kīhōlo is given the Hydrologic Unit Code #8156 and the Hydrologic Unit Name “Kīhōlo”.

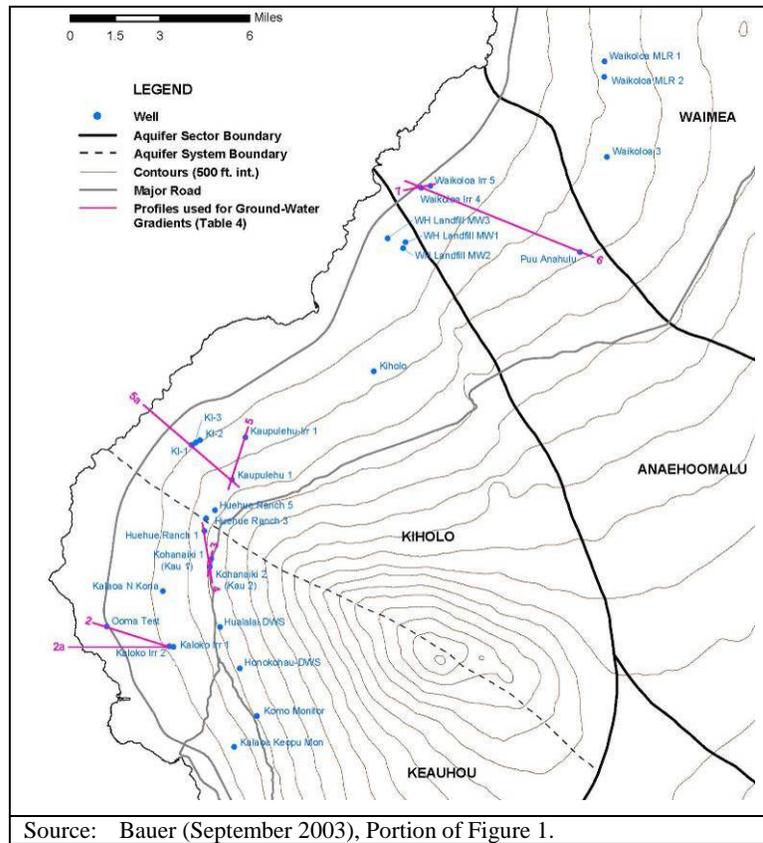
2.2.3.2 Groundwater

Kīhōlo is located in the Hualālai Aquifer Sector Area (ASEA), which includes the entire Hualālai shield volcano; it is divided into the Keauhou [80901] and Kīhōlo [80902] Aquifer System Areas (ASYA) along Hualālai’s main northwest-southeast rift zone. Average annual rainfall in the Kīhōlo ASYA varies from just over 10 inches at the coast (where the park is located) to 45 inches at mid-elevation, making this system area one of the driest on the island, with a sustainable yield of 18 million gallons per day (MGD). There is no County of Hawai‘i Department of Water Supply (DWS) water system in the Kīhōlo ASYA. There are no State or Federal water systems in the Hualālai ASEA. The State Department of Health has classified the aquifer as an unconfined basal aquifer flank (horizontally extensive) lavas.

The Ka‘ūpūlehu Potable Wells 1 and 2 (4658-01, 02) are drilled 2,000 feet northeast of Pu‘u Nahaha, a vent structure on the northwest rift that erupted between 3,000 to 5,000 years ago (Moore and Clague, 1991) (see Figure 2.3). When these wells were pump tested in the 1980’s chloride concentration ranged from the 36 mg/L to 42 mg/L. The non-potable irrigation wells located between elevation of 600± (Kūki‘o irrigation wells) and 900± (Ka‘ūpūlehu irrigation wells) produce water with chlorides ranging from 900± to 1,600± mg/L at the Kūki‘o battery and from 250± to 750± mg/L for the Ka‘ūpūlehu Irrigation wells. The Kīhōlo well is located 6 miles northeast of Ka‘ūpūlehu Potable Well 1, and was drilled in 1973 (State of Hawai‘i, 1973). The well was tested at 700 gpm and had a drawdown of less than one-foot. Chlorides during the testing phase varied between 330 and 352 mg/L, but remained steady at 345 mg/L.

¹⁵ For the majority of hydrologic units, unit boundaries closely matched the drainage basins; in a few instances, streams were found to go across hydrologic unit boundaries and in these cases drainage basins further were examined to more accurately determine the natural flow of water based on elevation gradients.

Figure 2.3 Groundwater Monitoring Network Well Locations



Bauer (September 2003) synthesized the available information on potable and non-potable wells in the Kūki‘o-Ka‘ūpūlehu-Kīholo region. The non-potable sources are the Kūki‘o irrigation wells (State No. 4759-01-03), the Ka‘ūpūlehu irrigation well (State No. 4757-01), and the Kīholo Well (State No. 4953-01). He concluded that the known groundwater occurrence in the study area is, for the most part, a thin basal lens with the water level located generally only a few feet above the sea level and with a slightly sloping water table toward the ocean. Groundwater levels from the USGS recording equipment located in a well located at a ground elevation of 931.65 feet above mean sea level are plotted in Figure 2.4. Based on the data from this and other wells, the slope of the basal lens is very flat, averaging perhaps 1.3 feet per mile. The lens water at the well is slightly brackish with increasing salinity towards the ocean.

Table 2.3 summarizes the current production, potential production (16 and 24 hour operation), sustainable yield (SY), and percentage of SY estimates contained in the *Hawai‘i Water Use Development Plan*. Current production is represented by the highest 12-month moving average (MAV) or the highest annual average yield calculated from the actual pumpage data.

Figure 2.4 Groundwater Levels at USGS monitoring well 2.7 Miles Inland of Kīholo Bay.

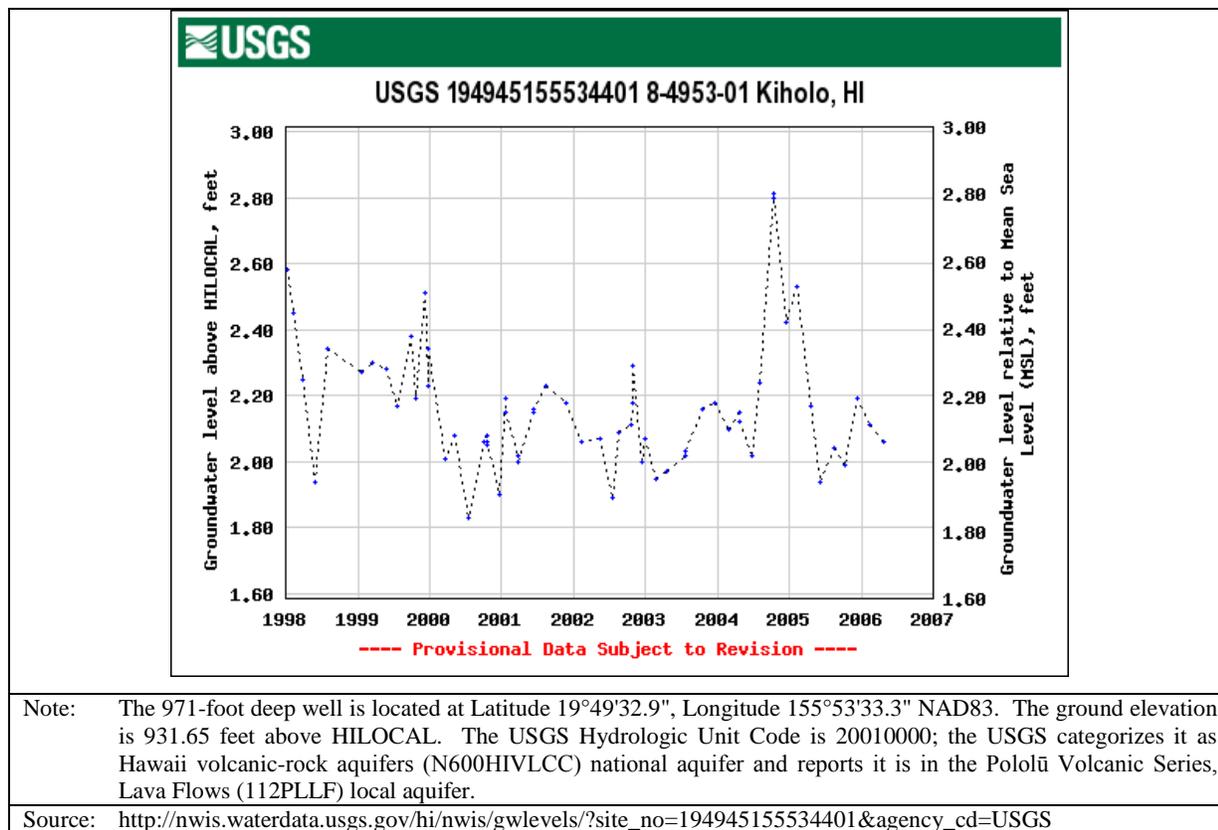


Table 2.3 Sustainable Yield and Pumpage – Hualālai Aquifer Sector Area

Sys Code	System Area	High 12-Month MAV (MGD)	Potential 16-Hour Production (MGD)	Potential 24-Hour Production (MGD)	SY (MGD)	High 12-Month MAV SY (%)	Potential 16-Hour Production n SY (%)	Potential 24-Hour Production SY (%)
		15.55	32.79	49.18	56	27.77	58.55	87.82
80901	Keauhou	11.49	16.58	24.87	38	30.24	43.63	65.45
80902	Kīholo	4.06	16.21	24.31	18	22.56	90.04	135.06

2.2.3.3 Hydrologic Opportunities and Constraints

The available data indicate that ground and surface water conditions at Kīholo offer few significant opportunities or constraints. Flooding is not an issue. Groundwater is present, but within the park boundaries it is generally not potable. As a result, developing the groundwater resources for park use is generally inadvisable.

2.2.4 AIR QUALITY

2.2.4.1 Existing Air Quality at Kīholo

In view of the absence of significant sources of human air pollution in the immediate vicinity of Kīholo State Park Reserve, existing air quality is believed to be generally good when the island’s volcanoes are inactive.¹⁶ However, in the absence of a nearby air quality monitoring station, that

¹⁶ However, as there is no nearby air quality monitoring station, data needed to demonstrate this are lacking.

cannot be documented. Moreover, all that changes when eruptions are ongoing. During such periods, high levels of volcanic air pollution (vog) can be present.

Vog is primarily a mixture of sulfur dioxide (SO₂) gas and sulfate (SO₄) aerosol. SO₂ (invisible) reacts with oxygen and moisture in the air to produce SO₄ aerosol (visible). SO₂ is expected to be the main problem in areas near the vent (Hawai'i Volcanoes National Park, Pāhala, Na'alehu, Hawaiian Ocean View Estates) and SO₄ aerosol is expected to be the main problem at locations far from the vent (Kona and farther north and west, including Kīhōlo).

Vog is monitored by the State Department of Health at a limited number of locations on the island. The highest levels are, as one would expect, typically located close to active vents, none of these are presently near Kīhōlo. The State Department of Health has developed the advisory levels for short-term Sulfur Dioxide (SO₂) reproduced in Table 2.4. As part of the Vog Measurement and Prediction Project (VMAP), monitoring stations located at various locations around the islands are now feeding data into a centralized system that is intended to allow residents and visitors to adjust their daily activities in a way that minimizes the health risks.¹⁷ The model uses estimates of volcano emissions along with forecast winds to predict the concentrations of sulfur dioxide gas (SO₂) and sulfate aerosol particles (SO₄) downwind of the ongoing Kīlauea eruption.

2.2.4.2 Air Quality Related Opportunities and Constraints

Vog will always be a factor when eruptions are ongoing and the winds are blowing from a direction that brings emissions towards the area. However, barring the return of activity to Hualālai, SO₂ and SO₄ concentrations are likely to remain moderate. However, the air quality at Kīhōlo is now, and is likely to remain, sufficiently good that it will not preclude any of the kinds of activities that might be planned for the park.

2.3 TERRESTRIAL AND AVIAN BIOTA

2.3.1 INTRODUCTION

2.3.1.1 Purpose of the Biological Surveys

Botanical, avian, and mammalian surveys of the Kīhōlo State Park Reserve were carried out as part of the environmental disclosure and planning processes. The primary purpose of the surveys were to determine if the area contains any botanical, avian or mammalian species currently listed, or proposed for listing under either federal or State of Hawai'i endangered species statutes and whose presence needed to be considered when preparing the park Master Plan.¹⁸ The secondary goals were to identify habitats within the Park that are particularly sensitive from a biological perspective, and which are candidates for protection, restoration for public use or preservation purposes, or other resource management activities. Fieldwork was conducted between July 7 and July 11, 2011, with additional site visits conducted by Reginald David in late July, August, and September.

¹⁷ The Vog Measurement and Prediction Project (VMAP) is a feasibility study in which scientists are evaluating whether vog forecasts are achievable and useful. While the project collaborators are making the feasibility study available to the public through a Web site, VMAP currently provides limited service and reliability, and the website warns that VMAP users "should have no expectation of accuracy or timeliness".

¹⁸ The federal and State of Hawai'i listed species status follows species identified in the following referenced documents, Department of Land and Natural Resources (DLNR) 1998; U. S. Fish and Wildlife Service (USFWS 2005a, 2005b, 2011).

Table 2.4 DOH Guidance on Short-term Sulfur Dioxide (SO₂) Advisory Levels

SO ₂ Conc. (ppm) ¹	Color Code & Air Quality Condition	Air Quality Description	Recommended Action/Activity ²		
			Sensitive Groups ³	People Experiencing Health Effects ³	Everyone Else
0 – 0.10	Green (Good)	Considered satisfactory & poses little or no risk	Highly sensitive individuals may be affected at these levels		Potential health effects not expected
0.11-0.20	Yellow (Moderate)	Acceptable, however, may be moderate health concern for small number of people	Be aware that levels are slightly elevated	If you experience breathing difficulties, such as chest tightness or wheezing, stop activities, use a rescue inhaler and find a place to sit down and rest.	Potential health effects not expected, however actions to reduce exposure to vog may be useful
0.21–1.00	Orange (Unhealthy for Sensitive Groups)	Members in sensitive groups, including healthy individuals with mild asthma, may experience health effects. They may be affected at lower levels than general public. Toward the upper end of this range, most asthmatics who are active outdoors are likely to experience some breathing difficulties. General public not expected to be affected in this range.	Avoid outdoor activities that cause heavy breathing or breathing through the mouth ⁴	If you experience breathing difficulties, such as chest tightness or wheezing, stop activities, use a rescue inhaler and find a place to sit down and rest.	Potential health effects not expected, however actions to reduce exposure to vog may be useful
1.01–3.00	Red (Unhealthy)	Everyone may begin to experience health effects. Members of sensitive groups may experience more serious health effects.	Avoid outdoor activities & remain indoors	Consider leaving the area	Avoid outdoor activities that cause heavy breathing or breathing through the mouth ⁴
3.01–5.00	Purple (Very Unhealthy)	Triggers health alert, meaning everyone may experience more serious health effects.	Avoid outdoor activities & remain indoors	Leave the area & seek medical help	Avoid outdoor activities & remain indoors
> 5.01	Maroon (Hazardous)	Triggers health warnings of emergency conditions. Entire population is more likely to be affected.	Avoid outdoor activities & remain indoors. Leave the area if directed by Civil Defense	Leave the area & seek medical help	Avoid outdoor activities & remain indoors. Leave the area if directed by Civil Defense

Notes:

- Asthmatics & persons with chronic respiratory disease: **ALWAYS** have your medications available. Reducing your exertion level so that you can breathe through your nose will reduce the amount of SO₂ that reaches your lungs.
- People experiencing health effects: Contact your doctor as soon as possible if any problems develop, as respiratory conditions might worsen rapidly in heavy SO₂ or vog conditions.
- People have different sensitivities to SO₂. Use this table to learn how sensitive you are to SO₂, so that you can develop appropriate measures to protect your health and avoid serious responses.

1. Based on 15-minute average. Part per million equals part per billion divided by 1000.
2. Susceptible individuals may develop symptoms at or below the Warning limits
3. Sensitive Groups = children and individuals with pre-existing respiratory conditions such as asthma, bronchitis, emphysema, lung or heart disease. Note: Some people with mild asthma may not be aware of it. If you have breathing difficulties at low levels of SO₂, check with your healthcare provider.
4. People react differently to SO₂-some are more sensitive. The nasal passages can remove a lot of SO₂ before it gets to the lungs. For many people simply reducing activity levels enough so that they can breathe through the nose will permit them to be outdoors without symptoms.

Source: State of Hawai‘i Department of Health, <http://www.hiso2index.info/assets/FinalSO2Exposurelevels.pdf>

The plant habitats present within the Park are largely determined by the age of the substrates on which it grows (a mix of ‘a‘ā and pāhoehoe lava flows). The entire park is within an extremely dry climatic zone, and this fact combined with the young ages of a goodly proportion of the lava flows that created the land surface here, limits the vegetation types that occur. These vegetation types range from essentially all but barren recent flows to coastal strand and *kiawe* (*Prosopis pallida*) forest, to *kiawe* savannah, to fountain grass (*Pennisetum setaceum*) grassland.¹⁹

¹⁹ Plant names follow *Manual of the Flowering Plants of Hawai‘i* (Wagner *et al.*, 1990, 1999) for native and naturalized flowering plants and *A Tropical Garden Flora* (Staples and Herbst, 2005) for crop and ornamental plants. Place names follow *Place Names of Hawai‘i* (Pukui *et al.*, 1974). The avian phylogenetic order and nomenclature follows the *AOU Check-List of North American Birds* (American Ornithologists’ Union, 1998), and the 42nd through the 52nd supplements to the Check-List (American Ornithologists’ Union, 2000; Banks *et al.*, 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser *et al.*, 2009, 2010, 2011). Mammal scientific names follow (Tomich, 1986).

2.3.1.2 Biological Survey Methods

Botanical Survey Methods. A botanical survey was undertaken on July 7 and 8, 2011 by wandering over selected areas of the Park and noting the plants growing there. No attempt was made to cover the entire 4,362-acre area; instead, the coastal section was walked from one end to the other, several times in most areas. Interior portions of the park were inspected both from coastal points of entry and from entry points along the Queen Ka‘ahumanu Highway. Each of the distinctive geological zones found in the park were inspected and several of the roads and trails which connect the coast to the highway were traversed. Plants typical of each geological formation were noted, along with their relative abundance. This approach allowed a characterization by terrain type. Species not immediately recognized in the field were photographed and/or material collected for identification in the laboratory.

Avian Survey Methods. The avian surveys were conducted between July 7 and 11, 2011. Three linear transects were established, one each along the coast – main human usage area, one on the relatively barren 1859 lava flow and one in the kiawe/buffel grass grasslands on the 3,000-5,000 year old lava flow between Kīholo Bay and Queen Ka‘ahumanu Highway. Six-minute avian point counts were conducted at each of 30 stations (ten along each of these three linear transects). Field observations were made with the aid of Leica 10x42 binoculars and by listening for vocalizations. The counts and subsequent searches of the surrounding area were conducted between 6:30 a.m. and 10:00 a.m. each morning, the period when birds are most active. In addition to the avian point counts, the entire coastline within the park was walked, as were all of the 4x4 roads, and several of the foot trails within the park. Time not spent counting the point count stations was used to search the remainder of the park for species and habitats not detected during the point counts.

Mammalian Survey Methods. With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or ‘ōpe‘ape‘a as it is known locally, all terrestrial mammals currently found on the Island of Hawai‘i are alien species, and most are ubiquitous. The survey of mammals (which was conducted in conjunction with the July 7 – July 11, 2011, avian surveys described above) was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the park.

Invertebrate Survey Methods. Dr. Steven Montgomery conducted a reconnaissance level field survey of terrestrial invertebrate resources within the Kīholo State Park Reserve. The goal of the survey was to identify the above ground terrestrial invertebrates present in the study area. The primary emphasis was on endemic and indigenous terrestrial arthropods. Particular effort was made to locate and identify any species having legal status under federal and/or state endangered and threatened species statutes. Published literature was reviewed prior to the survey.

Field surveys were conducted between May 3 and 6, 2011. Surveying efforts were conducted at various times of day and night, and field personnel paid particular attention to native plants as these were likely to host native invertebrates. A variety of survey methods were used as appropriate to the terrain, botanical resources, and target species. These included:

- General visual observation for any evidence of arthropod presence or activity. This included turning over rocks and examining dead wood and other debris.
- Host plant searches for arthropods that feed or rest on plants. Wandering transects were followed throughout the coastal and inland area with emphasis on reaching native host plants.
- Sweeping with nets for flying and perching insects. A fine mesh net was swept across plants, leaf litter, rocks, pond surfaces, etc. to collect any flying, perching, or crawling insects. Transfer from the net was either by aspiration, or by placing the net contents directly into a holding container.
- Baiting to attract beach and lava crickets for censusing.

- Light sampling for approximately 9 hours on each night of surveying using a bright light (mercury vapor bulb source) in front of a white cloth sheet to draw insects toward the collecting light and land on the cloth in confusion. This type of collecting is most successful during the dark phase of the moon or under clouds blocking moonlight.

Collecting conditions were generally favorable. The thirty minutes of rain that occurred on May 3 was not heavy and did not greatly disrupt collecting efforts. The atmospheric fog did not appear to alter the behavior of invertebrates and cleared skies after the rains did not make measurable differences in survey results. After seasonal rains, vegetation in the survey area was in a reasonable state to act as host to many invertebrates. The moon was ‘dark’ and presented no competition to the collecting light on the evening of May 3, 2011. May 4-5 the moon was a waxing crescent with increasing portions visible, but rose in the early morning and set at roughly 8:00 and 9:00 p.m. leaving most of the night as dark (U.S. Naval Observatory). The complete lack of artificial light sources at the chosen sites compensated for the little competition offered by the sliver of moon in the earliest hours of the survey. Lava tube invertebrate resources were not studied as part of this survey.²⁰

The invertebrate survey was focused on finding any terrestrial endemic and indigenous Hawaiian land species. No attempt was made to completely document the common alien arthropod species present. Marine and fresh / brackish water invertebrates were reviewed by other surveyors.

2.3.2 BOTANICAL SURVEYS

2.3.2.1 *Flora Present*

Table 2.5 lists the plants observed during the field survey. The species status, given in **bold** in the table indicates a plant of particular interest to the Hawaiian Islands flora (indigenous, endemic, or Polynesian introduction). The key to abundance and status values are as follows:

The number of different plant species recorded (43) is rather low for a 4,300-acre area.²¹ A survey conducted following a period of rainfall might well bolster this number, although the additions would likely be non-native, ruderal species and non-native annuals.

More than any other factors, the young ages of the lava flows and extreme dryness of this part of the Island of Hawai‘i are responsible for the small number of recognizable vegetation types on this property. Because of the youthfulness of the lava flows, there has been little time for soil development. In fact, the two recent flows that account for better than 60 percent of the total area are nearly devoid of plant growth. In the vegetation maps developed as part of the survey (see Figure 2.5, Figure 2.6, Figure 2.7, and Figure 2.8) these areas are coded “**BL**” for barren lava. The flows may be either ‘*a‘ā*’ or *pāhoehoe* types, or mixed. They lack soil and their surface is mostly too high above the groundwater table to enable plants to establish and flourish. Where these flows extend to the coast, groundwater may be near the surface or even sometimes exposed as anchialine pools. This accounts for the fact that scattered shrubs and trees (typically, *kiawe*) will occur on otherwise barren basalt, growing in low areas of the topography, mostly near the coast. A sparse growth of fountain grass marks a relative young *pāhoehoe* flow at the southern end of the Reserve (Figure 2.6). While this flow is easily differentiated from the adjacent 1859 ‘*a‘ā*’ flow which is barren of vegetation, the cover by grass is so sparse on the *pāhoehoe* flow that it is difficult to characterize as grassland.

²⁰ It is reasonable to assume lava tube fauna are present and indeed a previous partial survey noted the presence of lava tube species (Christiansen and Bellinger 1992; TNC 1993).

²¹ Some private inholdings were included only because there was difficulty in determining exact property boundaries in the field. A number more would almost certainly have been recorded in the survey if all private inholdings were included. Posted or fenced areas, and areas prohibiting access (i.e., posted “no trespassing” signs) were respected. Developed properties were typically landscaped, and these plants were mostly not included in the accounting of species present in the park, except perhaps where naturalized species had spread out from the original planting.

Table 2.5 List of Flowering Plants (Dicotyledones) from Kīholo State Park Reserve

FAMILY Species	Common Name	Status	Abun	Notes
ASCLEPIADACEAE				
<i>Calotropis gigantea</i> (L.) W. T. Aiton	crown flower	Nat	R1	GL, CS
ASTERACEAE (COMPOSITAE)				
<i>Ageratum conyzoides</i> L.	<i>maile hohono</i>	Nat	O	2, SV
<i>Conyza bonariensis</i> (L.) Cronq.	hairy horseweed	Nat	U	2
<i>Pluchea carolinensis</i> (Jacq.) G. Don	sourbush	Nat	U	AP, CS
<i>Pluchea indica</i> (L.) Less.	Indian fleabane	Nat	U	AP
<i>Pluchea x fosbergi</i> Cooperr and Galang	hybrid pluchea	Nat	R	AP
<i>Sphagneticola trilobata</i> (L.) Pruski	wedelia	Nat	R2	AP, PL
BORAGINACEAE				
<i>Tournefortia argentea</i> L. fil.	tree heliotrope	Nat	U	CS
CAPPARACEAE				
<i>Cleome gynandra</i> L.	wild spider flower	Nat	R	1, 2
CASSURINACEAE				
<i>Casuarina equisetifolia</i> L.	ironwood	Nat	U1	PL
CHENOPODIACEAE				
<i>Atriplex semibaccata</i> R. Br.	Australian saltbush	Nat	U1	CS
<i>Chenopodium murale</i> L.	<i>'āheahea</i>	Nat	A	SV
CLUSIACEAE				
<i>Calophyllum inophyllum</i> L.	<i>kamani</i>	Pol	R	PL
CONVOLVULACEAE				
<i>Ipomoea pes-caprae</i> (L.) R. Br.	<i>pōhuehue</i>	Ind	A	CS
<i>Jacquemontia ovalifolia</i> (Choisy) H. Hallier	<i>pa'u-o-Hi'iaka</i>	Ind	U	SV
EUPHORBIACEAE				
<i>Euphorbia albomarginata</i> (Torr. and A. Gray) Small	rattlesnake weed	Nat	R	1, SV
<i>Euphorbia hirta</i> L.	garden spurge	Nat	U	1, SV
FABACEAE				
<i>Acacia farnesiana</i> (L.) Willd.	<i>klu</i>	Nat	U	3, SV
<i>Prosopis pallida</i> (Humb. and Bonpl. ex Willd.) Kunth	<i>kiawe</i>	Nat	AA	SV
GOODINIACEAE				
<i>Scaevola sericea</i> Vahl	<i>naupaka kahakai</i>	Ind	U	CS
MALVACEAE				
<i>Hibiscus tiliaceus</i> L.	<i>hau</i>	Ind	U	AP
<i>Thespesia populnea</i> (L.) Sol. ex Corrêa	<i>milo</i>	Pol?	U	PL
<i>Sida fallax</i> Walp.	<i>'ilima</i>	Ind	C	SV
MOLLUGINACEAE				
<i>Mollugo cerviana</i> (L.) Ser.	threadstem carpetweed	Ind	A	2, SV
NYCTAGINACEAE				
<i>Boerhavia repens</i> L.	<i>alena</i>	Ind	R	CS
PAPAVERACEAE				
<i>Argemone glauca</i> (Nutt. ex Prain) Pope.	<i>pua kala</i>	End	R2	3,SV
RUBIACEAE				
<i>Morinda citrifolia</i> L.	<i>noni</i> , Indian mulberry	Pol	U	PL, AP
STERCULIACEAE				
<i>Waltheria indica</i> L.	<i>'uhaloa</i>	Ind	U	SV, GL

Table 2.5 (cont'd) List of Flowering Plants (Monocotyledones)

<i>FAMILY</i> <i>Species</i>	<i>Common Name</i>	<i>Status</i>	<i>Abun</i>	<i>Notes</i>
ARECACEAE				
<i>Cocos nucifera</i> L.	coconut	Pol	O	AP, CS, PL
<i>Dyopsis lutescens</i> (H. Wendl.) Beentje and J. Dransfield	golden-fruited palm	Orn	R	PL
<i>Phoenix dactylifera</i> L.	date palm	Nat	R	AP
<i>Pritchardia</i> sp.	<i>loulu</i>	End?	R	3, PL
CYPERACEAE				
<i>Bulboschoenus maritimus</i> (L.) Palla	<i>kaluhā</i>	Ind	R	AP
<i>Cyperus laevigatus</i> L.	<i>makaloa</i>	Ind	R	AP
<i>Mariscus javanicus</i> (Houtt.) Merr. and Metcalfe	<i>'ahu'awa</i>	Ind	C	AP
<i>Schoenoplectus</i> sp.	giant bulrush	?	R	2, AP
PANDANACEAE				
<i>Pandanus tectorius</i> S. Parkinson ex Z.	<i>hala</i>	Ind	R	AP, PL
POACEAE (GRAMINEAE)				
<i>Cenchrus ciliaris</i> L.	buffelgrass	Nat	O	GL
<i>Digiteria</i> sp.	---	Nat	R	1, 2
<i>Eragrostis tenella</i> (L.) P. Beauv. ex Roem. and Schult.	lovegrass	Nat	U	1
<i>Heteropogon contortus</i> (L.) P. Beauv.	<i>pili</i>	Ind	R3	3, GL
<i>Pennisetum setaceum</i> (Forssk.) Chiov.	fountain grass	Nat	AA	GL, SV
<i>Sporobolus virginicus</i> (L.) Kunth	<i>'aki'aki</i>	Ind	U	CS
<p>Status = distributional status End. = endemic; native to Hawai'i and found naturally nowhere else. Ind. = indigenous; native to Hawai'i, but not unique to the Hawaiian Islands. Nat. = naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation. Orn. = exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation). Pol. = Polynesian introduction before 1778.</p> <p>Abundance = occurrence ratings for plants seen in July 2001. R - Rare - only one to three plants seen. U - Uncommon - several to a dozen plants observed. O - Occasional - found regularly, but not abundant anywhere. C - Common - considered an important part of the vegetation and observed numerous times. A - Abundant - found in large numbers; may be locally dominant. AA - Abundant - abundant and dominant; defining vegetation type.</p> <p>Notes: 1 Typically seen mostly beside the roadway or similar disturbed areas (ruderal plants). 2 Observed plant(s) lacked flowers or fruit, or were no longer alive; identification uncertain. 3 Reported by S. Montgomery from a couple of areas near the highway. <i>Pili</i> grass seen by R. David in an interior area. AP - Typically or only associated with anchialine pond environments. CS - Typical of coastal strand. GL - Typical in open grassland. PL - Plantings (or spread from plantings) in or around private holdings. SV - Typically in <i>kiawe</i> savannah.</p> <p>Note: These values are based on observations made on July 7-8 mostly in the coastal zone of the park. For some species, a two-level system of abundance is used, with an alphanumeric code indicating a species having a clustered distribution; e.g., a species infrequently encountered, but numerous where observed. Thus, an abundance rating of "R" indicates a plant encountered between one and three times during the entire survey. An "R2" indicates a plant encountered in a few places, but with several to many individuals present where encountered. An "R3" is a plant seldom encountered (i.e., rare over the entire Park), but locally abundant in one or more of the locations where it was encountered.</p>				
Note: Survey conducted during July 2011.				
Source: Rana Biological Consulting, Inc., September 2011, Table 1.				

Figure 2.5 Overall Vegetation Map for Kīholo State Park Reserve



Source: Rana Biological Consulting, Inc., September 2011, Figure 3.

Figure 2.6 Vegetation Map: Southern Portion of Kiholo State Park Reserve



Source: Rana Biological Consulting, Inc., September 2011, Figure 4.

Figure 2.7 Vegetation Map: South Central Portion of Kiholo State Park Reserve



Source: Rana Biological Consulting, Inc., September 2011, Figure 6.

Figure 2.8 Vegetation Map: Northern Portion of Kiholo State Park Reserve



Source: Rana Biological Consulting, Inc., September 2011, Figure 5.

The older lava flows have weathered over time and developed a thin soil that accumulates in pockets. These flows are dominated in this area by fountain grass (*Pennisetum setaceum*) as a grassland vegetation (“GL”; see), or mixed with *kiawe* as a savannah vegetation (“SV”).²² In general terms, tree density on these old flows is a factor of proximity to groundwater, so the densest forests with the

²² Savannah is a type of open forest with a grassland understory. It is actually a continuum of densities of tree growth from very sparse with mostly grass to a nearly closed canopy with sparse understory growth of forbs and grasses.

largest *kiawe* trees occur in the coastal zone (*kiawe* forest or “KF”). Only these dense, coastal forests appear to create enough shading to restrict the growth of the understory plants. In some areas, the savannah understory is dominated by forbs (non-grass herbs; see Figure 2.9[c]) and in others by fountain grass (Figure 2.9[d]). Forbs noted as common or abundant in this savannah are ‘*ilima* (*Sida fallax*), threadstem carpetweed (*Mollugo cerviana*), ‘*aheahea* (*Chenopodium murale*), and *maile hohono* (*Ageratum conyzoides*). Only ‘*ilima* is considered a native species.

Figure 2.9 Photographs of Vegetation Types

<p>(a) <i>Pāhoehoe</i> Flow Near the Coast with Fountain Grass Colonizing Some Cracks (from Figure 7)</p>	<p>(b) Fountain Grass Forming Sparse Monotypic on an Older Basalt Flow (From Figure 8)</p>
<p>(c) <i>Kiawe</i> savannah with mostly forbs in the understory (from Figure 9)</p>	<p>(d) Unusually lush growth of fountain grass in a <i>kiawe</i> savannah (from Figure 10)</p>
<p>(e) Coastal strand with lush <i>pōhuehue</i> groundcover and trees of beach heliotrope and <i>kiawe</i> (from Figure 11)</p>	
<p>Source: Rana Biological Consulting, Inc., September 2011, Figures as noted.</p>	

Two other vegetation types are present but limited in distribution. These are coastal strand and riparian or anchialine pond associated vegetation. Both are typically small or narrow areas difficult to show on the scale of the vegetation maps. However, both are significant as they represent the only native plant-dominated vegetation types in the park. Further, these habitat types are associated with areas along the coast where the majority of park users visit.

2.3.2.2 Botanical Resources: Opportunities and Constraints

Of the 43 species recorded, 16 species (37 percent) are recognized as truly native, all of these are moderately common endemic and indigenous plants. Several early Polynesian introductions (*niu*, *noni*, *milo*, and *kamani*) are present as well. Combined, the 45 percent of species being either indigenous, endemic, or early Polynesian introduction is a respectably high proportion of the flora generally not attained in most lowland locations in the Hawaiian Islands. However, the vast majority of the biomass of plant matter is comprised of plant species that have become naturalized in this low elevation environment over the last 200 years (i.e., alien species).

No plants currently proposed or listed (USFWS, 2010, 2011) were observed during the July 2011 survey. Thus continued use and/or improvements to the park are not expected to result in deleterious impacts to any plant currently proposed, or listed under either the federal or State of Hawai'i endangered species statutes. This is true regardless of the type of park improvements and/or activities that are undertaken.

There is no federally delineated Critical Habitat present within the Kīhōlo State Park Reserve. Thus the continued use of the park or improvements to it will not result in modifications to federally designated Critical Habitat. There is no equivalent statute under State law.

The most environmentally sensitive plant assemblages are the coastal strand and the coastal pond/anchialine pond environments. These two plant assemblages are easily damaged by high human traffic, off-road vehicles, and invasive species. It is no coincidence that the best examples of coastal strand occur at the extreme southern end of the Park [see Figure 2.9 (e)]. This area has a very pristine aspect to it due to limited access (presently only via the coastal trail) and the rugged shore (there are no beaches). Only serious hikers and some fishermen visit this area regularly. The landscape offers an opportunity to develop interpretive material and views relating the physiological interactions between lava flows as they reach the sea and coastal processes. These interactions produce distinctive vegetation zones that encouraged utilization and settlement by the ancient Hawaiians.

Insofar as practical, plant species native to this coastal environment should be used in any landscaping efforts. Not only is this ecologically prudent, but if appropriate species are selected, the efforts will likely provide savings over the long term in maintenance costs. However, because it is likely to be cost-prohibitive and has a limited chance of success, no purpose would be served by a widespread attempt to remove the non-native growth that covers a majority of the park land.

Some benefit could be achieved from a more limited native vegetation restoration effort within the narrow coastal zone, however. *Kiawe*, which is an invasive, non-native plant, is widespread. *Kiawe* branches have very large thorns which litter the ground around the plants. The branches also tend to grow low to the ground in places where the plant receives a lot of moisture from the groundwater forming barriers to travel. The roots tap the groundwater and remove the moisture, making it difficult for native strand plants to establish.²³ In dune and back beach areas where a more “original”

²³ At the present time, a team from the University of Hawai'i at Hilo is conducting research on the effects of water and nitrogen use by *kiawe* at Kīhōlo Bay. Begun in September 2009, the project (which is part of is evaluating negative impacts that this species has on water and nutrient availability in the dryland and coastal ecosystems within the park. Continuous monitoring of the environment (i.e., rainfall, temperature, humidity, etc.) and sampling of soil, rainfall, and groundwater chemistry are being conducted as part of this study, focusing on one upland and one coastal location. (See, for example: <http://www.epscor.hawaii.edu/content/limu-kohu-asparagopsis-taxiformis-indicator-climate-change>; <http://www.epscor.hawaii.edu/content/evolution-subterranean-groundwaters-throughout-ahupua'a-west-hawaii-and-its-socio-economic-im>; <http://www.epscor.hawaii.edu/content/submarine-groundwater-discharge-and-associated-nutrient-fluxes-and-their-coastal-residence-t>; and [http://www.epscor.hawaii.edu/Water-and-Nitrogen-Use-by-Invasive-Tree-Prosopis-pallida-\(Kiawe\)-in-Kiholo-Bay](http://www.epscor.hawaii.edu/Water-and-Nitrogen-Use-by-Invasive-Tree-Prosopis-pallida-(Kiawe)-in-Kiholo-Bay)).

appearance and ecosystem is deemed desirable, *kiawe* could be removed and replaced with more suitable species. Native and Polynesian introductions, such as *naupaka kahakai* and *niu*, and the non-native beach heliotrope, are more contributory to an inviting beach experience than *kiawe*. Removal of *kiawe* may encourage natural recruitment of the strand vegetation if foot and vehicle traffic are minimal. Cut *kiawe* logs could be used by park users for campfires, if open fires are allowed, and they may have some monetary value.

2.3.3 AVIAN AND MAMMALIAN BIOTA

2.3.3.1 Avian Species Present

A total of 343 individual birds of 17 species, representing 13 separate families, were recorded during the station counts (see Table 2.6). Three of the species recorded, Black-crowned Night-Heron (*Nycticorax nycticorax hoactli*), Pacific Golden-Plover (*Pluvialis fulva*), and Bristle-thighed Curlew (*Numenius tahitiensis*) are indigenous. The remaining 14 species recorded are alien to the Hawaiian Islands. No avian species currently protected or proposed for protection under either the federal or State of Hawai‘i endangered species programs were detected during the course of this survey (DLNR, 1998; USFWS, 2005a, 2005b, 2011). Avian diversity and densities are extremely low, but in keeping with the habitats present in and around the Kīholo State Park Reserve. Four species: Zebra Dove (*Geopelia striata*), House Finch (*Carpodacus mexicanus*), Common Myna (*Acridotheres tristis*), and African Silverbill (*Lonchura cantans*), accounted for a little less than half of all birds recorded during the station counts. Predictably, avian diversity and densities varied significantly depending on the vegetation and human presence within the three major habitats sampled. These relative differences are noted in Table 2.6.

Although no seabirds were detected during this survey, it is probable that both the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened endemic sub-species of the Newell’s Shearwater (*Puffinus auricularis newelli*), over-fly the Kīholo State Park Reserve in small numbers between April and the middle of December each year. Both species have been recorded flying to and from their nesting colonies over the leeward areas of the island (Day *et al.*, 2003; David 2011). Both of these pelagic seabird species nest high in the mountains in burrows excavated under thick vegetation, especially *uluhe* (*Dicranopteris linearis*) fern. There is no suitable nesting habitat for either of these seabird species on, or close to the park.

The primary cause of mortality in the two aforementioned seabird species is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983; Simons and Hodges 1998; Ainley *et al.*, 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawai‘i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with man-made structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961; Telfer 1979; Sincock 1981; Reed *et al.*, 1985; Telfer *et al.*, 1987; Cooper and Day, 1998; Podolsky *et al.* 1998; Ainley *et al.*, 2001; Hue *et al.*, 2001; Day *et al.* 2003).

Table 2.6 Avian Species Detected Within Kīholo State Park Reserve

<i>Common name</i>	<i>Scientific name</i>	<i>Status</i>	<i>Costal RA</i>	<i>Kiawe RA</i>	<i>Lava RA</i>	<i>Comb. RA</i>
PHASIANIDAE - Pheasants and Partridges						
Phasianinae - Pheasants and Allies						
Gray Francolin	<i>Francolinus pondicerianus</i>	A	1.60	.80	0.10	0.83
PELECANIFORMES						
ARDEIDAE - Herons, Bitterns and Allies						
Black-crowned Night-Heron	<i>Nycticorax nycticorax hoactli</i>	IB	0.20	-	-	0.07
CHARADRIIFORMES						
CHARADRIIDAE - Lapwings and Plovers						
Charadriinae - Plovers						
Pacific Golden-Plover	<i>Pluvialis fulva</i>	IM	-	0.10	-	0.07
SCOLOPACIDAE - Sandpipers, Phalaropes and Allies						
Scolopacinae - Sandpipers and Allies						
Bristle-thighed Curlew	<i>Numenius tahitiensis</i>	IM	-	1.10	-	0.03
COLUMBIFORMES						
COLUMBIDAE - Pigeons and Doves						
Spotted Dove	<i>Streptopelia chinensis</i>	A	0.60	0.20	0.30	0.37
Zebra Dove	<i>Geopelia striata</i>	A	2.30	2.30	0.60	1.73
PASSERIFORMES						
ZOSTEROPIDAE - White-eyes						
Japanese White-eye	<i>Zosterops japonicus</i>	A	0.80	0.50	-	0.50
MIMIDAE - Mockingbirds and Thrashers						
Northern Mockingbird	<i>Mimus polyglottos</i>	A	0.40	0.50	-	0.30
STURNIDAE - Starlings						
Common Myna	<i>Acridotheres tristis</i>	A	2.00	0.90	0.70	1.17
EMBERIZIDAE - Emberizids						
Yellow-billed Cardinal	<i>Paroaria capitata</i>	A	1.70	0.20	-	0.63
CARDINALIDAE - Cardinals Saltators and Allies						
Northern Cardinal	<i>Cardinalis cardinalis</i>	A	1.20	0.90	0.10	0.73
FRINGILLIDAE - Fringilline and Carduline Finches and Allies						
House Finch	<i>Carpodacus mexicanus</i>	A	1.60	1.30	0.70	1.20
Yellow-fronted Canary	<i>Serinus mozambicus</i>	A	1.60	1.80	-	1.13
PASSERIDAE - Old World Sparrows						
House Sparrow	<i>Passer domesticus</i>	A	1.80	-	-	
ESTRILDIDAE - Estrildid Finches						
African Silverbill	<i>Lonchura cantans</i>	A	1.20	2.30	-	1.17
Nutmeg Mannikin	<i>Lonchura punctulata</i>	A	-	0.70	-	0.23
Java Sparrow	<i>Padda oryzivora</i>	A	1.60	0.30	-	0.63
Source: Rana Biological Consulting, Inc., September 2011, Table 2.						

2.3.3.2 Mammalian Species Present

Six terrestrial mammalian species were detected during the course of the field surveys. A lone unidentified rat (*Rattus* sp.) was seen close to the dumpsters near the Loretta Lynn house. Several European house mice (*Mus musculus domesticus*) were seen within the kiawe/grasslands. A large number of feral goats (*Capra h. hircus*) were seen within the kiawe/grasslands; the largest single group seen during the course of the survey had over 300 animals in it, but larger congregations have been reported. A total of 12 small Indian mongooses (*Herpestes a. auropunctatus*), three dogs (*Canis f. familiaris*), and two cats (*Felis catus*) were seen at various locations within the park. Scat, tracks, and sign of all mammalian species mentioned above were encountered at numerous locations within the park.

The findings of the mammalian survey are consistent with the location of the park, and the varied habitat present within it. All of the mammalian species recorded during the course of these surveys are alien to the Hawaiian Islands, and all are deleterious to native species and the ecosystems on which the native species depend. The sheer number of goats present within the park represents a major threat to existing vegetation, and almost precludes re-vegetation with native species without significant efforts to install ungulate exclusion fences and measures to significantly reduce the goat population.²⁴

No Hawaiian hoary bats were detected during the course of this survey. Bats have been recorded foraging for prey over the nearshore waters of Kīhōlo Bay (David, 2011).²⁵ Hawaiian hoary bats are widely distributed along the Kona and Kohala coast and are present in most areas that still have tree and dense shrubs (USFWS, 1998; Bonaccorso *et al.*, 2005, 2007; 2011; David, 2011). There is minimal habitat suitable for roosting bats within the park.²⁶

2.3.3.3 Avian and Mammalian Resources: Opportunities and Constraints

No mammalian species currently protected or proposed for protection under either the federal or State of Hawai‘i endangered species programs were detected during the course of this survey (DLNR, 1998; USFWS; 2005a, 2005b, 2011).

Although no seabirds were detected during this survey, it is probable that both the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened endemic sub-species of the Newell’s Shearwater (*Puffinus auricularis newelli*), over-fly the Kīhōlo State Park Reserve in small numbers between April and the middle of December each year. Both species have been recorded flying to and from their nesting colonies over the leeward areas of the island (Day *et al.*, 2003; David 2011). Both of these pelagic seabird species nest high in the mountains in burrows excavated under thick vegetation, especially *uluhe* (*Dicranopteris linearis*) fern. There is no suitable nesting habitat for either of these seabird species on, or close to the park.

²⁴ Goats are by no means a new problem at Kīhōlo. On the contrary, their depredations first started being a problem in the middle of the 19th century and continued thereafter. An example of the magnitude of the problem can be seen in records from 1922 relating to the Hind’s ranching operations in the ahupua‘a. They show that the impact of goats on Hawaiian forests and lands valued by ranchers for economic purposes was causing alarm among land officials. An October 12, 1922, letter from Charles Judd, Superintendent of Forestry in the Territory of Hawaii, estimated that there was one goat on every five acres of land, and Judd reported that in the ranch lands of Pu‘u Wa‘awa‘a and Pu‘u Anahulu, which comprised 105,000 acres, there were 21,000 wild goats. The same report noted that the problem was not only economic, it was also environmental. Goats were consuming and destroying the undergrowth of bushes, ferns, and herbaceous plants which form valuable ground cover and the trees which form the complement in the scheme of water conservation were being barked and killed by this pest. At Kīhōlo almost every algarroba tree, established in this dry region with great difficulty and most valuable here for the production of forage beans has been girdled by the wild goats. Pu‘u Wa‘awa‘a was one of the areas most affected by the over-population of wild goats and its owner (the Hind family) conducted a two-day drive which captured a stunning 7,000 wild goats.

²⁵ During the archaeological inventory survey for the Master Plan, State Archaeologist Alan Carpenter observed an ‘*Ōpe‘ape‘a* at the ‘Anaeho‘omalū end of the park.

²⁶ Most vegetation that may be suitable is present within one or more of the private inholdings, rather than in the park reserve proper.

The primary cause of mortality in the two aforementioned seabird species is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983; Simons and Hodges 1998; Ainley *et al.*, 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawai‘i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with man-made structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961; Telfer 1979; Sincok 1981; Reed *et al.*, 1985; Telfer *et al.*, 1987; Cooper and Day, 1998; Podolsky *et al.* 1998; Ainley *et al.*, 2001; Hue *et al.*, 2001; Day *et al.* 2003).

2.3.4 INVERTEBRATES

Steven L. Montgomery, Ph. D., surveyed the Kīholo State Park Reserve for the presence of invertebrate species, and key findings from his report are summarized below. The full report is reproduced in Appendix C.

2.3.4.1 Observed Species

The North Kona shoreline area sampled in this survey yielded native and adventive invertebrates. The complete survey results are summarized in Table 2.7. No invertebrate listed as endangered or threatened under either federal or state statutes was observed within the survey area. One candidate species, *Megalagrion xanthomelas* or the Orangeblack Hawaiian Damselfly, has been reported from the general area, but it was not observed during this search. Alien predatory ants are a major threat to native arthropods. The location does not provide appropriate habitat for any of the 12 native *Drosophila* species recently listed as endangered or threatened and none were observed. (USFWS 2006a, b). Blackburn’s sphinx moth (*Manduca blackburni*), an endangered species which favors leeward slopes, was not found in this survey. The moth’s solanaceous native host plant, ‘aiea (*Nothocestrum* sp.), and best alien host, tree tobacco (*Nicotiana glauca*), were not observed on the property.²⁷ *Capparis sandwichiana*, a nectar plant favored by the adult moth, is common at other Kona coastal sites but does not appear to be present at Kīholo. Although the final *Recovery Plan* (USFWS 2005b) for this large sphinx moth proposed two small management areas in North Kona, the habitat was ultimately designated only at the more inland location in Pu‘u Wa‘awa‘a, and it is well removed from the nearest park boundary.

2.3.4.2 Invertebrate Species: Opportunities and Constraints

A few of the invertebrates that are present have health implications for park use of the site, but none of these are out of the ordinary. For example, although not seen during the survey, the project area includes some classic habitat for centipedes, scorpions, and widow spiders. The Western yellow-jacket is unlikely in this habitat. Two stinging insects, common paper wasps (*Polistes exclamans*) and honey bees, were seen on the property, and these species may pose a serious risk to some individuals. Supervisors should be aware of any employee allergies as some individuals can experience anaphylactic reactions to venom. Wasps can sting repeatedly and pose a particular hazard to children due to their smaller body weight.

Before entering lava tubes, users should inspect overhangs for wasp nests and care should be taken to never put hands where the eyes cannot see. When moving stones or piled brush, workers can greatly reduce the risk of accidental contact and bites or stings with all species noted here by the use of gloves and wearing long sleeved shirts, long pants, boots with socks pulled up over pant cuffs. Campers should be advised to refrain from leaving sweet liquids in the open or unattended as these will attract bees or wasps.

The *Aedes albopictus* mosquito was seen in small amounts of water created in the drooping cover of a small boat. *Culex quinquefasciatus* also is likely to be present. Both species are widespread in the

²⁷ Solanaceae are members of the nightshade family of flowering plants.

islands and known to be vectors of disease for humans (*A. albopictus*, dengue) and birds (*C. quinquefasciatus*, bird malaria). Care should be taken during planning and design of new facilities not to create standing water without control methods. Control of trash will also be important in preventing breeding of both species.

Table 2.7 Invertebrates: Kiholo State Park Reserve

<i>Species</i>	<i>Common Name</i>	<i>Status</i>	<i>Frequenc</i>	<i>Notes</i>
ARTHROPODA				
ARACHNIDA				
ARANEAE	spiders			
Lycosidae				
<i>Lycosa hawaiiensis</i> Simon, 1899	wolf spider	End	U	with egg sac
INSECTA				
COLLEMBOLA	springtails			
Entomobryidae				
undetermined sp. 1		?	U	under stones
DERMAPTERA				
<i>Euborellia eteronoma</i> (Borelli, 1909)	earwig	End	C	in shore traps
DIPTERA	flies			
Canaceidae				
<i>Canaceoides hawaiiensis</i> Wirth, 1969	beach fly	End	A	
Ceratopogonidae				
<i>Forcipomyia hardyi</i> Wirth and (Howarth,	Hardy's midge	End	A	at light
Chironomidae	bloodworm midges			
<i>Chironomus hawaiiensis</i> Grimshaw, 1901		End?	C	at light
Culicidae	Mosquitoes			
<i>Aedes albopictus</i> (Skuse, 1894)	forest day mosquito	Adv	O	breeds in trash
<i>Culex quinquefasciatus</i> Say, 1823	Southern house mosquito	Adv	O	breeds in water on boat cover
Dolichopodidae				
<i>Hydrophorus williamsi</i> Parent, 1938	tidal long-legged fly	End	A	
Ephydriidae				
<i>Scatella</i> sp.	shore flies	End	C	pond edges; observed only
HETEROPTERA	true bugs			
Lygaeidae	seed bugs			
<i>Nysius coenosulus</i> Stal 1859		End	A	at light
HOMOPTERA	planthoppers			
Cicadellidae	leafhoppers			
<i>Balclutha hospes</i> (Kirkaldy)		End	U	
<i>Nesophrosyne</i> sp. 1		End	R	
HYMENOPTERA	wasps, bees, ants			
Anthophoridae				
<i>Xylocopa sonorina</i> F. Smith, 1874	carpenter bee	Adv	C	
Formicidae	ants			
<i>Camponotus variegatus</i>	carpenter ant	Adv	U	to light
<i>Anoplolepis gracilipes</i> (F. Smith, 1857)	longlegged ant	Adv	C	
<i>Pheidole megacephala</i> (Fabricius, 1793)	big-headed ant	Adv	A	
Megachilidae	leaf-cutter bees			
<i>Megachile</i> sp.		Adv	C	
Vespidae	wasps			
<i>Polistes exclamans</i> Viereck, 1906	common paper wasp	Adv	C	

<i>Species</i>	<i>Common Name</i>	<i>Status</i>	<i>Frequenc</i>	<i>Notes</i>
LEPIDOPTERA	butterflies and moths			
<i>Anatrachyntis incertulella (Walker, 1864)</i>		Adv	U	
<i>Hyposmocoma sp. 1</i>	black adult	End	O	at light
<i>Crambidae (Pyalidae)</i>	micro-moths			
<i>Eudonia sp. 1</i>	moss moth	End	C	at light
<i>Mestolobes sp.</i>		End	U	at light
<i>Omiodes blackburni (Butler, 1877)</i>	coconut leafroller	End	U	leaf damage only
<i>Orthomecyna exigua exigua (Butler, 1879)</i>		End	C	at light
<i>Tamsica hyacinthine (Meyrick 1899)</i>	dryland grass moth	End	A	at light
<i>Geometridae</i>				
<i>Macaria abydata Guenee, 1857</i>	koa haole moth	Adv	A	at light
<i>Noctuidae</i>				
<i>Ascalapha odorata (Linnaeus, 1758)</i>	black witch moth	Adv	O	observed at light
<i>Oecophoridae</i>				
<i>Ethmia nigroapicella (Saalmueller, 1880)</i>	Kou leafworm	Adv	O	leaf damage, widespread
ODONATA	dragonflies; damselflies			
<i>Aeshnidae</i>				
<i>Anax junius (Drury, 1770)</i>	common green darner	Adv	C	at light
<i>Libellulidae</i>	skimmers			
<i>Pantala flavescens (Fabricius, 1798)</i>	globe skimmer	Ind	O	in flight
ORTHOPTERA	praying mantis, grasshoppers, crickets			
<i>Gryllidae</i>	crickets			
<i>Caconemobius sandwichensis</i> Otte, 1994	beach cricket	End	C	in shore traps
<i>Gryllodes sigillatus (Walker) 1869</i>	flightless field cricket	Adv	C	on lava
STATUS: End endemic to Hawaiian Islands Ind indigenous to Hawaiian Islands Adv adventive Pur purposefully introduced ? unknown	FREQUENCY = occurrence ratings: R Rare — seen in only one or perhaps two locations. U Uncommon — seen in several locations O Occasional — seen with regularity C Common — observed numerous times A Abundant — found in large numbers AA Very abundant — abundant and dominant			
Source: Montgomery, July 16, 2011				

Rats and mice are present on the property. Rats have a long history as hosts to insects (fleas) which can transmit disease; they also attack nesting birds. Both rats and mice damage the seeds of native plants reducing natural replacement of mature plants which host invertebrates. Care should be taken during the construction phase not to create conditions that will lead to an increase in populations. Once the park is in use, trash disposal will be important in rodent control and to allow native seeds to sprout and host invertebrates.

2.4 AQUATIC RESOURCES

Independent analysis of the nearshore marine environment was beyond the scope of the present study. Instead, we have relied on information in existing reports as noted in the text. The discussion is divided into the following five parts: Section 2.4.1 – Overview of the Nearshore Environment, Section 2.4.2 – Marine Environment; Section 2.4.3 – Marine Biota; Section 2.4.4 – Kīhōlo Lagoon; and Section 2.4.5 – Anchialine Ponds.

2.4.1 OVERVIEW OF THE NEARSHORE ENVIRONMENT

2.4.1.1 *Background*

Kīhōlo Bay and the surrounding nearshore environment is an area with a unique marine ecosystem and rich cultural history. In 1823, William Ellis described Kīhōlo as follows:

A small bay, perhaps half a mile across, runs inland a considerable distance. From one end to the other of this bay, Tamehameha built a strong stone wall, six feet high in some places, and twenty feet wide, by which he had an excellent fishpond, not less than two miles in circumference.

The sea wall and most of the pond – as well as the adjacent pond Kīhōlo – were destroyed by the 1859 lava flow which gave the bay its present contours. Thus~ the northern terminus of the bay is a major section of the 1859 lava flow which destroyed the village of Kīhōlo and which cut off a section of the Kīhōlo Bay as a "lagoon" (Young et al. 1977).

The curving central section of Kīhōlo Bay now consists of a basaltic boulder and black sand beach, back of which lie the remnants of Kīhōlo Lagoon, an elongate body of water formed by a cobble and sand bar lying a few hundred meters on the 1859 *pāhoehoe* lava which constitutes the eastern boundary of Kīhōlo Bay. Figure 2.10 contains photos of the lagoon and bar. The bar is crossed by two shallow passes which connect the pond with the inner part of Kīhōlo Bay. Section 2.4.4 contains a fuller description of Kīhōlo Lagoon. The southern section of the Kīhōlo bay is fringed by a prehistoric lava flow.

Freshwater springs enter the pond at several points along the edge of the lava flow, with the most noticeable springs at the head (north end of the lagoon). Freshwater springs also enter the bay at various points along the central section of the bay.

The nearshore shallow shelf consists of black sand interspersed over a flat basaltic shelf, and with a few coral colonies. *Porites lobata* is the dominant coral in the bay, extending more than 150 feet out from the shoreline; *Porites compressa* cover increases as the water deepens, becoming the most abundant coral species at depths greater than 30 feet.

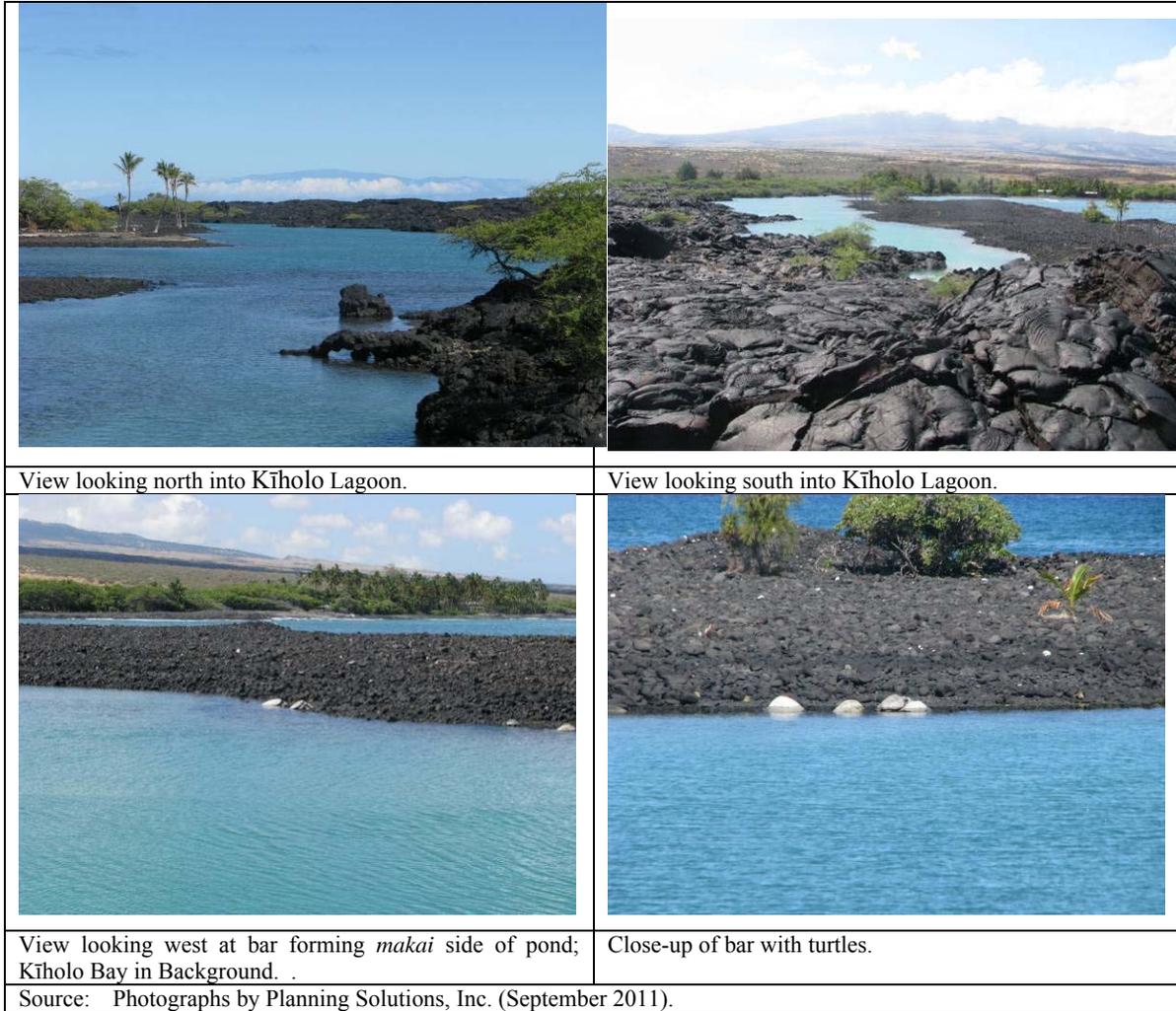
Within the shoreline area (from the high splash zone to sub-tidal breaker zone) there is an abundant variety of marine life determined largely by wave energy and the topography of and bathymetry of the area. The type of lava flow, 'a'ā or *pāhoehoe*, markedly affects the habitat in the intertidal zone. The shorelines along the coast are mainly of three types: 'a'ā flow, *pāhoehoe* flow, and sandy beach. Boulders from an 'a'ā flow will increase vertical relief and shelter from surf.

Nearshore sub-tidal areas are generally defined by the substrate. Along this coastline, due to the relatively young geological age of the Big Island, coral growth is generally on hard lava, calcareous substrate, or unconsolidated sand or rubble. As such, true coral reefs have not formed but there is a diversity of coral communities. Under prevailing conditions, no single coral species is able to monopolize the substrata.

There have been relatively few comprehensive studies of marine ecosystems within Kīhōlo Bay. However, preliminary assessments of water quality and fish species in the nearshore environment suggests that the sheltered waters of the lagoon and bay provide refuge for an abundance of juvenile

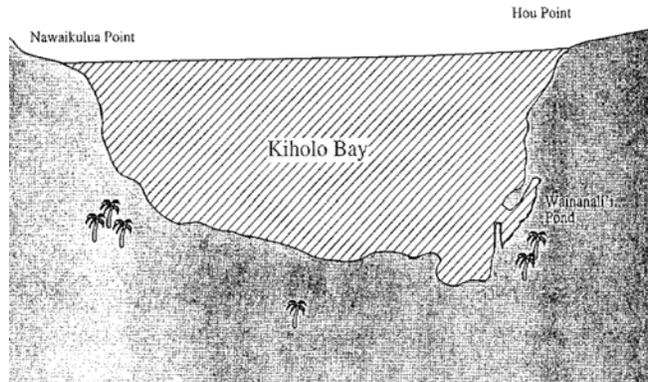
reef fish species. High freshwater inputs directly offshore inhibit coral growth, while providing favorable habitats for important resource species.

Figure 2.10 Photos of Kīholo Lagoon



2.4.1.2 Kīholo Bay Fisheries Management Area

Kīholo Bay is currently designated a Fisheries Management Area by the State of Hawai‘i DLNR Division of Aquatic Resources (see HAR §13-60). These regulations prohibit the collection of aquarium fish and the use of gillnets.²⁸ It is one of 19 such areas designated statewide, and one of several on the Big Island (the nearest being Kawaihae Harbor, Keauhou



²⁸ Aquarium fish are defined as salt water fish, fresh water nongame fish, or other aquatic life alive in a state of captivity as pets, for scientific study, or for public exhibition or display, or for sale for these purposes. “Gill net” means any net set vertically in the water column that is designed to entangle and capture fish by the gills, fins, or other body parts, as the fish swim into the net.

Bay, Kīhōlo Bay, and Puakō Bay and Reef. The “Kīhōlo Bay Fisheries Management Area” includes that portion of the submerged lands and overlying waters of Kīhōlo Bay beginning at the high water mark at the shoreline and extending seaward out to an imaginary line drawn between a sign posted onshore at Hou Point and a sign posted onshore at Nawaikulua Point, including the inner lagoon of Kīhōlo Bay (frequently misidentified as Wainānālī‘i Pond) but not including Luahinewai Pond. HAR §13-60-4 allows the department to issue permits to engage in activities within the Kīhōlo Bay Fisheries Management Area that would otherwise be prohibited by law or HAR §13-60-3.

2.4.2 MARINE ENVIRONMENT

2.4.2.1 *Water Quality*

2.4.2.1.1 State Water Quality Classification

The waters off of Kīhōlo State Park Reserve are classified as Class AA Marine waters by the State of Hawai‘i Department of Health [(HAR §11-54.3(c)(1)]. The stated objective for Class AA Marine waters is that they remain in their natural pristine state as nearly as possible with an absolute minimum of pollution or alteration of water quality from any human-caused source or actions and that to the extent practicable, the wilderness character of these waters be protected.²⁹ The uses to be protected in Class AA waters are oceanographic research, the support and propagation of shellfish and other marine life, conservation of coral reefs and wilderness areas, compatible recreation, and aesthetic enjoyment.

2.4.2.1.2 Existing Water Quality

There are no perennial streams in the region and, because of the highly porous and fractured nature of the ground, no places where concentrated surface runoff enters the ocean. As a result, suspended sediment concentrations are low and the water is very clear.

The most comprehensive study of the marine environment along this shoreline was carried out in 1977 under the University of Hawai‘i Sea Grant Program. The results are summarized in a report entitled *Hydrologic and Ecologic Inventories of the Coastal Waters of West Hawai‘i* (Technical Report No. 105, Sea Grant Cooperative Report UNIHI-SEAGRANT-CR-77-02, Young et al., April 1977). While the report is now several decades old, the absence of significant development in the area means that the findings are still applicable, and the following discussion draws heavily on the information in that report.

The State of Hawai‘i Department of Health does not maintain any water quality monitoring stations within the shoreline area fronting Kīhōlo State Park Reserve. The nearest permanent stations are at ‘Anaeho‘omalu Bay just to the north and at the Hualālai Resort, a short distance to the south. Data from those stations is summarized below in Table 2.8.

Table 2.8 Nearshore Water Quality in the Kīhōlo Area

Location	Temperature (in degrees C)			Salinity (in ppt)			Dissolved Oxygen Saturation (in %)			pH		
	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
‘Anaeho‘omalu	27.10	30.99	23.49	31.08	35.44	22.86	89.67	113.8	9.87	8.14	8.8	7.9
Hualālai 4 Seasons	28.04	30.22	25.72	33.46	34.87	31.01	100.82	114.9	92.9	8.32	8.47	8.2

Note: Data represent all available records from the period between January 2005 and July 12, 2011.

Source: Compiled by Planning Solutions from State Department of Health Records

²⁹ In Class AA waters, where there is a defined reef area, no zones of mixing are allowed in waters shallower than 60 feet; where no reef is present and the water depth exceeds 60 feet, the ban on zones of mixing extends 300 meters off shore.

2.4.2.1.3 Ongoing Aquatic Research at Kīholo Bay

Although, as noted above, there is no comprehensive water quality monitoring program at Kīholo Bay, it is the site of several ongoing research efforts. In September 2009, a team developed a research project focusing on the assessment of groundwater discharge into Kīholo Bay and other sites on the Kona coast. They have been able to calculate fluctuations of groundwater inputs and investigate how these change over time using 14 temporary monitoring platforms. These monitoring stations allow scientists to calculate the contribution of groundwater to the nutrient budget of coastal waters, characterize the groundwater plume spatially, and track how (if at all) these change with time. The team is continuing their efforts to collect data to build a long-term record that will help them understand the system's response to climate variability, shifts in land-use, and other variables. In addition, the team is working on the construction of a continuous radon-monitoring platform which will be deployed in Kīholo Bay in order to provide long-term time-series data on groundwater discharge rates. The information collected by this and other research programs in the area can be incorporated into an adaptive management regime over time.

In addition to water quality, another group is conducting a study on the highly valued edible marine red algae, known to Hawaiians as *limu kohu* (*Asparagopsis taxiformis*), in Kīholo Bay. This algae is found on the edge of reefs in areas with continuous water movement. This aquatic plant has largely disappeared from the Main Hawaiian Islands where it was once very abundant. At one time, *limu kohu* was so prized as a foodstuff that only *ali'i* were allowed to eat it. Because little is known about this species, this research effort is collecting samples, mapping their locations, and documenting their environmental conditions in order to determine growth characteristics, defense mechanisms, and adaptability. Ultimately, the program hopes to characterize ways in which *limu kohu* can be used as an indicator of climate change.

2.4.3 MARINE BIOTA

2.4.3.1 Coral Communities

Young et al. (April 1977) reported that coral cover along the South Kohala shoreline has *Porites* dominance that is typical of many reef areas in Hawai'i. At Kīholo Bay the nearshore shallow shelf area consists of patches of black sand over a flat, basaltic shelf. Water turbulence in Kīholo Bay appears to be slightly higher and water clarity slightly lower than at nearby Puakō and 'Anaeho'omalū Bays. They reported that while large (and apparently very old) colonies of *P. lobata* occurred in the sandy shallows at 'Anaeho'omalū, very few corals occurred on the solid bottom at Kīholo at depths of from 3 to 4 meters and at a distance of 30 to 40 meters from shore. The corals that did occur are *Pocillopora meandrina*, *Pocillopora damicornis*, *Porites lobata*, and *Montipora* spp. These colonies, usually very small in size and often found in fissures in the lava shelf, were as numerous as were the sea urchin, *Echinometra mathaei*.

At depths of 3 to 4 meters, coral assemblages at the time of the survey resembled those at 'Anaeho'omalū Bay, the main difference being that the colonies were smaller and more bare basalt was present. As at 'Anaeho'omalū, *Pavona lanulata* was abundant in the shallow 3-meter transect at both north (6.23 percent of bottom cover) and south (1.0 percent of bottom cover) Kīholo. *Porites compressa* cover increased seaward, except at the 12-meter transects which showed a drop in *P. compressa* cover. Researchers speculated that the drop may be due to the presence of numerous lava caves, arches, and boulders that provide irregular surfaces that may be better locations for settlement and growth of encrusting species rather than the branching *P. compressa*. On the reef slope where bottom structure is flat and not as consolidated, *P. compressa* abundance peaked on the 15-meter transect. Bare limestone on the deepest transects was considerably higher at the south end of Kīholo (40 percent bottom cover) than at the northern end (~9 percent), indicating that wave stress and the resulting coral damage may be greater at the southern end of Kīholo Bay.

2.4.3.2 Fish Abundance

The State of Hawai‘i Department of Land and Natural Resources, Division of Aquatic Resources (DAR) has assembled a considerable amount of information concerning fish stocks along the island’s shoreline. Data are from underwater visual surveys of fish stocks at 23 sites in West Hawai‘i (see Table 2.10 for listing). Survey sites are 8 to 14 meters deep and are all located on reef shelves with moderate to high *Porites compressa* cover, the predominant habitat type at that depth on West Hawai‘i reefs, and the key habitat for the majority of fishes harvested for the aquarium trade. The survey program began as the West Hawai‘i Aquarium Project (WHAP) but since 2004 has continued as part of DAR’s Main Hawaiian Islands Coral Reef Monitoring Program. ‘Anaeho‘omalū Bay (Station 05), Keawaiki (Station 06), and Ka‘ūpūlehu (Station 07) are located along the shoreline adjacent to or near Kīholo State Park Reserve.

In addition to the efforts of DAR, students at the Tropical Conservation Biology and Environmental Science program at University of Hawai‘i at Hilo, operating under a grant from EPSCoR, have been conducting research and collecting data on herbivorous fish abundance and biomass at various sites in West Hawaii, including Kīholo Bay (see Figure 2.11). As part of one study, a survey of herbivorous fish abundance was conducted at Kīholo Bay along a belt-transection (25 x 4 m) with fish number and size (± 1 cm), recorded by species. Fish biomass was calculated using length-weight relationships for each species. The results of this survey are included in Table 2.11 below.

Figure 2.11 Herbivorous Fish Abundance and Biomass at Kīholo Bay

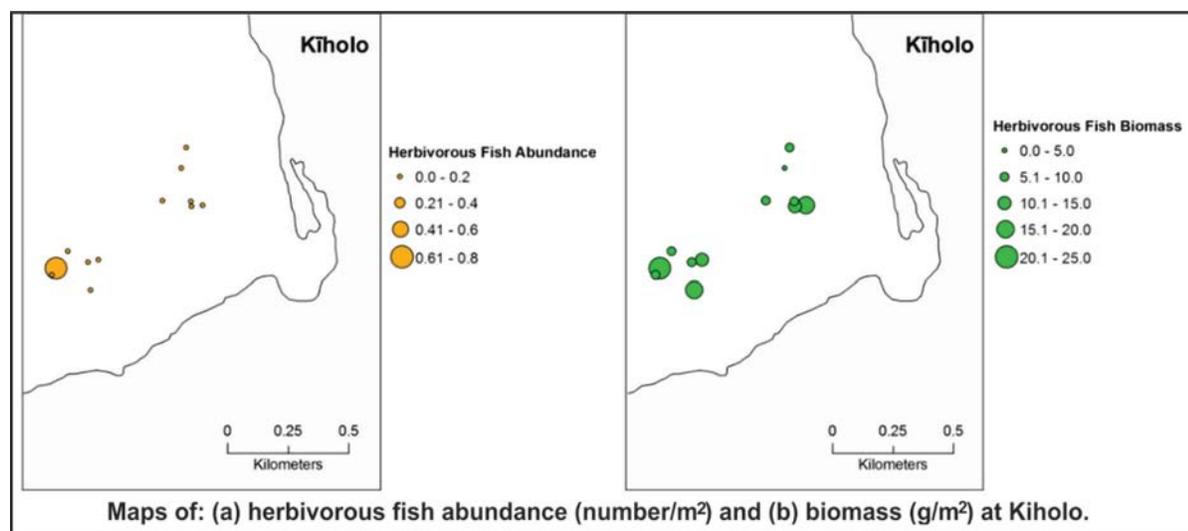


Table 2.9 Mean Biomass and Abundance for Fish Species at Kīholo

<i>Family</i>	<i>Taxon Name</i>	<i>Hawaiian Name</i>	<i>Biomass (g/m²)</i>	<i>Abundance (N/m²)</i>
Acanthuridae	<i>Acanthurus lineatus</i>		0	0
	<i>Acanthurus achilles</i>	Paku‘iku‘i	0.30	0.01
	<i>Acanthurus blochii</i>	Pualu	0.51	0.01
	<i>Acanthurus dussumieri</i>	Palani	0.58	0.01
	<i>Acanthurus guttatus</i>	‘Api	0	0
	<i>Acanthurus leucopareius</i>	Maikoiko	2.32	0.02
	<i>Acanthurus nigrofuscus</i>	Mai‘i‘i	1.12	0.03

	<i>Acanthurus nigroris</i>	Maiko	0.86	0.03
	<i>Acanthurus olivaceus</i>	Na'ena'e	1.88	0.02
	<i>Acanthurus triostegus</i>	Manini	7.38	0.20
	<i>Ctenochaetus strigosus</i>	Kole	1.57	0.03
	<i>Naso brevirostris</i>	Kala lolo	0.06	0.01
	<i>Naso lituratus</i>	Umaumalei	1.32	0.02
	<i>Zebrasoma flavescens</i>	Lau'ipala	0.37	0.02
Balistidae	<i>Melichthys niger</i>	Humuhumu'ele'ele	4.38	0.01
	<i>Melichthys vidua</i>	Humuhumuhi'ukole	2.46	0.01
	<i>Rhinecanthus rectangulus</i>	Humuhumuapua'a	3.66	0.01
	<i>Sufflamen bursa</i>	Humuhumulei	1.19	0.01
Blennidae	<i>Cirripectes vanderbilti</i>	-	0.05	0.01
	<i>Exallias brevis</i>	Pao'o kauila	0.06	0.01
	<i>Plagiotremus ewaensis</i>	-	0.01	0.01
	<i>Plagiotremus goslinaei</i>		0.01	0.01
Carangidae	<i>Scomberoides lysan</i>	Lai	10.6	0.08
Chaetodontidae	<i>Chaetodon auriga</i>	Kikakapu	1.24	0.01
	<i>Chaetodon lunula</i>	Kikakapu	0.73	0.01
	<i>Chaetodon lunulatus</i>	Kapuhili	2.01	0.03
	<i>Chaetodon miliaris</i>	Lauwiliwili	0.17	0.01
	<i>Chaetodon multicoloratus</i>	Kikakapu	0.44	0.02
	<i>Chaetodon ornatissimus</i>	Kikakapu	1.79	0.02
	<i>Chaetodon quadrimaculatus</i>	Lau hau	0.77	0.01
	<i>Chaetodon unimaculatus</i>	Lau hau	0.44	0.01
	<i>Forcipiger flavissimus</i>	Lauwiliwilinukunukuku'oi'oi	0.35	0.01
	<i>Forcipiger longirostris</i>	Lauwiliwilinukunukuku'oi'oi	0.66	0.02
Cirrhitidae	<i>Cirrhitops fasciatus</i>	Pili ko'a	0.18	0.01
	<i>Paracirrhites arcatus</i>	Pili ko'a	0.25	0.01
	<i>Paracirrhites forsteri</i>	Hilu pili ko'a	0.28	0.01
Dactyloptidae	<i>Dactyloptena orientalis</i>	Loloa'u	7.51	0.01
Diodontidae	<i>Diodon holocanthus</i>	'O'opu okala	7.75	0.01
	<i>Diodon hystrix</i>	Ko kala	15.12	0.01
Fistulariidae	<i>Fistularia commersonii</i>	-	0.61	0.01
Holocentridae	<i>Myripristis berndti</i>	'U'u	0.86	0.01
	<i>Myripristis kuntee</i>	'U'u	0.49	0.02
	<i>Sargocentron spiniferum</i>	Ala'ihī	2.34	0.02
Labridae	<i>Bodianus bilunulatus</i>	'A'awa	1.13	0.01
	<i>Coris gaimard</i>	Hinalea 'akilolo	0.30	0.01

	<i>Coris venusta</i>	-	0.04	0.01
	<i>Gomphosus varius</i>	Hinalea 'i'iwi, 'akilolo	0.15	0.01
	<i>Halichoeres ornatissimus</i>	'Ohua	0.09	0.01
	<i>Labroides phthirophagus</i>	-	0.02	0.01
	<i>Macropharyngodon geoffroy</i>	-	0.01	0.01
	<i>Oxycheilinus unifasciatus</i>	Po'ou	1.70	0.01
	<i>Pseudocheilinus evanidus</i>	Malamalama	0.05	0.01
	<i>Pseudocheilinus octotaenia</i>	-	0.03	0.01
	<i>Pseudocheilinus tetrataenia</i>	-	0.03	0.01
	<i>Stethojulis balteata</i>	'Omaka	0.18	0.01
	<i>Thalassoma ballieui</i>	-	0.46	0.02
	<i>Thalassoma duperry</i>	Hinalea lauwili	0.25	0.02
	<i>Thalassoma lutescens</i>	-	0.05	0.01
Lutjanidae	<i>Aphareus furca</i>	Wahanui	0.93	0.02
	<i>Lutjanus fulvus</i>	To'au	1.25	0.02
	<i>Lutjanus kasmira</i>	Ta'ape	2.86	0.04
Mullidae	<i>Mulloidichthys flavolineatus</i>	Weke	0.45	0.01
	<i>Parupeneus cyclostomus</i>	Moano kea	0.85	0.02
	<i>Parupeneus insularis</i>	Munu	0.25	0.01
	<i>Parupeneus multifasciatus</i>	Moano	0.85	0.01
	<i>Parupeneus porphyreus</i>	Kumu	0.06	0.01
Muraenidae	<i>Gymnomuraena zebra</i>	Puhi	12.10	0.01
	<i>Gymnothorax flavimarginatus</i>	Puhi paka	0.02	0.01
	<i>Gymnothorax meleagris</i>	Puhi oni'o	2.37	0.01
Ostraciidae	<i>Ostracion meleagris</i>	Moa	0.04	0.01
Pomacanthidae	<i>Centropyge potteri</i>	-	0.20	0.01
Pomacentridae	<i>Abudefduf abdominalis</i>	Mamo	3.17	0.15
	<i>Abudefduf sordidus</i>	Kupipi	0.35	0.01
	<i>Abudefduf vaiagensis</i>	Mamo	3.42	0.05
	<i>Chromis agilis</i>	-	6.12	0.06
	<i>Chromis hanui</i>	-	0.02	0.01
	<i>Chromis ovalis</i>	-	1.90	0.22
	<i>Chromis vanderbilti</i>	-	0.37	0.15
	<i>Dascyllus albisella</i>	'Alo'ilo'i	0.23	0.02

	<i>Plectroglyphidodon imparipennis</i>	-	0.05	0.01
	<i>Plectroglyphidodon johnstonianus</i>	-	0.17	0.01
	<i>Stegastes marginatus</i>	-	0.34	0.02
Scaridae	<i>Calotomus carolinus</i>	-	0.60	0.01
	<i>Chlorurus perspillatus</i>	Uhu uliuli	3.25	0.01
	<i>Chlorurus spirlurus</i>	Uhu	2.39	0.02
	<i>Scarus dubius</i>	Lauia	0.15	0.03
	<i>Scarus psittacus</i>	Uhu	2.06	0.03
	<i>Scarus rubroviolaceus</i>	Palukaluka	0.30	0.01
Serranidae	<i>Cephalopholis argus</i>	-	3.24	0.01
Synodontidae	<i>Synodus dermatogenys</i>	‘Ulae	0.03	0.01
	<i>Synodus variegatus</i>	‘Ulae	0.11	0.01
Tetrodontidae	<i>Canthigaster amboinensis</i>	-	0.28	0.01
	<i>Cantigaster jactator</i>	-	0.06	0.01
Source: Most, R. <i>Nutrient and Herbivory Effects on Benthic Marina Algal Biomass and Community Structure on the Kona Coast of Hawai‘i</i> (2012)				

Herbivorous fishes were the dominant taxa for fish biomass (g/m²) and abundance (number/m²) at Kīholo Bay. Mean biomass of herbivorous fishes was $X = 11.2 \pm 1.6$ g/m². Abundance of herbivorous fishes was $X = 0.2 \pm 0.0$ individuals/m² at Kīholo Bay. The dominant families of herbivorous fish biomass were surgeonfishes (Acanthuridae) ($X = 15.5 \pm 3.9$ g/m²) and triggerfishes (Balistidae) ($X = 3.0 \pm 0.9$ g/m²). The most abundant fish families observed at both sites also included blennies (Blenniidae), sea chubs (Kyphosidae), pufferfishes (Tetraodontidae), parrotfishes (Scaridae), damselfishes (Pomacentridae), and angelfishes (Pomacanthidae).

2.4.3.3 Molluscan Communities

Mollusks are ubiquitous inhabitants of marine environments throughout the Hawaiian Islands found from the vegetation line marking the upper limit of the littoral fringe to depths of more than 3,000 feet. Young et al. (April 1977) described molluscan assemblages of the intertidal zone and subtidal reaches of bays to depths of 60 feet. They classified the assemblages as either macromollusks (shells >10 mm, or ~3/8+ in.) in greatest dimension or micromollusks (shells ≤10 mm in greatest dimension) (Kay 1973). Macromollusks are the dominant components of the intertidal zone and micromollusks are dominant in subtidal reaches. Because micromollusks represent a variety of trophic and spatial habits, their assemblages reflect the structure of the communities of which they are a part. The researchers based their description of these on an analysis of benthic molluscan assemblages obtained between August 1973 and March 1976.

The stations at ‘Anaeho‘omalū and Kīholo bays include three depth groups: (i) shoreline stations encompassing tidepools and inshore waters at depths of less than 3 feet; (ii) mid-bay stations located on transects across the mid-sections of each bay at depths of 10 to 50 feet; and (iii) outer bay stations located on transects running across the mouths of bays at depths of 20 to 60 feet. Observations on the macromollusks, those species more than 10 millimeters in greatest dimension, are qualitative, and the macromollusks observed are merely reported.

Micromollusks were obtained quantitatively from sediment samples retrieved at each of the intertidal and subtidal stations. Sediments were washed in fresh water and air dried in the laboratory.

Micromollusks were picked from the sediments under a binocular dissecting microscope from volumes of 10 to 25 cm.

Young et al. (April 1977) identified two assemblages of micromollusks at Kīholo, one associated with a predominantly offshore cluster of stations, the other characterizing predominantly inshore and shoreline stations. The inshore area is comprised largely of sediments of black sand studded with rubble at distances to 30 feet offshore and at depths of less than 3 feet. A variety of corals, such as *Porites lobata*, *Pocillopora meandrina*, and *Montipora verrucosa*, also occurs, although coral cover in the inshore area is sparse. They reported that the dominant micromollusks of the inshore stations are *Bittium paraum* and *B. zebrum* and identified two species associated with fresh water, *Eatoniella* sp. and *Planaxis* sp., as also prominent. The dominant micromollusks of the offshore stations are *Bittium impendens*, *Vitriathna marmorata*, and *Parashiela beetsi*. The offshore stations at Kīholo are distinguished from those at ‘Anaeho‘omalū and Puakō by consistently lower proportions of *Rissoina miltozona* and higher proportions of *Parashiela*. Three inshore stations occurring in the cluster of offshore stations include mollusks associated with fresh water, *Eatoniella* and *Planaxis*, as well as pyramidellids which may be associated with sessile invertebrates, such as oysters and sponges.

Table 2.10 WHAP Monitoring Sites with Corresponding Coordinates and Depth

Site (Local ID)	District	Latitude	Longitude	Mean Depth (m)
Lapakahi (01)	N. Kohala	20.160	-155.900	12.1
Kamilo Gulch (02)	N. Kohala	20.081	-155.868	12.8
Waiaka‘īlio Bay (03)	N. Kohala	20.074	-155.865	13.4
Puakō (04)	S. Kohala	19.970	-155.849	9.2
‘Anaeho‘omalū Bay (05)	S. Kohala	19.953	-155.866	10.0
Keawaiki (06)	N. Kona	19.891	-155.910	13.3
Ka‘ūpūlehu (07)	N. Kona	19.844	-156.981	11.4
Makalawena (08)	N. Kona	19.797	-156.033	10.2
Ho‘onā / Unualoha Pt.	N. Kona	19.743	-156.056	12.4
Wawaloli Beach (09)	N. Kona	19.709	-156.059	9.8
Wawaloli (10)	N. Kona	19.700	-156.050	13.6
Kaloko-Honokōhau (1□)	N. Kona	19.671	-156.030	13.1
Papawai (13)	N. Kona	19.647	-156.023	10.4
S. Oneo Bay (14)	N. Kona	19.631	-155.993	12.0
Keauhou (15)	N. Kona	19.568	-155.969	12.0
Kualanui Pt. (16)	N. Kona	19.548	-155.962	11.3
Red Hill (17)	S. Kona	19.505	-155.953	13.9
Keopuka (18)	S. Kona	19.483	-155.946	10.3
K Bay (19)	S. Kona	19.479	-155.933	8.0
Ke‘ei (20)	S. Kona	19.463	-155.927	11.5
Ho‘okena (Kalahiki) (21)	S. Kona	19.369	-155.897	11.1
Ho‘okena (Auau) (22)	S. Kona	19.298	-155.890	13.6
Miloli‘i/Honomalino (23)	S. Kona	19.167	-155.913	12.3
Manukā (24)	Ka‘u	19.077	-155.904	12.0

Notes: Surveys are conducted in 'rounds', each site being surveyed once per round. 4 to 6 rounds have been conducted per year and in total 39 rounds have been conducted. Each survey of a site generally involves 4 divers (2 pairs), who between them conduct (i) 'WHAP' surveys of the four 25m *4m permanently-located transects per site; and (ii) 10-minute freeswims (presence-absence swims).

The protocol is based on fixed transects which can be closely surveyed for targeted species of all size classes, and where variability among fish populations can be related to fine-scale habitat variability among transects and sites. Six stainless steel eyebolts have been permanently drilled and cemented into the bottom to establish reference locations for four permanent 25m transects at each site. For efficiency during WHAP they have been situated in an H-shaped design at each study site. A transect width of 4m is utilized based on previous sampling experience with coral reef fishes in Hawai'i. The species, size class (in 5cm slots), and in some cases phase (e.g. 'recruit') of all fishes on transects are counted by a pair of divers in each survey.

In addition to the fixed transects at each site, a 10 minute roving free-swim survey is done by a team of two divers after the fixed transect surveys are completed. The divers range about the areas adjacent to transects (~5000m²) recording the presence of fish species which were not observed on the transects.

Source: West Hawai'i Aquarium Project (WHAP) <http://www.nodc.noaa.gov/archive/arc0006/0002767/1.1/data/0-data/>

Table 2.11 Relative Abundance of Fish at WHAP Sites 05, 06, and 07

Abundance	Scientific Name	Common Name	Hawaiian name	Relative Abundance at Each Site		
				Keawaiki	Kaupulehu	'Anaeho'omalu
1	<i>Ctenochaetus strigosus</i>	Kole tang	kole	1	1	1
2	<i>Zebrasoma flavescens</i>	yellow tang	lau'ipala	2	2	2
3	<i>Chromis agilis</i>	Agile chromis		3	4	5
4	<i>Acanthurus nigrofuscus</i>	Brown surgeonfish	ma'i'i'i	6	3	7
5	<i>Chlorurus sordidus</i>	bullethead parrotfish	Uhu	4	6	3
6	<i>Chaetodon multicinctus</i>	multiband butterflyfish	Kikakapu	7	5	9
7	<i>Thalassoma duperrey</i>	Saddle wrasse	Hinalea lau wili	5	8	6
8	<i>Paracirrhites arcatus</i>	Arc eye hawkfish		13	7	14
9	<i>Gomphosus varius</i>	bird-nose wrasse	hīnālea -'i'iwi	8	13	8
10	<i>Chromis hanui</i>	chocolate-dip chromis		15	9	11
11	<i>Stegastes fasciolatus</i>	Pacific gregory		21	14	4
12	<i>Pseudocheilinus tetrataenia</i>	fourline wrasse	Hinalea	11	12	12
13	<i>Plectroglyphidodon johnstonianus</i>	blue-eye damselfish		9	11	17
14	<i>Pseudocheilinus octotaenia</i>	eightline wrasse	Hinalea	12	23	16
15	<i>Stethojulis balteata</i>	belted wrasse	'omaka	19	20	10
16	<i>Pseudocheilinus evanidus</i>	disappearing wrasse	Hinalea	10	43	19
17	<i>Cephalopholis argus</i>	peacock grouper	roi	14	27	13
18	<i>Halichoeres ornatissimus</i>	ornate wrasse	la'o	23	17	15
19	<i>Oxycheilinus unifasciatus</i>	twospot wrasse	Hinalea	17	22	18
20	<i>Naso lituratus</i>	Unicorn fish	umaumalei	28	10	22
21	<i>Chaetodon ornatissimus</i>	ornate butterflyfish	kikakapu	16	16	29
22	<i>Scarus psittacus</i>	palenose parrotfish	uhu	20	36	20
23	<i>Parupeneus multifasciatus</i>	manybar goatfish	moano	18	21	27
24	<i>Melichthys niger</i>	black durgon	humuhumu ele ele	-	15	21
25	<i>Centropyge potteri</i>	Potter's angelfish		24	19	44

Source: West Hawai'i Aquarium Project (WHAP) <http://www.nodc.noaa.gov/archive/arc0006/0002767/1.1/data/0-data/>

Table 2.12 Molluscan Assemblages Described by Young et al. in April, 1977

<i>Station</i>	<i>Depth (in m)</i>	<i>Collection Date</i>	<i>Method</i>
Puakō:			
01C-04	12-15	Mar. 1975	SCUBA
Inl-1n3B	3-6	Mar. 1975	SCUBA
ShA-C	1	Oct. 1974	Snorkeling
SB, SC, M2	Shoreline	Mar. 1976	Shoreline
Waiulua Bay:			
Inl-3	Shoreline	Mar. 1975	Snorkeling
1-3	Shoreline	Mar. 1975	Snorkeling
‘Anaeho‘omalū:			
01-04	7-18	Mar. 1975	SCUBA
Inl-1n3	5-7	Mar. 1975	SCUBA
ShA-B	Shoreline	Oct. 1974	Snorkeling
TP	Shoreline	Mar. 1976	Shoreline
Kīholo:			
01-05	6-9	Oct. 1975	SCUBA
Inl-3	2-5	Oct. 1975	SCUBA
10.2-10.20	0.3-1	Aug. 1973	Snorkeling/SCUBA
12.20-12.2-5	Shoreline	Aug. 1973	Shoreline

Source: Table 14, Young et al. (April 1977)

The assemblage of macromollusks associated with the shoreline and inshore areas of Kīholo and ‘Anaeho‘omalū reflected the substantial freshwater influxes that are noticeable features of the shoreline of both bays. The most consistently encountered assemblage of mollusks is that found in the rocky supratidal, the assemblage characterized by *Littorina pintado*, *Nodilittorina piata*, and *Nerita piaeae*. This assemblage is characteristic of all rocky supratidal substrates in the windward Hawaiian Islands.

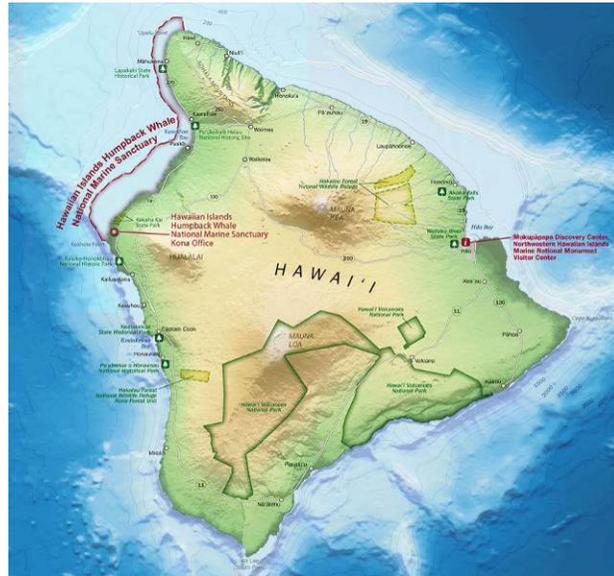
In the intertidal there are two assemblages of macromollusks, a marine assemblage with *Hipponix grayanus*, *Morula granulata*, and *Isognomon perna* most frequently encountered, and a freshwater-associated assemblage of *Theodoxus negleatus*, *Isognomon aaliforniaum*, and *Braahidontes arebristriatus*. At Kīholo the mollusks were consistently encountered throughout the length of the shoreline. That the freshwater intrusions at Kīholo are permanent features of the shoreline is indicated by the distinct zonation exhibited by these mollusks in Kīholo Lagoon. The Kīholo stations (subgroup B2) are distinguished from those at ‘Anaeho‘omalū by the occurrence of *Eatoniella* sp. which is associated with fresh water. The effect of the freshwater intrusions on the benthic marine community at distances of some 100 feet from shore is also indicated at Kīholo by the presence of *Eatoniella* sp. at three offshore stations where the freshwater-associated species are admixed with marine species. The admixture of species associated with freshwater and typically marine species at these stations suggests that although the freshening effect persists offshore, the low salinity water is mixed with the water mass of the bay.

2.4.3.4 Marine Mammals and Sea Turtles

Hawai‘i is home to many species of marine mammals and sea turtles. These include whales, dolphins, Hawaiian monk seals, green sea turtles (*honu*), hawksbill turtles (*honu‘ea*), and other sea turtle species. Under federal law, all marine mammals are protected under the Marine Mammal Protection Act (MMPA). Some marine mammals, including humpback whales, sperm whales, and Hawaiian monk seals, are also protected as endangered species under the federal Endangered Species Act (ESA). Sea turtles are also protected under the ESA. The National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) is responsible for administering the MMPA and ESA.

Humpback Whale. The humpback whale (*Megaptera novaeangliae*) is by far the most common whale species found in Hawaiian waters and is protected as an endangered species under federal and state law. The National Oceanographic and Atmospheric Administration estimate that a minimum of several thousand humpbacks come to Hawai‘i every year to mate, give birth and nurse their calves. Hawai‘i’s humpback whale season runs from November through May, with January through March being the peak whale-watching months. Humpback whales are provided special protection in Hawai‘i by the Hawaiian Islands Humpback Whale National Marine Sanctuary. A portion of the sanctuary runs along the northeast coastline of the Big Island and includes the area adjacent to Kīholo State Park Reserve (see Figure 2.12).

Figure 2.12 Hawaiian Islands Humpback Whale National Marine Sanctuary



Source: <http://sanctuaries.noaa.gov/pgallery/atlasmaps/hihws.html>

Hawaiian Monk Seals. Hawaiian monk seals (*Monachus schauinslandi*) are among the most critically endangered mammals in the world, with recent estimates placing the total population at fewer than 1,200 worldwide. Most of these live in the Northwestern Hawaiian Islands (which the National Marine Fisheries Service has identified as critical habitat for the species), but there is a small and potentially growing population of seals in the Main Hawaiian Islands (MHI) as well. NMFS has proposed expanding the critical habitat for the species to include terrestrial and marine habitat from 5 meters inland from the shoreline seaward to the 500-meter depth contour around all of the MHI. If approved, this would include the entire shoreline of the Kīholo State Park Reserve. Monks seals frequently haul-out onto the shoreline to rest and molt. Female seals also haul-out on shore for up to seven weeks to give birth and nurse their pups. Hauled-out seals may look sick, but they are usually perfectly healthy.



Sea Turtles. The two types of sea turtles most frequently observed in Hawai‘i are the *honu*, or green sea turtle (*Chelonia mydas*) and the *honu‘ea*, or hawksbill sea turtle (*Eretmochelys imbricata*). Three other species may occur, but are very rarely seen in our coastal waters. The green sea turtle is listed as a threatened species under federal and state law. Hawai‘i’s green sea turtles have shown a good population recovery in recent years, although they are still plagued with a papilloma virus that causes disfiguring tumors. Hawksbill sea turtles, listed as an endangered species, are sighted much less frequently than the green sea turtle.

Kīholo Bay, particularly the Kīholo Lagoon area is home to a thriving population of green sea turtles. Photographs of some of these taken during field trips are reproduced below.



Source: Planning Solutions, Inc. 2011

Scientists and naturalists have studied the turtle populations in the Kīholo Bay area for many years, and have periodically captured, tagged, and released turtles. Balazs et al. (1996) reported that as of December 1995, 313 green turtles of immature sizes ranging from 33.2 to 71.5 centimeters in straight-line carapace length had been captured and tagged at Kīholo Bay. Nearly all of the turtles were caught by hand while they were resting on the bottom within Kīholo Lagoon or by net while they were passing through the pond's narrow entrance channel. Besides green turtles, three juvenile hawksbills have been captured, tagged, and re-sighted within Kīholo Lagoon. The number of turtles captured on each trip has increased over time, indicating the robustness of the population. Moreover, the survey results strongly suggest that turtles tend to remain relatively close to their home grounds rather than ranging far afield.³⁰ Balazs et al. reported that none of the turtles captured at Kīholo Bay or anywhere else along the western coast of the island of Hawai'i had tumors indicative of fibropapillomatosis or evidence of any other disease. They did report that in the period between 1988 and 1995, nine carcasses had been recovered that suggested their death had been caused by gillnet fishing.

There is no law specifying the minimum distance people can approach a sea turtle, but as getting close to any threatened or endangered species may constitute a federal or state violation if the animal is disturbed, NOAA and DLNR recommend that everyone stay at least 150 feet from all marine sea turtles and avoid sudden movements and other actions that might disturb the animal.

2.4.3.5 Marine-Related Opportunities and Constraints

The relative abundance of sea turtles along the shoreline of Kīholo Bay makes it a wonderful place for individuals and groups to visit and see those creatures. The protection that has been afforded by the strict enforcement of endangered species laws has allowed the population of Green sea turtles to rebound from the low-point that it reached in the 1960s, and there is now a certainty that anyone visiting the Kīholo Lagoon area will see them in the water and sunning themselves on the beaches. More rarely, it will be possible to see the turtles as they haul themselves out to lay eggs in the sand immediately behind the shoreline.

Because the State has designated the portion of Kīholo Bay from the high water mark at the shoreline outward to an imaginary line drawn between Hou Point and Nawaikulua Point (including Kīholo Lagoon) as a Fisheries Management Area, the collection of aquarium fish and the use of gillnets is prohibited. Fishing is allowed in other areas, and there is evidence (in the form of detritus left by fishermen) that it is used for that purpose. Access poses a challenge, however, and it appears that

³⁰ Sonic telemetry of 10 green turtles involving 500 hours of monitoring (270 hours diurnal and 230 hours nocturnal) revealed extremely limited movements in the turtles' daily cycles at Kīholo Bay. Nights were spent inside Kīholo lagoon where the turtles are known to rest under submerged lava rock ledges or on the silty bottom where the maximum depth is less than four meters. During the early morning, usually just before sunrise, the sonic-tagged turtles would leave the pond to feed on *Gelidium* and other benthic algae in the adjacent nearshore waters of the bay.

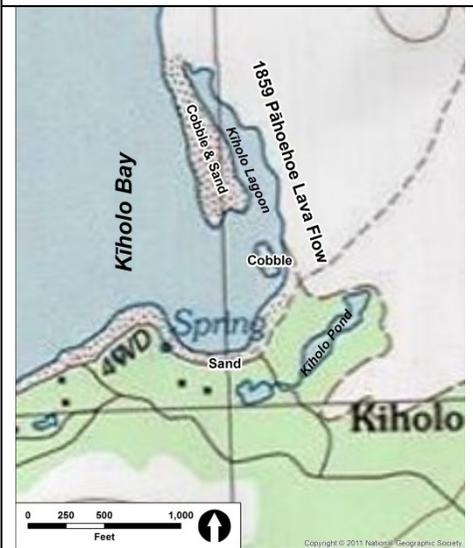
many of the individuals who do exploit the resource take advantage of the uncontrolled nature of the area to access the area by vehicle rather than walking in. If enforcement of park rules were to prohibit that, the use is almost certain to decrease, particularly along those stretches that are farthest from the nearest vehicular parking area.

2.4.4 KĪHOLO LAGOON

2.4.4.1 *Introduction*

As previously noted, Kīhōlo Lagoon is an elongated lagoon formed by a cobble-and-sand bar lying along the 1859 pāhoehoe lava flow which constitutes the eastern boundary of Kīhōlo Bay (see Figure 2.13). It is distinct from Kīhōlo Pond, which is the inland, culturally modified pond shown in the adjacent figure. The lagoon is roughly 1,500 feet long by 100 feet to 300 feet wide, with an area of nearly 5 acres. Detailed soundings were not made, but observations indicate steep sides and a relatively flat bottom at depths of 10 to 13 feet. There is a partial barrier, about halfway along the lagoon, formed by a submerged extension of the lava flow. The gap between the end of this shoal and the cobble bar is about 10 feet deep, so that while this feature restricts circulation, it does not form a sill behind which the deep water might tend to stagnate. The main (northern) pass has a “channel” about 20 feet wide with a sill depth of about 3 feet at mean low water. The sides of the pass shoal very gradually, so that the total width varies with the stage of the tide between approximately 100 feet and 200 feet. The small secondary pass, in which no measurements were made, has a maximum width of about 50 feet at high water. Freshwater springs enter the pond at several points along the edge of the lava flow; the most notable spring was observed at the head (northern end) of the pond.³¹ They reported strong physicochemical gradients in the water column and concluded that these gradients primarily affect the fauna in the upper 2 feet of the water column where a brackish to freshwater lens operates in conjunction with tidal flow and selects for euryhaline organisms.³² The dominant macromollusks in the lagoon are, thus, two species which are primarily associated with fresh water.

Figure 2.13 Kīhōlo Bay



Source: USGS 1:24,000 Quad Map

2.4.4.2 *Temperature, Electrical Conductivity, and Dissolved Oxygen Concentration*

Observations of temperature, electrical conductivity, and dissolved oxygen concentration were made at stations extending the length of the lagoon, on the entrance bar, and just outside the bar. They indicated the following.

Temperature. At low tide the cold, fresh outflow from the springs extended over the whole surface of the lagoon; the development of stratification was aided by calm or very light winds during the night. The cooling seen in the deeper lagoon near the bar may be caused by mixing generated at the bar by the seiche. At high tide, and after some hours of a brisk sea breeze from the WNW, the surface of the pond was 3 to 5 degrees C warmer, with stratification very much reduced. The deeper layers also become warmed by the sun, especially toward the inner end of the lagoon where seiche-induced

³¹ Young et al. (April 1977) reported the tidal range in the lagoon as being 2.5 feet at an extreme spring-tide maximum. What they found more interesting was a persistent 4- to 5-inch seiche, with a period of 6 to 8 minutes, which they observed throughout their study period. They indicated that the seiche was virtually undetectable on the open shoreline, but was easily visible within the quiet lagoon and striking where it passed over the bar, where the fairly strong current alternated in direction every few minutes.

³² Euryhaline organisms are living things which can adapt to a wide range of salinity levels.

mixing has the least effect. The effect of the freshwater springs can be seen only in the slight cooling near the surface at the very head of the lagoon.

Salinity. At low tide, the freshwater layer shows up clearly. The station outside the bar show salinity lower than the usual oceanic value of near 35 ppt in Hawaiian waters because there are many springs entering the ocean along this coast. Salinity in the deeper lagoon is 28 to 29 parts per thousand during the low tide period. At high tide the stratification has nearly vanished, with surface salinities sharply increased and deep salinities somewhat reduced from the earlier values. During the out flowing phase, the bottom salinity on the bar dropped sharply.

Dissolved Oxygen. The dissolved oxygen concentration distribution in the lagoon shows strong photosynthetic-respirational effects. In the early morning, at low tide, the deeper lagoon has depleted oxygen levels as the stable stratification has restricted downward mixing from the surface. At high tide, the oxygen level increases everywhere in the deeper lagoon, and also in the water outside the bar. At the surface of the inner lagoon, the dissolved oxygen level decreases with the rising tide, possibly due to a combination of mixing with deeper water and loss to the atmosphere.

2.4.4.3 Pond Biota

The strong physicochemical gradients within the lagoon appear to have little effect on the fauna except in the uppermost few feet where a brackish to freshwater lens operates in conjunction with tidal flow and strongly selects euryhaline organisms. Elsewhere, throughout the lagoon, community composition appears relatively consistent within a given substrate despite variations in water quality parameters (see Table 2.13 for a summary of the substrates and associated macrobenthos of Kīholo Lagoon).

2.4.4.4 Micromollusks

Two distinctive assemblages of micromollusks were identified in the lagoon, one at the entrance. the other mid-way in the pond itself; brackish-water or freshwater-associated mollusks predominate in both. At the entrance of the lagoon the dominant species are *Eatoniella* (~45 percent) and *Planaxis* and *Theodoxus* (10 percent) which are associated with brackish water, and marine-associated cerithids (*Bittium parcum*, *B. zebrum*), rissoids (*Rissoina ambigua*, *R. miltozona* and pyramidellids. On the shoaling sill mid-way into the lagoon, *Theodoxus* and *Melania* (which are associated with fresh water) comprised over a quarter of the assemblages, and the remaining micromollusks consisted of dead shells of marine species such as rissoids, *Tricolia*, cerithids, and other similar organisms. Young et al. (1977:91) reported seeing the endemic Hawaiian capulid, *Capulus tricarinatus*, in the center of the pond and speculated that it lives on the oyster *Ostrea sandvicensis*.

2.4.4.5 Kīholo Lagoon-Related Opportunities and Constraints

Kīholo Lagoon is a beautiful and uncommon feature of the Kohala shoreline. As noted above, it is used by a large population of green sea turtles that provide a wonderful viewing opportunity. The rough lava on the mainland coastline hinder movement and make it unlikely that humans or their pets will approach the turtles sufficiently fast to surprise or harm the turtles, this is not as true for the sand bar. Because of this, warning signs may be needed to make park users aware of the need to behave responsibly when turtles are present.

Table 2.13 Substrates and Associated Macrobenthos of Kīholo Lagoon.

<i>Zone</i>	<i>Substrate</i>	<i>Community Composition</i>	<i>Other Observations</i>
Ia	Bare clean cobble	Sparse pelecypod (<i>Isognomon perna</i>) anthozoan (<i>Aiptasia</i> -like) community; infrequent small colonies of two species of demospongiae	Entirely within low salinity lens at low tide
Ib	Clean coarse sand	Macrobenthos is absent	
IIa	Vegetated cobble, silt content in	Diverse pelecypod (<i>I. perna</i> ; <i>I. californicum</i> ; <i>Brachydontes cerebristriatus</i> ; <i>Ostreaea hawaiiensis</i>)-gastropod (<i>Hipponyx</i> sp.)-anthozoan (<i>Aiptasia</i> -like) polychaete (<i>Eurythoe complanata</i>)-holothurian (<i>Holothuria monocarida</i>)-poriferan community	<i>Acanthophora</i> and filamentous algae cover much exposed surface
IIb	Coarse sand, silt content increasing with depth	Enteroptneust (<i>Ptychodera flava</i>) annelid (<i>Cirratulus</i> sp.) community; burrows of unidentified Callinassid shrimp common, some of these occupied by gobies	Some filamentous algae present on sand surface, density increases with depth
III	Fine claylike silt	Similar to sandy section of Zone II, but <i>Ptychodera</i> less common. <i>Acanthophora</i> and <i>Aiptasia</i> -like anemone cover scattered rocks	Single specimen of gastropod-feeding crab (<i>Calappa hepatica</i>) found
IV	Vegetated, lightly silted pāhoehoe lava	Anemone (<i>Aiptasia</i> -like) and <i>Acanthophora</i> cover virtually entire surface	
V	Bare, clean pāhoehoe lava	Scattered anemones (<i>Aiptasia</i> -like) only	Entirely within low saline lens at low tide
Source: Table 20, <i>Hydrologic and Ecologic Inventories of the Coastal Waters of West Hawai'i</i> . Sea Grant Cooperative Report UNIH-SEAGRANT-CR-77-02; Sea Grant College Program, Years 07-08.			

2.4.5 ANCHIALINE PONDS³³

2.4.5.1 *Anchialine Pond Overview*

Anchialine resources first received attention in modern times with the taxonomic work by Holthius (1973), the ecological work of Maciolek and Brock (1974) on the West Hawai'i coast, the ecologic studies at Cape Kīna'u, Maui by Maciolek (1986) and more recently, studies elsewhere worldwide. Anchialine pools are defined as landlocked pools located adjacent to the sea, having measurable salinities whose water levels rise and fall with the tides due to subsurface connections with the nearby ocean. These pools are typically found in porous substrates such as limestone or recent lavas, the latter being the case for most Hawaiian anchialine pools. The Hawaiian Islands are the only place in the nation that has anchialine resources, and most of these are found on the geologically young islands of Maui and Hawai'i. The statewide total number of anchialine pools was first estimated to be about 650 pools with the majority of them being located on Hawai'i Island (Brock 1985). The additional surveys completed since that time (most recently at Kohanaiki in North Kona), have raised the estimate to about 950 pools statewide (Brock, personal notes).

³³ In preparing their report for the Kīholo State Park Reserve Master Plan, Environmental Assessment, LLC reviewed forty years of personal notes collected during studies on West Hawai'i anchialine habitats as well as reviewing pertinent scientific literature. Primary sources used include Maciolek and Brock (1974), Oceanic Institute (1985), as well as the Hawai'i Heritage Program (1993). In order to avoid the release of information that could lead to the degradation of the existing pristine ponds, the complete report, *Anchialine Resources in the Kīholo, North Kona, Hawai'i Area* (August 2011), has not been included in this document.

Biological resources in the Hawaiian anchialine habitat are dominated by a number of red pigmented small crustacean species along with species in other phyletic groups. Many of these species are only known from the anchialine habitat, are endemic to the Hawaiian Islands, and because the habitat in which they live is relatively rare and the numbers of individuals are low, some of these species are listed as candidates for federal status as threatened or endangered species. The most conspicuous and characteristic species, the *‘ōpae‘ula* (*Halocardinia rubra*) is a small (≤ 1 cm) red-pigmented shrimp which may occur in high densities of up to several hundred per 0.1 m² area in a given pool. These shrimp are primarily herbivorous and are known “keystone” species that maintain the native anchialine habitat (Brock 1985, Bailey-Brock and Brock 1993) through their feeding activities. They are also known to occur in the interstitial water table beneath the surface-exposed anchialine habitat. In the non-lighted water table *Halocardinia rubra* probably feeds on bacterial films and detritus that fall through interstices in the porous lava connecting surface anchialine pools to the water table below. In the subterranean habitat population densities of *H. rubra* are low, probably due to the lack of food resources, thus the anchialine pools exposed to sunlight are the sources of most food resources for this species.

2.4.5.2 Assessment of Anchialine Resources

Maciolek and Brock (1974) carried out the first studies on the distribution and status of the anchialine resources in the Kīholo area as well as elsewhere along the West Hawai‘i coast. This study did not attempt to identify every anchialine pond encountered; if anchialine pools were found singly or in small groups, they were often all sampled but due to time constraints when larger clusters of pools were discerned, only a subset was sampled. In the Kīholo-Anahulu area, Maciolek and Brock (1974) noted and roughly mapped twenty-three pools.³⁴

In sampling pools, these authors noted the physical sizes and substrates of the pools, the surrounding vegetation, and the aquatic species present. Each pool was also photographed. At the time of the survey, thirteen of the twenty four pools (54.1 percent) surveyed had native species present, four (or 16.7 percent) had native predaceous fish present, three (12.5 percent) had neither fishes nor native crustacean species present, and four (16.7 percent) were colonized by alien fishes and native shrimp were absent.

In 1990, the State of Hawai‘i Department of Land and Natural Resources contracted with the Nature Conservancy’s Hawai‘i Heritage Program to prepare a biological inventory of the coastal lands in the Kīholo area (Hawai‘i Heritage Program 1993). In total, the report mentions fourteen low salinity anchialine pools on the surface and an additional seven anchialine pools in subterranean lava tubes.³⁵ However, the authors observed that the anchialine pools along the surveyed coastline include some of the “least modified” [physically] and “most significant” on the island of Hawai‘i. The report confirmed that most of the pools that are exposed at the surface had been invaded by alien fish such as tilapia and poeciliid live-bearers and where that had occurred the fish had depressed the populations of native invertebrates (Hawai‘i Heritage Program, 1993:21-22). However, the seven anchialine pools situated in subterranean lava tubes had not suffered from introduced fishes and were in generally good health.³⁶

³⁴ At the time of the survey in 1972, there was no practicable method of determining latitude and longitude; hence the locations of the pools were approximately placed on USGS quadrangle sheets (scaled 1:24,000) in the field using locally visible geographical features as reference points.

³⁵ In order to protect the resource, the report withheld information about the exact location of anchialine pools and most of the data concerning the status of the aquatic communities in them.

³⁶ Maciolek and Brock (1974) only surveyed one anchialine pool situated in a lava tube in the Kīholo area and did not find any native shrimp present probably due to the unseen presence of a native goby or *‘o‘opu‘akupa* (*Eleotris sandwichensis*). However native shrimp were present in the Hawai‘i Heritage Program (1993) survey of this pool which suggests that the lack of shrimp in 1972 may have been due to an individual predator such as *‘o‘opu‘akupa* which after its passing, the native shrimp returned. If this assumption is correct, in the twenty years between the 1972 and 1991-1992 surveys, the biological status of the surface-exposed anchialine pools in the Kīholo area has declined from about 50 percent having the normal suite of native species present to probably less than 10 percent having those species twenty years later.

For the present park master planning effort, Brock concluded that, in total, there are at least twenty-four surface exposed anchialine pools in the Kīholo State Park Reserve area and the majority of them (including virtually all of the ones that are exposed at the surface) were impacted by the spread of alien predatory fishes. Despite the presence of predatory alien fish species in most of the surface-exposed anchialine pools located in the Kīholo area, they remain an important habitat for native crustacean species. This is because frequently, under the cover of darkness, native anchialine shrimp (particularly 'ōpae'ula or *Halocardinia rubra*) will move from the underlying water table into the surface exposures to feed when the predatory fish cannot see them because these fish feed using visual cues. Despite the presence of alien fishes, the biologically degraded anchialine habitat continues to remain very important to many of the native aquatic species and deserves continued protection.

2.4.5.3 Anchialine Pond-Related Opportunities and Constraints

From a biological perspective, nearly all of the anchialine pools that occur on public property along the Kīholo shoreline are already degraded. Reversing this by ridding the pools of introduced fish species is virtually impossible with the techniques that are now available.³⁷ In view of this, the pond restoration that was recommended in the *Draft Management Plan for the Ahupua'a of Pu'u Wa'awa'a and the Makai Lands of Pu'u Anahulu* is not practical. Even if it were possible to rid the ponds of invasive species, the fact that most surface-exposed anchialine pools are situated relatively close to the shoreline or have old trails which lead directly to them means that they are subject to public use that has a high probability of further alien introductions in the future. Because of this, Brock recommended against making extensive efforts to restore the unique assemblage of biota that once inhabited the ponds a major focus of park planning. Other groups believe that it may be possible to restore at least a select group of ponds and are experimenting with the means to do so, and State Parks is supportive of their efforts. Regardless of the biological degradation of these pools, they remain attractive shoreline features and signage should be used for the purpose of educating the public about the anchialine habitat and their biological and cultural-historical value, especially in areas within easy reach of parking and major footpaths.

Attention should not be drawn to anchialine pools situated in caves due to the delicate nature of the natural communities and cultural resources present in those areas. Unless sufficient funds and personnel become available to provide adequate protection while leaving cave entrances open as they presently are, sealing the entrances to particularly high-value caves using rock work is an option. This strategy has been used on some West Hawai'i development sites to prevent disturbance or looting of cultural resources. Without sealing the entrances to such resources, it is doubtful that over time and with greater public use of the area, even the cave pools will remain intact.

Despite the fact that the majority of the surface-exposed anchialine habitats in the Kīholo State Park Reserve are biologically degraded by alien fishes, management of these resources should include signage cautioning against entering the water, releasing any aquatic species into the ponds, and explaining the natural (and where appropriate cultural-historical) value of the resource. This signage would have the greatest impact if it was placed adjacent to anchialine pools in proximity to trails or other points of access. Any anchialine pool with the remaining normal suite of native aquatic species present should not have its location publicized. Subsurface anchialine pools in lava tubes should not be marked as to protect not only these resources but also native insect communities and cultural resources that may lie within them. As noted above, where these subterranean resources are particularly well preserved, one strategy could be to seal the entrances to these caves with rock work.

³⁷ Chlorine, rotenone and antimycin A are the only fish toxicants currently approved by the U.S. Environmental Protection Agency (EPA). Chlorine is a non-restricted, general use pesticide that is used as a fish toxicant and algacide, but it cannot be used effectively in anchialine ponds. Rotenone is a restricted-use pesticide and can be hazardous to people and the environment; the restrictions on its application make it unlikely that approval can be obtained for its application in the ponds at Kīholo. Because the use of antimycin A use is prohibited in estuarine/marine environments and must be deactivated with potassium permanganate to ensure that it will not affect areas beyond the treatment area, it is not suitable for use in the anchialine ponds in the Kīholo area.

2.5 SCENIC RESOURCES

2.5.1 OVERVIEW OF THE RESOURCE

Kīholo State Park Reserve possesses magnificent scenic views of wild coastline, volcanoes, and lava fields. The vistas can be enjoyed by persons passing through the area on Queen Ka‘ahumanu Highway and from various points within Kīholo State Park Reserve itself. In addition to the ocean and shoreline views that are available from nearly all of the Kīholo Bay coastline, 360-degree panoramic views are available to those hiking the extensive lava flows to the north and south. The primary scenic views within the park are: (i) views from Queen Ka‘ahumanu Highway and entrance points off the highway; (ii) views along the shoreline; and (iii) views from the shoreline towards more distant vistas, such as Mauna Kea or Haleakalā. Both at inland locations and along the water, there are opportunities to view volcanoes, ocean vistas, wildlife, and the island of Maui in the distance.

As park goers travel through the lava fields and along the highway, they are offered panoramic views of the wilderness, including isolated *kīpuka* among the lava flows, coastline, and more distant features. Once on the shoreline, the visual resources include extensive views north and south along the coast, including smaller coastal features such as Pueo Bay or the remnant of Kīholo fishpond, which are not immediately apparent from more distant vantage points. Within the *kīpuka* and other vegetated areas, the views are more restricted yet still rewarding.

2.5.2 SCENIC RESOURCES: OPPORTUNITIES AND CONSTRAINTS

The existing highway scenic viewpoint that is located adjacent to Kīholo State Park Reserve provides an excellent place for persons in vehicles driving past the park to stop and enjoy the vistas. Passengers in passing vehicles can enjoy the scene from many other stretches along Queen Ka‘ahumanu Highway as well (drivers must keep their eyes on the road and other vehicles). No additional physical improvements are needed for this purpose.

The existing main roads within the park reserve itself generally pass through areas with scrub vegetation, and they are not remarkable for their scenery. Some work could be done to improve the appearance or the areas immediately adjacent to these roads, but as the focus of the park is on a wilderness experience, this is neither necessary nor particularly appropriate.

2.6 EXISTING INFRASTRUCTURE

While the fact that the existing roads and other infrastructure within Kīholo State Park Reserve are man-made means that they are not, strictly speaking, “natural” resources however, they are important to park planning. Rather than create an entirely separate section, they are discussed here.

2.6.1 EXISTING ROADWAYS AND TRAILS

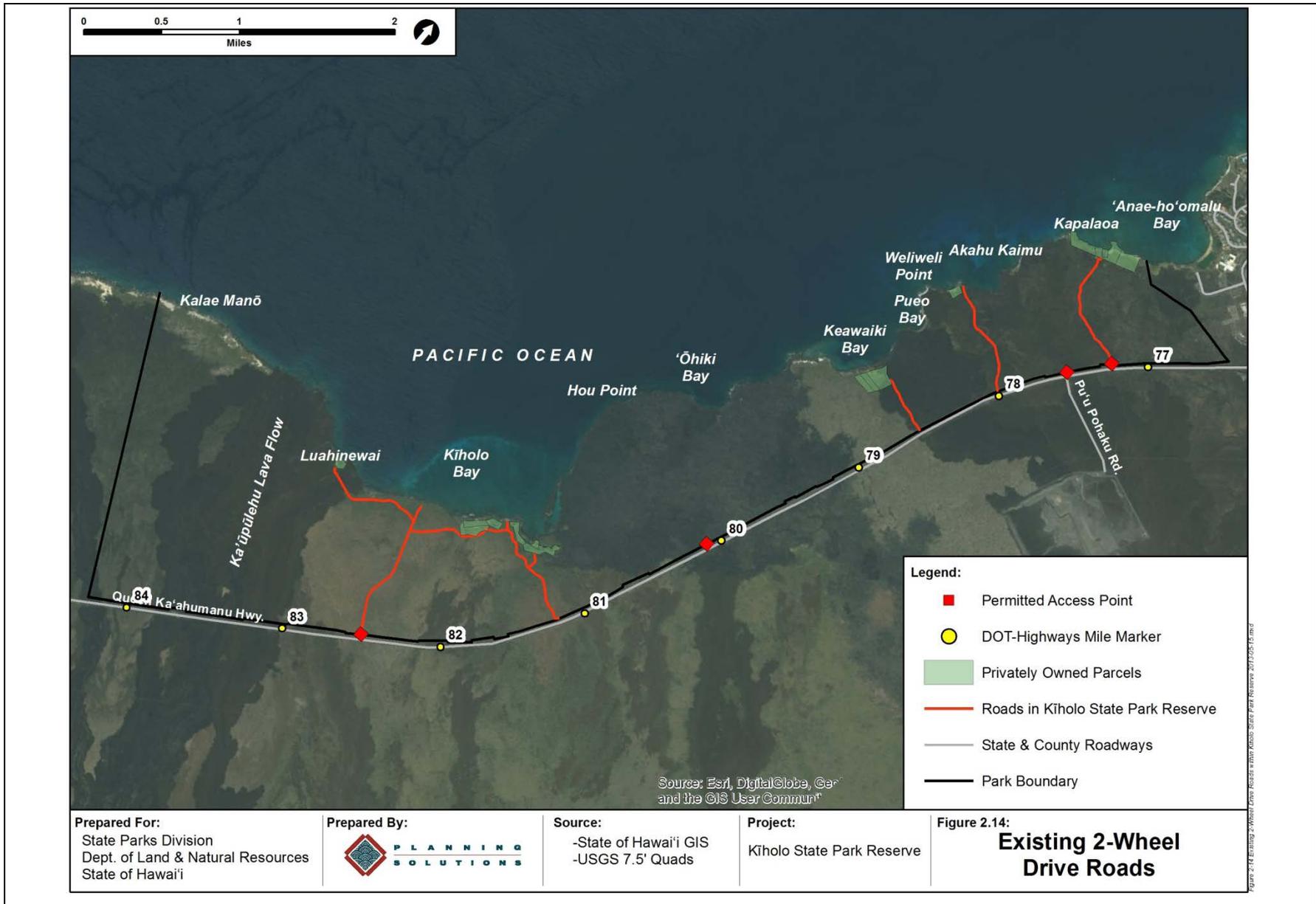
2.6.1.1 Characteristics and Constraints of Existing Roadways

2.6.1.1.1 Characteristics of Existing Roadways

Existing roadways within the boundaries of the State-owned lands at Kīholo are shown on Figure 2.14. All of these were created before the land was acquired by the State and/or were constructed by private property owners for the purpose of accessing their shoreline properties. The drawing shows only those roads that are generally usable by 2-wheel drive vehicles.

In addition to the roadways shown on Figure 2.14, there are numerous 4-wheel drive paths within the park boundaries. A few of these are relatively well-defined while others, particularly those that cross relatively smooth pāhoehoe lava can be challenging to follow because they have been modified so little.

Figure 2.14 Existing 2-Wheel Drive Roadways within Kīholo State Park Reserve



Photographs of the types of roadways within the Kīholo State Park Reserve that are readily passable by two-wheel-drive vehicles are reproduced in Figure 2.16. Figure 2.15 shows the examples of the intersections of those roads with Queen Ka‘ahumanu Highway. Figure 2.17 contains photographs of roadways within Kīholo State Park Reserve that are generally passable only by 4-wheel drive vehicles.³⁸ Because information on the exact location and condition of roads that are (or may be) used by 4-wheel drive vehicles is incomplete, no attempt has been made to map their location.

Many of the roadways that are passable by 2-wheel drive vehicles were constructed to connect shoreline parcels with Queen Ka‘ahumanu Highway (State route 11). It is the main arterial roadway along the South Kohala coastal area. Running north from Palani Road in Kailua-Kona to Kawaihae Road near Kawaihae Harbor, this road was initially constructed in 1975. Many changes have been made to the highway since that time. The majority of these involved intersection widening as individual resort and other development occurred along its length, but more general widening efforts have taken place at the Kailua-Kona end of the highway. In mid-2010, the State Department of Transportation issued a contract for the second phase of widening between Kailua-Kona and the Kona International Airport; DOT reported that an average of approximately 22,800 vehicles utilize this thoroughfare each day.

Existing vehicular traffic volumes on the segment of Queen Ka‘ahumanu Highway that passes Kīholo State Park Reserve is much lower, but still substantial. The Hawai‘i State Department of Transportation, Highways Division, Planning Branch, estimates that the annual average daily traffic³⁹ on Queen Ka‘ahumanu Highway between Kīholo Bay Lookout and Ka‘ūpūlehu Drive (i.e., the entrance to the Hualālai Resort) for 2009 and 2010 is 11,800. During the busiest periods of the day more than 1,000 vehicles per hour may transit the area.

No formal traffic counts have been conducted on roads within the Kīholo State Park Reserve. However, members of Hui Aloha Kīholo have collected data on the number of vehicles present in the Kīholo Bay area during both “typical” and very busy periods. These suggest that the number of vehicles using the portion of the existing Kīholo access road closest to Queen Ka‘ahumanu Highway might reach a few tens of vehicles per hour on a very busy day. Inholders are responsible for a portion of this, but generally no more than a few cars per hour are attributable to that source.

2.6.1.1.1 Roadway Opportunities and Constraints

Internal Roadways. There are already a significant number of roadways within the Kīholo State Park Reserve. While most are suitable only for 4-wheel drive vehicles, the central Kīholo area that is most suitable for park use is served by graded roads that are adequate for all vehicles. An adequate maintenance budget needs to be included in the operating budget for the park, but entirely new internal roadways aside from one needed to connect with Queen Ka‘ahumanu Highway are not needed. In fact, there are several locations at which barriers have recently been erected, and should be maintained, in order to further restrict vehicle access to roadways that have been used in the recent past. The most notable of these is the road that runs atop the beach berm in the camping area. The beach road serves as an important pedestrian way and also provides emergency and maintenance access to shoreline areas and should be retained, but access to it should be restricted with barriers and vehicle-resistant gates.

Intersections with Queen Ka‘ahumanu Highway. Queen Ka‘ahumanu Highway is a restricted access roadway. Four existing roadways within the park boundaries that existed prior to the creation of the highway are designated for limited access on the State Department of Transportation’s right-of-way maps. Those intersections are noted on Figure 2.14, along with three additional points of ingress/egress which may currently be in use, but do not appear on DOT maps.

³⁸ Some drivers undoubtedly have taken their two-wheel drive vehicles onto roadways that are depicted as “4-wheel drive roadways”. In other cases, the “roadways” are so basic that only the most adventurous 4-wheel drive vehicle drivers will attempt them.

³⁹ Annual average daily traffic (AADT) is the average of 24 hour counts collected every day in the year.

Figure 2.15 Photographs of Existing Road Intersections with Queen Ka‘ahumanu Highway

	
<p><i>Kīholo Bay Looking North (Milepost 82.5)</i></p>	<p><i>Kīholo Bay Looking South (Milepost 82.5)</i></p>
	
<p><i>Queen Ka‘ahumanu Highway Milepost 81.2</i></p>	<p><i>Queen Ka‘ahumanu Highway Milepost 78.8</i></p>
	
<p><i>Queen Ka‘ahumanu Highway Milepost 78.6</i></p>	<p><i>Queen Ka‘ahumanu Highway Milepost 77.3</i></p>
<p>Source: Rana Biological Consulting, Inc.</p>	

Figure 2.16 Photographs of Typical 2-Wheel Drive Roads within the Park



Access road to inholdings near Kapalaoa at shoreline.



Road between Queen Ka'ahumanu Highway and Kapalaoa inholdings.



Access road to Loretta Lynn house and Kīholo Bay.



Main entrance road to Kīholo State Park Reserve.



Entrance road to Bakken residence.



Gated access road off of Queen Ka'ahumanu Highway.

Source: Photos taken by Planning Solutions, Inc. (June 13, 2011 and September 9 and 10, 2011)

Figure 2.17 Typical 4-Wheel Drive Roads within the Park



Jeep trail along the beach at Kīholo Bay.



Jeep trail outlet along shoreline.



Jeep trail leading to Keawaiki Bay.



Outlet of jeep trail at Keawaiki Bay.



Jeep trail between Queen Ka'ahumanu Hwy. and Kaiwi Point.



Jeep trail through lava fields at Keawaiki.

Source: Photos taken by Planning Solutions, Inc. (September 9, 2011)

The change in status from a “State Park Reserve” into a “Wilderness State Park” does not, in-and-of-itself affect the number of vehicles that use the existing access points. In fact, adoption of the master plan and conversion of the property into a State Wilderness Park could well lead to a decrease in the intensity of use compared to what has existed in the past. This, in turn, could decrease the number of vehicles traveling into and out of the property through the three intersections. However, the change in designation would subject the intersection to higher design standards. Specifically, without an exemption, which the Highways Division of the State Department of Transportation has indicated it does not wish to grant, acceleration/deceleration and turn-storage lanes would be required. Until recently it would have been possible (although expensive) to provide those at the existing intersection location, but the construction of the roadside scenic lookout a short distance to the north of the existing Kīholo access road means that is no longer the case. In view of this, an alternate connection will be needed.

The other roadways that provide limited access from Queen Ka’ahumanu Highway to the Kīholo State Park Reserve property have even less existing and forecast use. Hence, while none of them have turning lanes, this is unlikely to limit their use.

2.6.1.2 Existing Trails and Paths within Kīholo State Park Reserve⁴⁰

Photographs of typical foot trails within the Kīholo State Park Reserve are reproduced in Figure 2.18. They illustrate the range of trails that are present, from the well-graded/nicely bordered King’s Trail (the Ala Nui) to much less distinct (and frequently fragmented) shoreline trails and trails across barren lava fields of *pāhoehoe*. While several sources contain maps showing the location of these trails and paths, the mapping is incomplete and it has not been possible to prepare a comprehensive trail map for the Kīholo State Park Reserve property.

The “Kīholo-Puakō Trail” (a National Register site) begins at Kalāhuipua’a, in the lands of ‘Anaeho‘omalū in South Kohala, and crosses through the Kīholo State Park Reserve to Kīholo Bay. Along the dry, west coast, dominated by geologically recent lava flows from Mauna Loa and Hualālai, many miles of the Kīholo-Puakō Trail are plainly visible, lined with curbstones and still in good condition. Running roughly parallel to the Kīholo-Puakō Trail is what is thought to be its “forerunner”, a prehistoric foot trail traditionally referred to as “Ala Loa”. The Ala Loa trail is at times clearly visible from the newer Kīholo-Puakō Trail and was traveled prior to the widespread use of saddle and pack animals. The older Ala Loa crosses underneath the Kīholo-Puakō Trail within the project area. The Kīholo-Puakō Trail is a primary north-south route for those trail users in Kīholo State Park Reserve and the Ala Kahakai National Historic Trail (NHT).

The Ala Kahakai NHT is a 175-mile trail corridor established in 2000 for the preservation, protection and interpretation of traditional Native Hawaiian culture and natural resources (see Figure 2.19). The Ala Kahakai NHT combines three kinds of Hawaiian trails:

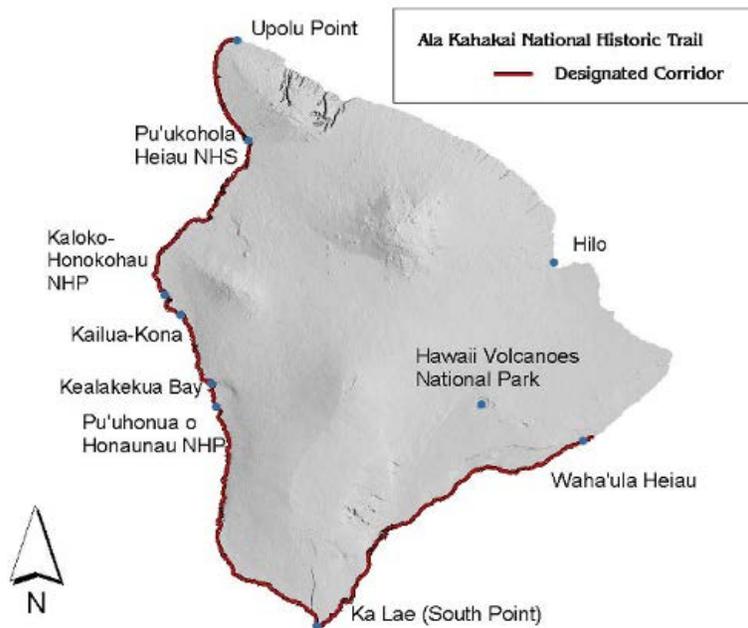
- Surviving elements of the ancient Ala Loa trail system;
- Historic trails that developed on or parallel to the traditional routes post-contact (i.e., after 1778); and
- More recent pathways and roads that created links between these ancient and historic segments.

These trails may run lateral to the shoreline or, within the trail corridor, run *mauka-makai*. The trail extends from ‘Upolu Point on the northern tip of Hawai‘i Island down the Kona Coast and around South Point to the eastern boundary of Hawai‘i Volcanoes National Park.

⁴⁰ Historical aspects of the numerous trails are discussed more fully in Section 3.3.2.

Figure 2.18 Photographs of Typical Foot Trails within Kīholo State Park Reserve



Figure 2.19 Ala Kahakai National Historic Trail

Source: National Park Service

The National Park Service (NPS) administers the Ala Kahakai NHT in accordance with the approved *Ala Kahakai National Historic Trail Comprehensive Management Plan*. The Management Plan notes that the trail passes near hundreds of ancient Hawaiian settlement sites and through more than 200 *ahupua'a*. Cultural resources along the trail include several important *heiau* (temples), royal centers, *kahua* (house site foundations), *loko 'ia* (fishponds) *ko'a* (fishing shrines), *ki'i pōhaku* (petroglyphs), *hōlua* (stone slide), and *wahi pana* (sacred places). Natural resources include anchialine ponds, *pali* (precipices), nearshore reefs, estuarine ecosystems, coastal vegetation, migratory birds, native sea turtle habitat, and several threatened and endangered endemic species of plants and animals. The Ala Kahakai NHT Management Plan contains strategies for resource protection, trail use, and facility development. It serves as the umbrella document under which the National Park Service expects to prepare future implementation plans.

The Ala Kahakai National Historic Trail is the subject of a Memorandum of Understanding (MOU) between the U.S. Department of the Interior, National Park Service (NPS), DLNR, and the County of Hawai'i.⁴¹ Federal involvement in Ala Kahakai is intended to encourage and assist state, local, and private entities that wish to manage and protect those segments of the trail and associated resources that cross non-federally-owned lands, such as those within the Kīholo State Park Reserve. The MOU is intended to help coordinate and clarify the jurisdictional, regulatory and management actions and fiduciary responsibilities between the Federal, State, and County governments in relation to the management of the Trail in order to provide a seamless trail experience for the user. In entering the MOU, the parties agreed to:

- Participate in implementing the Trail Comprehensive Management Plan (CMP) and to manage the Trail's resources as appropriate and feasible.

⁴¹ The MOU was established in accordance with the provisions of the National Trails System Act of 1968, as amended (16 USC 1241-1252), Hawai'i Revised Statutes (HRS) Chapters 6E, 171, 183C, 184, 198D, 205, 205A, and sections 46-6.5, 226-11, 264-1, Hawai'i Administrative Rules (HAR) Chapters 13-130, 13-146, 13-221, 13-275 to 13-284, 13-300, and section 15-150-26, and the Hawai'i County Code, Chapters 25 and 34. The original term of the MOU is for five years (beginning February 21, 2010) with the provision that it can be renewed upon mutual agreement between the Parties.

- Establish individual coordinators within each agency for Trail administration activities.
- Keep each other informed and consult periodically on management issues pertaining to the Trail.
- Work to develop a single set of guidelines regarding administration and management of the Ala Kahakai NHT.
- Develop and implement a Programmatic Agreement in accordance with the Section 106 of the National Historic Preservation Act and its implementing regulations to ensure appropriate identification and treatment of historic properties potentially affected by use of the Trail and to coordinate federal and state statutory and regulatory authorities regarding historic properties and burial sites.

The MOU does not commit the parties to expend resources or to participate in obtaining funds unless they agree to do so through separate agreements. Under the MOU, the NPS agreed to act as the lead agency in coordinating activities associated with the implementation of the CMP and this MOU and with the administration and management of the Trail. The NPS also agreed to:

- Review land use permit applications, environmental assessments and impact statements, and other reviews pertinent to the Trail, as requested by parties to this MOU.
- Produce and share Geographic Information System (GIS) maps documenting the historic trail and access data submitted by Nā Ala Hele and others.
- Work with DLNR and the County in responding to legal issues associated with the Trail.
- Consider accepting management responsibilities for state-owned portions of the historic trail that become official parts of the Trail or for land owned by private entities that wish to participate in the Ala Kahakai NHT program.
- Coordinate with the Hawai'i Island Nā Ala Hele Trail and Access Advisory Council on issues that pertain to the Trail.

For its part in the MOU, the State of Hawai'i, DLNR agreed to:

- Coordinate the sharing of data and technical expertise within the department and inform the Governor, Legislature, and Congress on issues that affect the Trail.
- Include the Ala Kahakai NHT-related concerns in the review of Conservation District Use applications and other land use permits that affect lands likely to contain trails that might be included in the Trail.
- Continue to provide NPS with historical and archaeological data from the State Historic Preservation Division database.
- Assist with the investigation and classification of unrecorded burial sites and historic properties and provide regulatory oversight and guidance on issues associated with those features.
- Provide management of the Trail consistent with the NPS Comprehensive Management Plan where it traverses State Parks.
- Collaborate on the design of signs and interpretive media and provide technical interpretive assistance along other sections of Trail not owned by State Parks.
- As is mutually determined feasible and desirable, execute either a Set-Aside or Lease Agreement, through the Board of Land and Natural Resources (BLNR) and Office of the Governor, as appropriate, that would formally approve the conveyance to the NPS of portions of State-owned ancient or historic *ala loa* (long trail) that qualify to be included as official components of the Trail.⁴²

⁴² The MOU recognized that the execution of either a set-aside or a lease does not relinquish the State's fee simple interest in trail segments that have been determined to be State-owned via section 264-1, Hawai'i Revised Statutes.

- Continue to provide abstract data that pertains to the NHT corridor through the Division of Forestry and Wildlife-Nā Ala Hele Trail and Access Program and coordinate with the Hawai‘i Nā Ala Hele Trail and Access Advisory Council on issues that pertain to the Trail.
- Assist with the determination of alignments that qualify for recognition as part of the Trail or for conveyance to NPS.
- Provide technical training on trail maintenance to NPS staff and community volunteers and provide input on the Trail management planning process.
- Collaborate on the design of specific signage that identifies the route of the Trail on the ground and other signage (e.g., signs warning of specific dangerous natural conditions related to rockfall, flash floods, cliffs, and submerged hazards [excluding hazards related to the ocean]).
- Provide other pertinent technical information and staff support related to trail management and maintenance if it does not adversely affect other Nā Ala Hele projects and existing staff workload.
- Consider the feasibility of adding currently identified State-owned trail segments that traverse private property, with the consent of the landowner, to the Nā Ala Hele Program and include these segments under Chapter 13-130, HAR.

In addition to this major trail, there is also a complex network of other modern and ancient trails within the Kīholo State Park Reserve. These do, or did, provide access to coastal and inland resources, former habitation areas, and other resources. A considerable amount of mapping of these resources has been accomplished as part of the archaeological and cultural research that State Parks has undertaken. However, those maps are not reproduced in this report in order to protect the resources that they access.

2.6.1.3 Road Maintenance

The Division of State Parks has principal responsibility for maintenance of all of the roadways within the Kīholo State Park Reserve. From the time the State acquired the Kīholo property to the present, the area was designated as a State Park Reserve and no funds have been budgeted specifically for its improvement or maintenance. However, the owners of the private inholdings have, on their own initiative, undertaken (with the State’s concurrence) maintenance work as needed, including improving portions of the private access roads on their properties. As a result, maintenance work has been limited to occasional patches. Fortunately, the modest slope of the land and relatively dry conditions have allowed the roads to remain passable despite the use they have received. In view of the low-density use that is envisioned for Kīholo State Park Reserve, paving of the roadways is not required. However, budgeting for regular upkeep is needed.

2.6.1.4 Parking Areas

There are no formal parking lots at Kīholo at the present time. However, parking is provided in several areas, including the following:

- The open area near the Loretta Lynn house that has traditionally been used for that purpose.
- Parking areas for campsite users; these are located on the *makai* side of the access road immediately inland of the campsites. These replace the “within campsite” spaces that were formerly accessed by driving along the beach; those spaces were eliminated when beach access to vehicles was eliminated during the Fall 2011 cleanup at Kīholo.
- Roadside parking along the roadway leading to the former Loretta Lynn house. These spaces were created during the Fall 2011 clean-up at Kīholo.
- Roadside parking alongside the *makai* end of the road that provides direct access to the turnaround and unloading spot in the center of Kīholo Beach.
- A parking area approximately 300 feet *makai* of Queen Ka‘ahumanu Highway along the northern side of the main access road to Kīholo Bay.

Together, these areas are more than adequate at most times. However, on a few rare and unusually busy weekends, the demand for parking has been so great that cars park along the access roads for a distance of up to 2,000 feet inland. In view of the “wilderness” nature of the facility, providing sufficient dedicated parking to accommodate the few extreme situations appears unwarranted.

Figure 2.20 Typical Parking Areas, November 2011



Source: Photos taken by Planning Solutions, Inc. (various dates during 2011)

2.6.2 EXISTING STRUCTURES

Built in the late 1980s, the former home of Loretta Lynn is located along the eastern side of the 7-1-002:002 parcel which is accessible via a gravel road from Queen Ka’ahumanu Highway. Located along the Ala Kahakai National Historic Trail at Kīholo Bay, the house is situated *mauka* of a sand and pebble beach with approximately 400 feet of unobstructed beach front. The house sits adjacent to two historic salt pans and is primarily surrounded by *kiawe* trees. Visitors to Kīholo often use the open areas adjacent to the gravel road that lead up to the house to park their vehicles. The site has no existing water or drainage system and has been boarded up and abandoned for a number of years.

Figure 2.21 contains photographs of the house and surroundings. The two photographs in the top row of the figure depict it as it appeared in 2001, when the windows were still intact and the stairway was connected. The photos in the middle row of the figure depict it as it appeared in September 2011. It is completely abandoned, with the windows boarded up and the connection between the stairway and the surrounding deck removed to discourage access. The photographs in the bottom row of the figure show the toilets and refuse bin that are located in the gravel parking area near the structure.

Figure 2.21 Photographs of Former Loretta Lynn House and Surroundings



In 2001, the State of Hawai‘i took ownership of the house (and the 3-acre parcel on which it was located) as part of a land exchange for other lands at Kīholo. In June 2009, Mason Architects, Inc. produced a scoping report and evaluation of the house for Ala Kahakai National Historic Trail and DLNR with the intent of possibly converting the facility as a trail office, visitor contact, and interpretive center. State Parks is now considering two options on how best to incorporate the use of the abandoned house for park use. One option is to convert the structure into a concession that would supply firewood, camping supplies, water, and other items for either land access or kayak campers

that may use the proposed Blue Water Trail. Another option is to create an interpretive center for visitors. The cost of providing electrical power, water, and sewer service to the house is high, and this may limit the uses to which it can be put. However, Hui Aloha Kīhōlo is pursuing a grant that could allow it to refurbish the structure to the point where it can be put to use as an orientation center.

2.6.3 ELECTRICAL POWER AND COMMUNICATION FACILITIES

2.6.3.1 Electrical Power Service

The Kīhōlo State Park Reserve does not presently have electrical or land line communications services. The existing inholders rely on their own power systems (either photovoltaic or internal combustion engine-powered generators).

2.6.3.2 Telecommunications Service

There are no land-line telephone or electronic data services within the Kīhōlo State Park Reserve. Cellular telephone service is generally good within the boundaries of Kīhōlo State Park Reserve, and park users and inholders now rely on that for their telecommunications services. Similarly, inholders are dependent on satellites for television service.

2.6.4 WATER SUPPLY AND WASTEWATER TREATMENT AND DISPOSAL

2.6.4.1 Existing Water Supply Facilities

As can be seen in the map reproduced in Figure 2.22, the State does not own any potable water supply facilities within its lands at Kīhōlo, and there is no municipal water supply system nearby to which it could connect without a very large capital investment and extensive construction. The individuals and families who own property and homes at Kīhōlo and the other shoreline locations where they are present all have their own individual water systems. Most of these are very small and depend upon potable water that is brought in by vehicle and on brackish water (for irrigation). Users of Kīhōlo State Park Reserve must bring all of the water that they need when they come to visit.

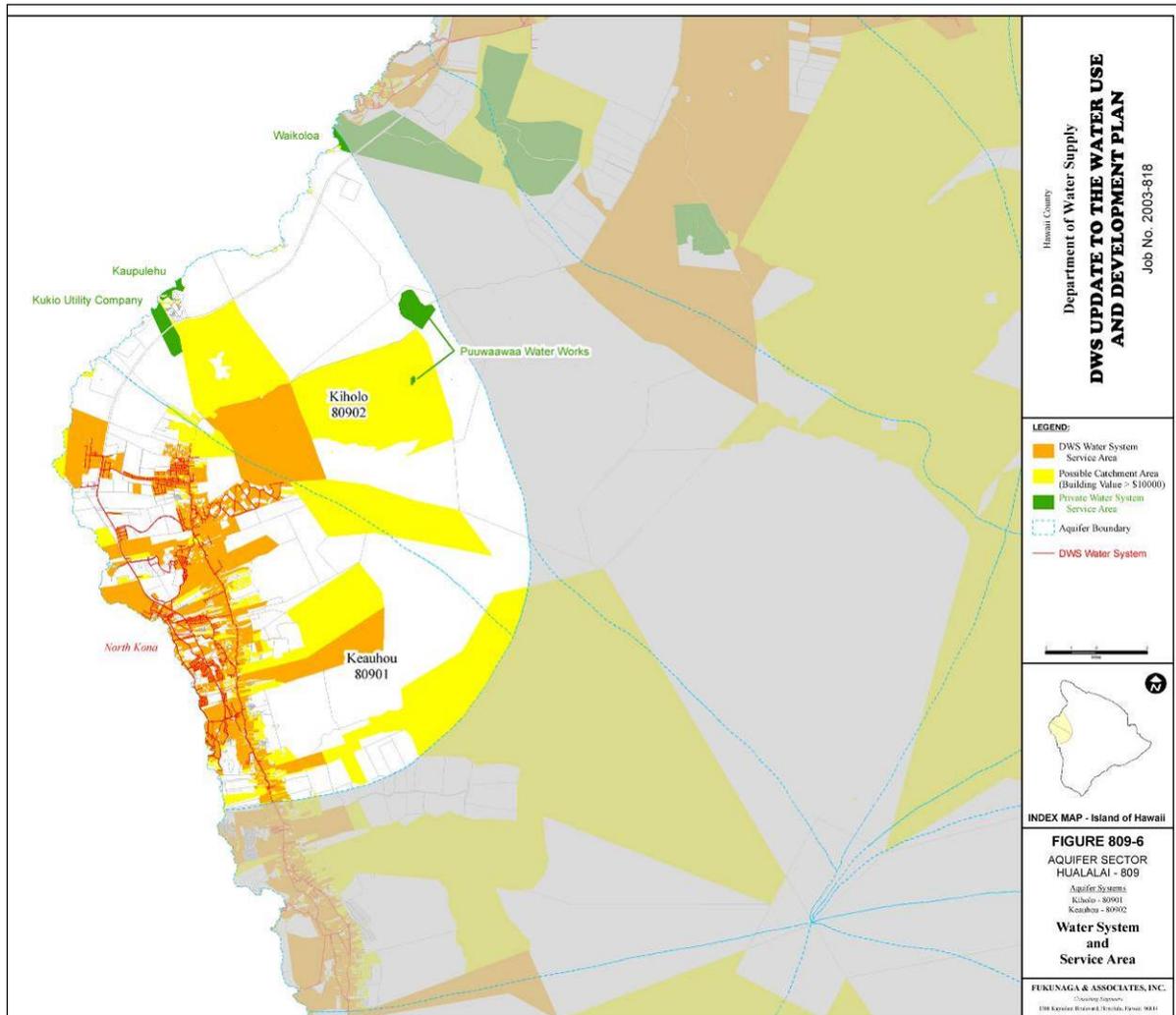
2.6.4.2 Existing Wastewater Treatment and Disposal Facilities

The Division of State Parks does not own any existing wastewater treatment and disposal facilities within its Kīhōlo lands. Consequently, a few portable toilets located near the Loretta Lynn House and near the end of the access road that terminates near the central portion of the bay provide the only sanitary facilities on the State lands at Kīhōlo. These toilets are serviced once a week by a private contractor. Because of the limited number of toilets and the service interval, the portable toilets are not capable of accommodating the volume of waste that is generated during periods of heavy use. That, and the fact that a number of the areas that are used for camping are located well away from the toilets contributes to a relatively large number of users relieving themselves in the bushes near the camp sites. In addition to resulting in an unsightly distribution of wastepaper, this creates unsanitary conditions that is detrimental to public health and to enjoyment of the park.

Most of the park area is within a “Critical Wastewater Disposal Area” (CWDA) as defined in HAR §11-62-03 by the State of Hawai‘i Department of Health. CWDA means an area where the disposal of wastewater has or may cause adverse effects on human health or the environment due to existing hydrogeological conditions.⁴³ Only portions of the Kīhōlo State Park Reserve that are at a minimum of 1,000 feet from the shoreline and at an elevation of 100 feet or more are considered non-critical wastewater disposal areas. As a State facility, cesspools are not permitted in these areas. In practice, this means that either composting toilets or zero-discharge chemical toilets can be used at Kīhōlo.

⁴³ Maps indicating the boundaries of the critical wastewater disposal areas are found in appendix E of §11-62. §11-62-05 allows the Director of the State Department of Health to establish CWDA based on one or more of the following concerns: (1) High water table; (2) Impermeable soil or rock formation; (3) Steep terrain; (4) Flood zone; (5) Protection of coastal waters and inland surface waters; (6) High rate of cesspool failures; and (7) Protection of groundwater resources. In general, the rules discourage or severely restrict or prohibit new cesspools in any designated CWDA.

Figure 2.22 Water System and Service Areas



Source: Hawai'i County, Department of Water Supply, *Water Use and Development Plan*

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CHAPTER 3 – CULTURAL RESOURCES

Whereas the previous chapter focused on the physical environment, this chapter focuses on cultural aspects of the environment. The two are not separate, of course, as traditional culture was deeply dependent of, and often (but not always) respectful of natural values. The discussion is divided into the following main parts:

- Section 3.1 contains a brief introduction to the land divisions and to the overall attitude that Hawaiians had toward the land and ocean on which they depended.
- Section 3.2 summarizes traditions and legendary sites associated with Kīholo, historical records of the area in the immediate post-contact period, and archaeological remains associated with these early times.
- Section 3.3 covers the post-contact history of Kīholo as reported in various documentary sources.
- Section 3.4 summarizes oral/historical accounts obtained from interviews of representatives of families of Nāpu‘u.
- Section 3.5 discusses the opportunities and constraints for park use posed by the cultural resources discussed in the chapter.

The vast majority of the material presented here is excerpted or paraphrased from material prepared for this plan by Kumu Pono Associates LLC. It includes material from the literature (including translations from Hawaiian language resources) and from interviews that Kepā Maly conducted specifically for the park Master Plan. All Hawaiian translations referenced in this report have been performed by Kepā Maly.

3.1 OVERVIEW OF KĪHOLO

Kīholo State Park Reserve encompasses all of the lands in the *ahupua‘a* of both Pu‘u Anahulu and Pu‘u Wa‘awa‘a that lie *makai* of Queen Ka‘ahumanu Highway.⁴⁴ Those *ahupua‘a* are two of twenty three *ahupua‘a* within the *‘okana*, or sub-district of Kekaha-wai-‘ole (the waterless land of Kekaha). Traditional and historic literature, and oral historical accounts describe this portion of Kekaha-wai-‘ole, sometimes also called Nāpu‘u in reference to her hilly terrain, as one of the favored lands of Kekaha. The fresh water pond of Luahinewai, and the watered shoreline of Pu‘u Anahulu-Pu‘u Wa‘awa‘a; the once-great fishponds of Kīholo; rich ocean and nearshore fisheries; sheltered bays from Kīholo to Kapalaoa; important salt making locations; the inland agricultural field systems; and the nearby diverse forest and mountain resources, attracted native residents to the area, and sustained them on the land.

The *ahupua‘a* of Pu‘u Anahulu and Pu‘u Wa‘awa‘a cross a wide range of *wao*, or environmental zones. These zones include the nearshore fisheries, the shoreline strand, and the *kula kai-kula uka* (i.e., shoreward and inland plains). Native Hawaiians considered these areas very desirable places of residence. The *kula* region partially encompassed by Kīholo State Park Reserve is now a volcanic desert, though native and early historic accounts describe groves of native hardwood shrubs and trees such as *‘ūlei* (*Osteomeles anthyllidifolia*) and *lama* (*Diospyros ferrea*) extending across the land and some distance shoreward. Small remnant communities of native dryland forest also give us an indication that there was a significant diversity of plant life growing in these *kula* regions.

These lower *kula* regions receive only about 10-20 inches of rainfall annually, and it is because of this dryness that the larger region of which Kīholo State Park Reserve is part is known as “Kekaha.” While on the surface, the environment appears to be arid, with little or no potable water to be found, the very lava flows which cover the land conceal many underground streams that are channeled

⁴⁴ Altogether, Pu‘u Wa‘awa‘a includes approximately 40,000 acres of land and Pu‘u Anahulu contains 86,945 acres of land.

through subterranean lava tubes. The traditions and historical accounts all relate the importance of water and lava in the history of this area.

Early native historians and the descendants of the *kama'āina* of this region attest to the deep cultural attachment these Hawaiians had to their environment. The ancient Hawaiians saw, as many do today, all things within their environment as being integral and interrelated. That which is in the uplands shares a relationship with that which is in the lowland, coastal region, and even in the sea. This relationship and identity with place worked in reverse as well, and the *ahupua'a* as a land unit was the thread which bound all things together in Hawaiian life.

Early Hawaiians were attuned to the natural rhythms of the land and sea. In an early account, written by Kihe⁴⁵, with contributions by John Wise and Rev. Stephen Desha Sr., the significance of the dry season in the area encompassing Kīhōlo, and the custom of the people departing from the uplands for the coastal region is detailed. Of the native custom during the dry season, Kihe et al. wrote:

'Oia ka wā e ne'e ana ka lā iā Kona, hele a malo 'o ka 'āina i ka 'ai kupakupa 'ia e ka lā, a o nā li'i o Kona, pūhe'e aku la a noho i kahakai kāhi o ka wai e ola ai nā kānaka.

It was during the season when the sun moved over Kona, drying and devouring the land, that the chiefs and people fled from uplands to dwell along the shore where water could be found to give life to the people. (April 5, 1917).

As recorded in the oral history of this region, the custom of traveling between the *mauka* and *makai* lands remained important in the lives of the families of Kekaha (and specifically Kīhōlo) through the first half of the twentieth century. While life has changed dramatically since that time, the accounts of the native people of this land are very deeply rooted in a sense of place. Place names, native traditions, and historic accounts of the land, connecting uplands to the shore, are intricately bound together with the features of the landscape and the environment of Pu'u Anahulu and Pu'u Wa'awa'a.

3.2 TRADITIONS AND LEGENDARY SITES

3.2.1 INTRODUCTION

Kekaha is the traditional place name given to the lava fields which extend north of Kailua in the district of North Kona to the boundary with South Kohala (Kelly, 1971). These lava fields range in age from ancient to relatively recent (1801 Hualālai eruption and the 1859 Pu'u Anahulu eruption.) The name Kekaha refers to the dry, sunbaked land from Honokōhau, North Kona to 'Anaeho'omalū, South Kohala, and encompasses all the lands of Kīhōlo State Park. This shoreline was known for its wealth of fishponds, including the complex at Kīhōlo, and the complex of anchialine ponds, including Luahinewai.

The land itself is a cultural site, and the place names and landforms reflect many of the values and traditions of the place. Kīhōlo (lit. the Fishhook) refers to the legend which describes how in 1859 the goddess Pele, hungry for the 'awa and mullet, or 'anae, which grew there in the great fishpond constructed by Kamehameha I, sent down a destructive lava flow, grasping at the fish she desired (Pukui et al. 1974). Many places have multiple origins, meanings, or significances and reflect the depth and richness of the traditional Hawaiian civilization. Starting with the name of its centerpiece, Kīhōlo, and the *ahupua'a* which comprise it, the park site is full of meaning that can be incorporated into its planning and programs.

The earliest information available regarding Kīhōlo and the surrounding areas comes from the great wealth of *mo'olelo*, or native oral traditions. Some of these traditional narratives, which span many centuries, make specific reference to sites in Pu'u Anahulu and Pu'u Wa'awa'a, as well as neighboring lands which share some of these traditions in common. Other accounts make reference

⁴⁵ Ka Hōkū o Hawai'i, 1914-1917.

to larger traditions that are associated with regional and islandwide events. The native traditions describe the customs and practices of the native people who resided on these lands, walked the trails, and who were sustained by the wealth of the land and adjacent marine fisheries. It is also important to note that the occurrence of these traditions, often in association with place names, land divisions, cultural sites, land features, and events in the history of these lands are an indicator of the rich native history of the area.

3.2.2 LEGENDS

3.2.2.1 *The Legend of Kaulanapoki'i*

One of the earliest available traditions which can be placed in a datable context via genealogical calculation which references the region is titled, *The Legend of Kaulanapoki'i*. This *mo'olelo* was collected by Abraham Fornander in 1916 or 1917. This narrative describes travels through uplands of this region, viewing Kīhōlo and Kapalaoa from Hu'ehu'e, and describes the practice of salt making at Puakō, a practice that was also very important in the coastal lands of Pu'u Wa'awa'a and Pu'u Anahulu. By association with Hīkapōloa, chief of Kohala at the time of the events described in this story, the narrative dates back to around the thirteenth century. The narrative below is a paraphrased summary of Fornander's texts:

Kaumamalu was the father and Lanihau was the mother (both of these names are also the names of lands in North Kona) of ten children, five boys and five girls. When the children grew to adulthood, the eldest girl, Mailelauli'i invited her four sisters to go site seeing with her. The girls set out on their journey from the lowlands of Kona, and traveled to Hu'ehu'e. Looking upon the shore from Hu'ehu'e, the girls saw the beaches of Kīhōlo and Kapalaoa, and desired to see them up close. They then descended to the shore and visited Kīhōlo and Kapalaoa. From Kapalaoa, the sisters then traveled to Kalāhuipua'a where they met Puakō, a handsome man who lived in the area.

Puakō immediately fell in love with Mailelauli'i, and she consented to becoming his wife that day. The next morning, Puakō rose early and began carrying sea water to the salt ponds for making salt. Mailelauli'i's sisters did not like the thought of Puakō being a salt maker and feared that they too would be put to work at carrying water to fill the salt beds. As a result, the sisters encouraged Mailelauli'i to bid farewell to Puakō and continue on their journey further into Kohala... (Fornander 1916-1917 Vol. 4-3:560-568)

The narrative continues by describing how Mailelauli'i married the chief Hīkapōloa, who by treachery slew the brother of Mailelauli'i. In the end, Hīkapōloa was himself killed, the brother returned to life, and all the family returned to Kona, to never again sleep with another person from Kohala (Fornander 1916-1917 Vol. 4-3:560-568).

3.2.2.2 *The Legend of Ke-Ahu-a-Lono*

Abraham Fornander also records an event that took place near the northern border of the Kīhōlo State Park Reserve, where Pu'u Anahulu meets 'Anaeho'omalū during the lifetime of the chief Lono-i-kamakāhiki in the mid-seventeenth century (i.e., ca. 1650 CE). Out of jealousy, some of the Hawai'i Island chiefs slandered Kapaihihilina (Kapaihi), a trusted advisor and companion of Lono's, who had befriended the king while he was on Kaua'i. For a while, Lono believed the slanderous allegations, and Kapaihi departing from Lono, returned to Kaua'i. Feeling remorse, Lono set off after Kapaihi, and they met at 'Anaeho'omalū. Fornander described the meeting and how Ke-ahu-a-Lono (the-Altar-Made-by-Lono) came to be made on this, the boundary between Kohala and Kona:

When Lonoikamakāhiki set sail on his search for his friend, Kapaihihilina had already arrived at Anaeho'omalū and soon afterwards was followed by Lonoikamakāhiki and others. Lonoikamakāhiki saw Kapaihihilina sitting on the sand beach when the canoes were being hauled ashore. Lonoikamakāhiki immediately began to wail and also described their previous wanderings together. Kapaihihilina recognizing the king also commenced

wailing. When they came together and had ceased weeping and conversing, then Lonoikamakahiki made a covenant between them, that there would be no more strife, nor would he hearken to the voice of slander which surrounds him, and in order that the understanding between them should be made binding, Lonoikamakahiki built a temple of rocks as a place for the offering of their prayers and the making of oaths to Lonoikamakahiki's god to fully seal the covenant.

Kapaihahilina observed that Lonoikamakahiki was sincere in his desires and at that moment gave his consent to return with Lonoikamakahiki. After their religious observances at this place they returned to Kona and resided at Kawa'aloa, in South Kona.

(Tradition says because of the covenant entered into for the erection of the mound of rocks at Anaeho'omalua, the boundary between Kohala and Kona was named Keahualono, and that place has been known ever since by that name signifying the erection of a mound of rocks by Lonoikamakahiki). (Fornander 1917 Volume 4-3:360,362)

Another account describing circumstances around construction of *Ke-Ahu-a-Lono* was published in the Hawaiian language newspaper *Ka Hōkū o Hawai'i* in 1924. The narrative is part of a series of historical articles, penned by J.W.H.I. Kihe, a native resident of Pu'u Anahulu. Kihe was a native Hawaiian historian and prolific writer, and was also one of the translators of the Fornander collection. Kihe placed construction of *Ke-Ahu-a-Lono* in the period when Lono-i-ka-makahiki and his followers were preparing for their battle against Kama-lālā-walu, king of Maui. This native account provides the following historical notes:

*This Altar (Ahu) is an Altar of the warrior leaders and warriors of Lonoikamakahiki, built at the time he went to battle with Kamalalawalu, the king of Maui. Kamalalawalu and his forces landed at Kawaihae and began their ascent. This stone altar was built then and is called the Ahu made by Lono to this time (Ke-Ahu-a-Lono)...The Altar is at the boundary between Kona and Kohala, near the road (alanui) to Kohala, made by Haanio. (Kihe in *Ka Hōkū o Hawai'i* Jan. 31-Feb. 14, 1924.)*

Ke-Ahu-a-Lono is an important feature on the boundary of Kohala and Kona, next to the *ala loa* or *ala nui* (trail system) that marks the inland boundary of 'Anaeho'omalua.

Another of Kamakau's historical accounts contain an interesting reference to eighteenth century events in the Kekaha region, with particular emphasis on the lands of Pu'u Wa'awa'a and Ka'ūpulehu. When Alapa'i-nui, ruler of Hawai'i, died in 1754, his son Keawe'ōpala was chosen as his successor (Kamakau 1961:78). In the years preceding that time, the young chief Kalani'ōpu'u had been challenging Alapa'i's rule. The challenge continued after Alapa'i's death, and following a short reign, Kalani'ōpu'u killed Keawe'ōpala and secured his rule over Hawai'i Island. Kamakau also reports that ca. 1780, as a result of their valor and counsel Kalani'ōpu'u granted "estate lands" in Kekaha to the twin chiefs Kame'eiamoku and Kamanawa (ibid.:118). Kamakau also reports that "the land of Kekaha was held by the kahuna [priestly] class of Ka-uahi and Nahulu." (ibid. 231); to which the twin chiefs are believed to have belonged.

3.2.2.3 Native Traditions Recorded by Ka'ohuha'aheoinākuahiwi'ekolu (J.W.H.I. Kihe)

Hawaiian traditions provide readers with documentation pertaining to land use, practices, and features of the cultural landscape, the narratives also convey values and expressions of the relationship between ancient Hawaiians and their environment. One of the most prolific native writers of the late nineteenth and early twentieth centuries was John Whalley Hermosa Kihe, who lived on the island of Hawai'i at Pu'u Anahulu. Kihe also wrote under the penname Ka'ohuha'aheoinākuahiwi'ekolu (The Proud Mist on the Three Mountains).

Born in 1853, Kihe's parents came from Honokōhau and Kaloko. During his life, Kihe taught at various schools in the Kekaha region, served as legal counsel to native residents applying for homestead lands, worked as a translator on the Hawaiian Antiquities collections of A. Fornander, and

was a prolific writer himself. In the later years of his life, Kihe lived at Pu‘u Anahulu with his wife Kaimu (Pu‘u Anahulu Homestead Grant No. 7540), and served as the postman of Nāpu‘u. Kihe is still remembered by a few of the *kupuna* of this area. Kihe, who died in 1929, was also one of the primary informants to Eliza Maguire, who translated some of Kihe’s writings, publishing them in abbreviated form in her book, *Kona Legends* (1926).

During his career, Kihe collaborated with several other noted Hawaiian authors, including John Ka‘elemakule of Mahai‘ula, John Wise (who also worked with Kihe on translations of the Fornander Collection), and Reverend Steven Desha, Sr., editor of the Hawaiian language newspaper *Ka Hōkū o Hawai‘i*.

Kihe was the preeminent historian of Pu‘u Anahulu-Pu‘u Wa‘awa‘a and Kekaha, and from his pen (with contributions from his peers), came a rich collection of native traditions. His narratives ranged from native traditions to historical commentary. In his accounts of native traditions are found subjects of islandwide significance, and importantly for the region surrounding and including Kīholo State Park Reserve, he provided readers with historical accounts that were place-based; the native traditions of this land and the people who sustained them.

In a series of articles entitled “*Na Hoonanea o ka Manawa, Kekahi mau Wahi Pana o Kekaha ma Kona*” (Pleasant Pastimes About the Famous Places of Kekaha at Kona), J.W.H.I. Kihe presented readers with detailed narratives of traditions at Nāpu‘u (i.e. Pu‘u Wa‘awa‘a and Pu‘u Anahulu) and Kekaha (in *Ka Hōkū o Hawai‘i*; December 6th, 1923 to February 21st, 1924.) Kihe described some of the famous places (*wahi pana*) of the land (from mountain to sea), and how they came to be named. He also identified some of the early residents of the region, and practices associated with water catchment and agriculture in Kekaha. The following translations are near verbatim translations of Kihe’s original texts.

3.2.2.3.1 Luahine Wai – The Water of the Old Woman

Of the famous anchialine pond of Luahinewai, Kihe writes:

There is a large pond near Kīholo and Laemanō; it is a famous bathing place of the chiefs of ancient times. The water there is cold, and causes the skin to tingle. Because it is so cold, it is like ice water.

It is said that there is an opening in this pond by which an old woman (luahine) enters. And there below the pond, are said to be laid out the bones of the chiefs of ancient times. It has been said that the bones of Kamehameha are among those buried there. Now one cannot be certain if this is true or not, but, if someone was to enter the hidden cave, it might be known what is in the secret cave.

This pond is about five fathoms deep at its deepest point near the center of the pond. That too, is where the water is coldest. And if you should dive in and pass this area, you will find the cold water and not be able to stay there long. You will quickly retreat and wrap yourself up with a cloth.

The one who dives into it at its deepest point, will also see that his/her skin will turn red like the red coral. There are also pebbles at the bottoms of this pond, and it is a good thing, as you will not strike your foot upon any rocks.

This is an attractive and good pond. The only one problem is that there are no people in this quiet place. It is an unpopulated region, which is regretful for this famous bathing pond of the beloved chiefs of distant times.

The chiefs and fearless warriors of ancient times have passed from this side of the dark waters of death, and the bathing pool of Luahine Wai remains with its beauty, playing in the ocean mist and the gentle blowing of the breezes. This generation too, shall pass, and the next generation that follows, but Luahinewai shall remain as was found in the beginning.

3.2.2.3.2 Ka Loko o Kīholo – The Pond of Kīholo

Kihe records the following of the great fishpond at Kīholo, constructed during the reign of Kamehameha I:

This pond was consumed by the wondrous fires of the mysterious woman the crater of Kīlauea, Madame Pele of the mountain castle, Halema‘uma‘u; it was completely covered with pāhoehoe in 1857 [1859], and remains covered to this day.

There are many small ponds that remain from this famous pond of Kīholo. They remain as evidence to this young generation whose thoughts return to the ancient land, and the stories of Pele who directed the pāhoehoe lava to flow into the famous pond of Kīholo as it is now, and for all generations who will follow. (December 6, 1923)

3.2.2.3.3 Ka Pu‘u o Moemoe – The Hill of Moemoe

A mo‘olelo of Kīholo recorded by Kihe:

This [Pu‘u Moemoe] is a stone outcropping from which one could look to the village at Kīholo in days gone by. On this side was the pond of Kīholo, and from this outcropping to Kīholo, it was about one mile, and to Keawaiki, almost one half a mile.

The hill is so called because of a Makāula (priest-seer) who guided and protected the people of the Kaha lands. Before men and women were eaten by a shark as they swam in the ocean, or perhaps while fishing, and this became a burden for the people. This Makāula, Moemoe discerned the reason that so many men and women were killed by the shark. So he instructed the men to make a large imu (earthen oven), like none ever before made, and he had the men pile the timber high upon the imu. He also instructed them how to carefully capture the “man with the mouth of a shark on his back,” telling them to watch that he did not break their arms when they captured him. And one thing which the priest Moemoe forcefully instructed them in while they were preparing the imu for the baking of the “shark man,” was that they needed to be watchful, that when he had been completely cooked, that not one bit of ash or one bit of the kindling from the imu was touched by the sea. If one ash or perhaps a bit of kindling from the imu was touched by the ocean, the task would not be completed, and the man with the shark’s mouth of his back would live again.

It is perhaps appropriate here to talk about the deeds of this Shark who ate men. He had a human body, but on his back was the mouth of a shark, and he ate the people who went to the sea and fished at Nāpu‘u. And here, we shall speak of ‘Īwaha‘ou‘ou, the man who had the mysterious shark’s body, in the uplands of Nāpu‘u. There at the place called Puakōhale, at Pu‘u Anahulu, that is where the house of this shark man was. It was also there that he had his gardens of ‘uala, kalo, kō, and mai‘a (sweet potatoes, taro, sugarcane, and bananas). Also, it was there that the trail to the shore was situated.

When the people would go to the shore, and pass close to the place where ‘Īwaha‘ou‘ou was cultivating the land, he would call out to the people. “You are going down?” They would respond, “Yes, to swim in the sea and remove the dirt of the Nāpu‘u-alu-kinikini.” ‘Īwaha‘ou‘ou would then answer, “You go down, but the shark has not yet had his morning meal. Do not pick any of the sugarcane that bears his name, ‘mai o hu‘i,” that is the firm restriction of Hu‘i, of that sugarcane. It is the restricted sugarcane of this land for Hu‘i, the fish which gnashes at the people of these shores of the sea of Kapa‘ala.”

The people did not heed the warning as they descended the cliff side to Kapa‘ala which is shoreward of the cave called Ke ana o Na‘alu. When the people arrived at the beach of this place, they heard a voice calling out: “The sugarcane, ‘Mai o Hu‘i has been taken.” The people then said among themselves “Hoo! We were told before by ‘Īwaha‘ou‘ou not to take any of the sugarcane that was restricted to Hu‘i.” So the people threw away that particular

type of sugarcane and departed, leaving it along the rail side at the cave called Ke ana o Na'alu.

(Here, the story teller once again offers an explanation.) This man, 'Īwaha'ou'ou, who spoke to the people who were descending to the shore, he was also the shark who was named Hu'i, they were one and the same.

When the group of travelers passed by, descending to the shore, the shark entered into the cave and traveled to the shore, arriving at the place where the travelers were at; it was there that 'Īwaha'ou'ou called out to them as mentioned (December 20, 1923).

(Recounting events that led up to Moemoe's first meeting with 'Īwaha'ou'ou, Kihe wrote):

A story about this hill is, Moemoe was a seer, of the kāula Pele (Pele prophet) line, and he was a runner who could run as swiftly as the whirl wind. He was very fast and well known, there was no one that could compete against Moemoe. It is for Moemoe that the hill is named and the saying is given:

"Palakī o Moemoe⁴⁶, palakī o Moemoe, auhea o Moemoe? Pane mai la palakī o Moemoe, 'Kalakahi-ko - ia'u - wale - ka-la'." ("Excrement of Moemoe, excrement of Moemoe, where is Moemoe? The excrement of Moemoe answered, 'At the first of the day—I am fulfilled—only by the sun). That is, the transgression will not be forgiven by Moemoe, at noon, at the declining of the sun or any other time.

One time, when Moemoe arrived at the hillock and rested, he heard the roaring of voices rising from the shore. Turning and looking down, he saw that the place was filled with people, and the voices enticed the prophet to descend to them—he wondered what it was the people were doing, causing them to call out loud on this afternoon? The people had gathered together for a contest of kōnane (checkers), being played before the chief Ka'uali'i and the chiefess, Welewele. Arriving there, Moemoe saw that one of the competitors was a man from the uplands of Nāpu'u, and his name was 'Īwaha'ou'ou. He was a man of a dual nature, for he had the body of a shark and the body of a man. But the people did not know the nature of this man, the people all thought that he was a regular man with a real body, not possessed of two bodies. When Moemoe entered the crowd, he immediately knew that this man was a mysterious one, the voracious shark of this place.

When Moemoe sat down among the crowd, 'Īwaha'ou'ou quickly spoke to him, "Do you know either the game of no'a or kōnane?" Moemoe answered, "I have been instructed in those things, and taught the skills of racing, and discerning omens—whether or not it will be a stormy day or a good day, a troublesome day or a day of life—and know the features of man, the women, children, old men, and the humpbacked old women..." Moemoe and 'Īwaha'ou'ou exchanged subtle challenges, and agreed to compete. But first, 'Īwaha'ou'ou invited Moemoe to come with him for a swim in the sea, and then they would return and compete. Moemoe replied, "It is needful for you to go and bathe in the sea, for there is dirt all over you, covering you in layers. It is as if you slept in the dirt before descending here to the shore, the dust on you is like that of the dry field." 'Īwaha'ou'ou was outraged at these words, saying that he had slept in the dirt, and that it was set in layers upon his skin.

'Īwaha'ou'ou stood up and answered, "You wait here, and I will return, then we will compete, and I will take up like bait for the shark." Moemoe responded, "It will be my pleasure. We two shall meet and you will see that there is no branch on which this bird (competitor) cannot land; landing on dry branches and on the wet branches."

⁴⁶ Pukui (1983:285 No. 2592) recorded that, "Moemoe was a prophet whose excrement, when questioned, was said to reply of his whereabouts."

Now when 'Īwaha'ou'ou departed, Moemoe remained with the gathering of people, and that was the time that he instructed them about the true nature of 'Īwaha'ou'ou. (December 27, 1923)

While 'Īwaha'ou'ou was out swimming, he killed and ate a few women, and there was much lamenting on the shore. When 'Īwaha'ou'ou returned, the men were ready to trap him. It was then that Moemoe leapt and took him, and 'Īwaha'ou'ou began thrashing about, but the people held him tightly and then bound him hand and foot. Thus, this despised man was safely held. When his shawl was removed from his back, everyone saw the open jaws of the shark, and the shark's eyes, and that his flesh was like that of the nūhi (great white shark).

While 'Īwaha'ou'ou was lying helplessly there, Moemoe called to all of the men and women to come and throw him upon the imu. The families of those who had been killed by the shark were filled with wrath for this man whom they had thought was a real man, and who had dwelt with them in the uplands of Nāpu'u...They took 'Īwaha'ou'ou and threw him upon the imu which was burning with a raging fire. When he fell upon the fire of the imu, his shark form was completely burned and turned to ashes. So died the evil one of the uplands of Nāpu'u.

If Moemoe had not come forward, as was his practice, and helped, the people would not have known that this man had the body of a shark, and that eventually, no people would have remained at Nāpu'u.

In ancient times, this was a peopled land, and he [Moemoe] is the one who helped establish 'Ehu as the chief of these districts of Keawe-Nui-a-'Umi, and he is the one who established the cultivation of sweet potatoes in the uplands of Nāpu'u... (January 3, 1924)

3.2.2.3.4 Ka Loko o Wainānālī'i – The Pond of Wainānālī'i

The many tales linked to the ponds of Pu'u Anahulu and Pu'u Wa'awa'a suggest the importance of water resources to the native people who lived there:

This pond was one of the great ponds of the ahupua'a of Pu'u Anahulu in ancient times. Today, it is a place of 'a'ā, the lava flow that is called Kanikū⁴⁷. That is where the pond is covered by 'a'ā till this day. Within the boundaries of the pond, it was like a lake, and the character of this pond was astonishing, and it was exceedingly famous.

Perhaps, if the pond had not been covered by the eruption, there would perhaps be thousands of dollars that could be made by the Government for the multitudes of fish living within it. There were awa, 'anae, 'ama'ama, and āhole living within the pond. It is said that the width of the pond was about 1 ½ miles and its length was about 2 miles or more. There are many places that show this to be true, as the people of old have said. It is said that upon the walls (kuapā) of the pond, there were houses for the pond guardians, and that there were sluice gates (mākāhā) at various locations as well.

Within this great pond were three divisions, known as Nā Wai 'Ekolu (The Three Waters):

These were the divisions of the boundaries of the pond. There were stone walls that separated one pond from the other, and separated the 'anae and 'ama'ama, from the awa, and the pond for the āhole, and the ponds of the various 'ōpae (shrimp); the 'ōpae kowea from the 'ōpae ula. There were also small fingerling ponds for the 'anae, awa, and such.

The ingenious mechanism by which this threefold pond operated was described at Nā Pūkolu-a-Ka'ena-o-Kāne (The Three Made by Ka'ena-o-Kāne):

⁴⁷ A portion of this pond remains as one of the attractions within the boundaries of Kīholo State Park Reserve.

These are the three channels (hā) of this pond, where the ocean comes into the pond, and where the water from the pond entered into the sea. At high tide, the water rose and entered into the pond through these channels. And because of the cold fresh water, the fish came together in schools, filling the channels. It was then that people would go and spear the fish, determine which kind of fish were in the pond, and set the nets to catch the fish. This is what has been said about the pond. It is also said that at these channels, there were kū'ula (fishermen's god stones), where the fish could increase, with ceremonies. The fish would multiply, increase in size, and be fat like a pig.

The pond at Wainānāli'i was said to be inhabited by the supernatural beings *Kanikū a me Kanimoe* (Kanikū and Kanimoe):

These were two mo'o (water-spirits with lizard bodies), who had the forms of beautiful women. They were the native residents of the pond at Wainānāli'i, and it is for the mo'o who bore the name Kanikū, that the 'a'ā flow is called Kanikū to this day. At the time that the lava flowed covering this pond (foremost of the land), the mo'o lost her pond that was filled with fat fish of all kinds.

Kanikū and Kanimoe, the mysterious-formed mo'o, were turned to stone, and the stone bodies remain there to this day in the middle of the 'a'ā, lying side by side, and that is why it is said:

<i>Pupuwale kau wahi</i>	Drawn together in your place
<i>He 'ā wale kāu moe</i>	It is stone upon which you sleep
<i>I moe au i Kanikū</i>	I sleep at Kanikū
<i>I waenakonu i ka 'ino</i>	In the middle of a treacherous place

3.2.3 EARLY POST-CONTACT RECORDS AND REPORTS

Nineteenth century historians left a number of accounts that provide a good word-picture of the area in the years immediately following western contact. Most of the narratives focus on the coastal region encompassed by Kīholo State Park Reserve, although several tie these areas to the larger regions of Nāpu'u (the combined *ahupua'a* of Pu'u Wa'awa'a and Pu'u Anahulu) and Kekaha as a whole. Later accounts were authored by native residents of, and visitors to, this area and record (from the residents' knowledge) some of the traditions of this land. Some of the most important of these are summarized below.

3.2.3.1 'Ōmu'o Ceremony at Luahinewai and the Dedication of Pu'u Koholā

In ca. 1790 Kamehameha I and his chiefs were living at Kawaihae. Following advice of a priest from Kaua'i, Kamehameha undertook the reconstruction of the *heiau* Pu'u Koholā, to dedicate it as a house for his god Kūkā'ilimoku (Kamakau 1961:154). During this time, "thousands of people were encamped on the neighboring hillsides," (Fornander 1996:328 [reprint]). In ca. 1791, Kamehameha dedicated this *heiau*, and his cousin, Keōuakū'ahu'ula (Keōua)—a rival for supremacy on Hawai'i—was offered as the dedicatory sacrifice. The narratives below are excerpted from Kamakau's account of the events that led up to the dedication of the *heiau*, and include references to several places along the coast, between Pu'u Wa'awa'a and Kawaihae. In order to construct the *heiau*, Kamehameha:

"...Summoned his counselors and younger brothers, chiefs of the family and chiefs of the guard, all the chiefs, lesser chiefs, and commoners of the whole district. Not one was allowed to be absent except for the women, because it was tabu to offer a woman upon the altar; a man alone could furnish such a sacrifice. The building of the heiau of Pu'u Koholā was, as in ancient times, directed by an expert—not in oratory, genealogy, or the prophetic art, but by a member of the class called hulihonua who knew the configuration of the earth (called kuhikuhi pu'uone). Their knowledge was like that of the navigator who knows the

latitude and longitude of each land, where the rocks are, the deep places, and the shallow, where it is cold and where warm, and can tell without mistake the degrees, east or west, north or south. Such knowledge, taught on Kauai, one could apply anywhere in the world; so Kapou-kahi had instructed Ha'alo'u [a chiefess relative of Kamehameha's] to the letter.

When it came to the building Pu'u Koholā no one, not even a tabu chief was excused from the work of carrying stone. Kamehameha himself labored with the rest. The only exception was the high tabu chief Ke-ali'i-maika'i [Kamehameha's younger brother]...As soon as the heiau was completed, just before it was declared free, Kamehameha's two counselors, Keawe-a-heulu and Ka-manawa [who resided at Kīhōlo], were sent to fetch Keoua, ruling chief of the eastern end of the island of Hawaii...Keoua was living in Ka-'u mauka in Kahuku with his chiefs and warriors of his guard. Keawe-a-heulu and his companion landed at Ka'iliki'i and began the ascent to Kahehawahawa...Close to the extreme edge of the tabu enclosure of Keoua's place the two...messengers rolled along in the dirt until they came to the place where Keoua was sitting, when they grasped his feet and wept..."We have come to fetch you, the son of our lord's older brother, and to take you with us to Kona to meet your younger cousin, and you two to be our chiefs and we to be your uncles. So then let war cease between you." (Kamakau 1961:154-155).

Keōua agreed to accompany his uncles, the two messengers sent by Kamehameha. Some of the party traveled by foot overland, while Keōua and some of his trusted counselors and guards traveled with the messengers by canoe. Along the way, certain members of his party kept urging Keōua to kill Kamanawa and Keawe-a-heulu, and turn around, but the chief refused:

"...They left Kailua and went as far as Luahinewai at Kekaha [in the land of Pu'u Wa'awa'a], where they landed the canoes. Keoua went to bathe, and after bathing he cut off the end of his penis ('omu'o), an act which believers in sorcery call "the death of Uli"⁴⁸, and which was a certain sign that he knew he was about to die. There for the sixth time his counselors urged the killing of the messengers and the return by the mountains to Ka-'u, since to go to Kawaihae meant death. Keoua refused...

When all was ready, Keoua and his followers went aboard the canoes, twenty-seven in all. Keoua, with Uhai carrying the kahili and another chief carrying the spittoon, was on the platform (pola), and paddlers took their places. Just outside of Puakō they came in sight of the plain of Kawaihae and Pu'u Koholā standing majestic. The fleet of canoes grouped in crescent formation like canoes out for flying fish. Keoua remarked to Keawe-a-heulu, "It looks stormy ashore; the storm clouds are flying!" The chief replied, "From whence can a storm come on such a pleasant day?" Again Keoua repeated, "It looks stormy ashore; the storm clouds are flying." They kept on their course until near Mailekini, when Ke'e-au-moku and some others carrying spears, muskets, and other weapons broke through the formation of the fleet, surrounding the canoes of Keoua, separating them from those of Keawe-a-heulu and his followers and calling to Ka-manawa to paddle ahead. Keoua arose and called to Kamehameha, "Here I am!" Kamehameha called back, "Stand up and come forward that we may greet each other." Keoua rose again, intending to spring ashore, when Ke'e-au-moku thrust a spear at him, which Keoua dodged, snatched, and thrust back at Ke'e-au-moku, who snatched it away. Keoua and all those who were with him on the canoe were killed...By the death of Keoua Kuahu'ula and his placing in the heiau of Pu'u-Koholā the whole island of Hawaii became Kamehameha's." (Kamakau 1961:156-157).

⁴⁸ "The death of Uli" refers to death caused by the vengeance of the sorcerer, since Uli is the goddess worshipped by Sorcerers. The part cut off is used for purpose of sorcery so that those who do a man to death may themselves be discovered and punished.

3.2.3.2 *Kekaha in the Eruptions of 1800-1801*

One of the most significant natural events on the island of Hawai‘i that occurred during the reign of Kamehameha I, was the eruption of Hualālai in 1800-1801 CE. Hawaiian historian, S.M. Kamakau (1961) provides readers with an early written description of the eruptions and their effect on the land and impact on the people of the region between Kīholo and Kalaoa:

One of the amazing things that happened after the battle called Kaipalaoa, in the fourth year of Kamehameha’s rule, was the lava flow which started at Hu’ehu’e in North Kona and flowed to Mahai‘ula, Ka‘ūpūlehu, and Kīholo. The people believed that this earth-consuming flame came because of Pele’s desire for awa fish from the fishponds of Kīholo and Ka‘ūpūlehu and aku fish from Ka‘elehuluhulu; or because of her jealousy of Kamehameha’s assuming wealth and honor for himself and giving her only those things which were worthless; or because of his refusing her the tabu breadfruit (‘ulu) of Kameha‘ikana⁴⁹ which grew in the uplands of Hu’ehu’e where the flow started...Kamehameha was in distress over the destruction of his land and the threatened wiping-out of his fishponds. None of the kahuna, orators, or diviners were able to check the fire with all their skill. Everything they did was in vain. Kamehameha finally sent for Pele’s seer (kaula), named Ka-maka-o-ke-akua, and asked what he must do to appease her anger. “You must offer the proper sacrifices,” said the seer. “Take and offer them,” replied the chief. “Not so! Troubles and afflictions which befall the nation require that the ruling chief himself offer the propitiatory sacrifice, not a seer or a kahuna.” “But I am afraid lest Pele kill me.” “You will not be killed,” the seer promised. Kamehameha made ready the sacrifice and set sail for Kekaha at Mahai‘ula.

When Ka-ahu-manu and Ka-heihei-malie heard that the chief was going to appease Pele they resolved to accompany him...Ulu-lani also went with them because some of the seers had said, “That consuming fire is a person⁵⁰; it is the child of Ulu-lani, Keawe-o-kahikona, who has caused the flow,” and she was sent to accompany them to Kekaha. Other chiefs also took the trip to see the flow extinguished. From Keahole Point the lava was to be seen flowing down like a river in a stream of fire extending from the northern edge of Hualālai westward straight toward Ka‘elehuluhulu and the sweet-tasting aku fish of Hale‘ohi‘u. There was one stream whose flames shot up the highest and which was the most brilliant in the bubbling mass as it ran from place to place. “Who is that brightest flame?” Asked Ulu-lani of the seer, “That is your son,” he answered. Then Ulu-lani recited a love chant composed in honor of her first-born child as his form was seen to stand before her...The flow had been destroying houses, toppling over coconut trees, filling fishponds, and causing devastation everywhere. Upon the arrival of Kamehameha and the seer and their offering of sacrifices and gifts, the flow ceased; the goddess had accepted the offering. The reasons given for the flow may be summed up as: first, Pele’s wanting the aku of Hale‘ohi‘u and awa fish of Kīholo; second her anger at being denied the ‘ulu (breadfruit) of Kameha‘ikana in upper Hu’ehu’e; third, her wrath because Kamehameha was devoting himself to Ka-heihei-malie and neglecting Ka-‘ahu-manu. It was said that Pele herself was seen in the body of a woman leading a procession composed of a multitude of goddesses in human form dancing the hula and changing (Kamakau in Kū ‘Ōko‘a, July 13-20, 1867 and 1961:184-186).

John Papa I‘i, native historian and companion of the Kamehamehas, adds to the historical record of the fishpond Pa‘aiea which extended from Mahai‘ula vicinity to Kalaoa, and was destroyed by the

⁴⁹ Kāmeha‘ikana, one of the many names for the earth-mother, goddess Haumea; symbolic of her many descendants. In her form as Kāmeha‘ikana, Haumea is associated with the ‘ulu (breadfruit), also a form she took to save her husband Ku from his captors (cf. Kamakau 1991:11-13).

⁵⁰ John Wise (pers. comm. to Kepā Maly) says, “The Hawaiians believe that the fires of Pele are dead persons who have worshipped the goddess and become transformed into the likeness of her body.”

1801 lava flows (see Section 2.2.1.2.1). I'i reports that in the 1790s, as a result of his exceptional abilities at canoe racing, Kepa'alani "became a favorite of the king, and it was thus that he received [stewardship of] the whole of Pu'uwa'awa'a and the fishponds Pa'aiea in Makaula and Kaulana in Kekaha" (I'i 1959:132).

3.2.3.3 An Account of Kekaha: 1812 to 1814

As a child ca. 1812, Hawaiian historian John Papa I'i passed along the shore of Kekaha in a sailing ship as a part of the procession of Kamehameha I bound for Kailua, Kona. In his narratives, I'i described the shiny lava flows and fishing canoe fleets of the "Kaha" (Kekaha) lands. I'i noted:

"...the ship arrived outside of Kaelehuluhulu [the fishery station of Kaulana-Mahai'ula], where the fleet for aku fishing had been since the early morning hours. The sustenance of those lands was fish.

When the sun was rather high, the boy [I'i] exclaimed, "How beautiful that flowing water is!" Those who recognized it, however, said, "That is not water, but pāhoehoe. When the sun strikes it, it glistens, and you mistake it for water..."

Soon the fishing canoes came from Kawaihae, the Kaha lands, and Ooma drew close to the ship to trade for the pa'i'ai (hard poi) carried on board, and shortly a great quantity of aku lay silver-hued on the deck. The fish were cut into pieces and mashed; and all those aboard fell to and ate, the women by themselves."

The gentle Eka sea breeze of the land was blowing when the ship sailed past the lands of Mahaiulas, Awaula, Haleohiu, Kalaoas, on to Oomas, Kohanaiki, Kaloko, Honokohaus, and Kealakehe, then around the cape of Hiikanoholae..." (I'i 1959:109-110)

Kamakau also noted that in the last years of Kamehameha's life (ca. 1812 to 1819), "fishing was his occupation" (Kamakau 1961:203):

...[Kamehameha] would often go out with his fishermen to Kekaha off Kaelehuluhulu and when there had been a great catch of 'aku or ahi fish he would give it away to the chiefs and people, the cultivators and canoe makers (ibid.: 203).

3.2.4 ARCHAEOLOGICAL RESOURCES (SITES, BURIALS, AND ARTIFACTS)

By the middle to late 1800s, Hawaiians were increasingly aware of the rapid decline in knowledge of native customs, practices, and familiarity with features of the cultural landscape. With this increasing awareness in mind, work by native Hawaiians and others began, seeking to document and preserve as much of the rapidly vanishing Hawaiian civilization and artifacts as was practicable given the resources and technology available at the time. This section of the Master Plan provides some background and a brief overview of selected historical studies and archaeological investigations into the lands, sites, and practices of the lands encompassed by the Kīholo State Park Reserve.

3.2.4.1 T. Thrum (1908) and J.F.G. Stokes (1906-1909)

The earliest report on archeological features—*heiau* and ceremonial sites—on the island of Hawai'i was compiled and published by Thomas Thrum in 1908. Thrum's work was the result of literature review and field visits spanning several decades. Unfortunately, Thrum's work did not take him into the Kekaha region. He offers no record of sites between Pu'u Koholā and Mailekini at Kawaihae and Keahuolu (the Kailua vicinity) of North Kona.

In 1906 and 1907, J.F.G. Stokes conducted a field survey of *heiau* on the island of Hawai'i for the Bernice Pauahi Bishop Museum (Stokes and Dye 1991). Like Thrum, Stokes bypassed the Nāpu'u lands encompassed by the present day Kīholo State Park Reserve and most of the rest of the Kekaha region. Stokes returned to Hawai'i in 1909 and traveled to portions of Pu'u Anahulu and Pu'u Wa'awa'a, via the *ala loa-alanui aupuni*, the native trail and government road system. In doing so he

found and described an extensive field of petroglyphs.^{51,52} Describing the petroglyphs field he had seen on that trip, Stokes wrote in 1910:

At Puu Anahulu in South Kohala, when passing along a trail late one afternoon, the remarkable sight of a couple of acres of pāhoehoe closely covered with petroglyphs was experienced...One striking peculiarity was the use of irregularly circular lines for the inclusion or separation of groups of petroglyphs, perhaps for the purpose of limiting or defining a particular record. There were forms innumerable, forms not suggestive of the human or animal, which from this grouping could leave but little doubt that they told a connected story. They left a strong impression that most Hawaiians had made a decided advance towards a written language...Mostly on the outskirts of this interesting area were many names of Hawaiians, sometimes dates, and more initials. It seemed to have been a time-honored place for recording events. The place had been isolated by the flow of lava in 1859 and is not easy of approach... (Stokes 1910:59-60)

3.2.4.2 Archaeology of Kona, Hawai‘i (Reinecke ms. 1930)

The first detailed recording of Hawaiian archaeological sites in the area encompassed by Kīholo State Park Reserve was compiled by John Reinecke (ms. 1930). In 1929-1930, Bishop Museum contracted John Reinecke to conduct a survey of Hawaiian sites in West Hawai‘i. A portion of Reinecke’s survey extended from Kailua to Kalāhuipua‘a, his work being the first attempt at a survey of sites of various functions, ranging from resource collection and ceremonial to residential purposes. During his study, Reinecke traveled along the shore of Kekaha, documenting the nearshore sites. Where possible, he spoke with the few native residents he encountered. Among his general description of sites throughout Kekaha, Reinecke observed:

“This coast formerly was the seat of a large population. Only a few years ago Keawaiki, now the permanent residence of one couple, was inhabited by about thirty-five Hawaiians. Kawaihae and Puakō were the seat of several thousands, and smaller places numbered their inhabitants by the hundreds. Now there are perhaps fifty permanent inhabitants between Kailua and Kawaihae—certainly not over seventy-five.

When the economy of Hawaii was based on fishing...this was a fairly desirable coast; the fishing is good; there is a fairly abundant water supply of brackish water, some of it nearly fresh and pleasant to the taste; and while there was no opportunity for agriculture on the beach, the more energetic Hawaiians could do some cultivation at a considerable distance mauka....” (Reinecke ms. 1930:1-2)

Reinecke also observed that he recorded only a limited number of sites in the region; his study field was generally within sight of the shore (*ibid.*:2), and he wrote:

The coast is for the most part low and storm-swept, so that the most desirable building locations, on the coral beaches, have been repeatedly swept over and covered with loose coral and lava fragments, which have obscured hundreds of platforms and no doubt destroyed hundreds more...many of the swellings must have been built directly on the sand, as are those of the family at Ka‘ūpūlehu, and when the posts have been pulled up, leave no trace after a very few years...(ibid.)

⁵¹ Petroglyphs are rock engravings of images or symbols made by removing part of a rock surface by incising, picking, carving, or abrading.

⁵² Confusion arose because Stokes identified the site as being at “Pu‘uanahulu in South Kohala.” In 1918, A. Baker set out to locate the petroglyphs which Stokes described in 1909, and he noted that Pu‘u Anahulu is in North Kona, not in South Kohala. Ten years later, J. Reinecke (ms. 1930) noted that neither Stokes nor Baker had the benefit of good maps, and Reinecke placed the site in ‘Anaeho‘omalū (Reinecke’s Site No. 147).

Table 3.1 contains site descriptions that are excerpted from Reinecke's field work in the areas now included within Kīholo State Park Reserve. The approximate locations of the sites are shown in Figure 3.1.

3.2.4.3 Handy, Handy and Pukui (1972)

In *Native Planters of Old Hawaii* (Handy, Handy, and Pukui 1972), the authors present readers with documentation regarding agriculture, fishing, and life in the Kekaha region of North Kona, including the coastal areas of Pu'u Anahulu and Pu'u Wa'awa'a. The information was collected from native informants and archival sources. In describing the Kekaha-Nāpu'u region, the authors wrote:

Wherever a little soil could be heaped together along the dry lava coast of North Kona, a few sweet potatoes were planted by fishermen at such places as Honokōhau, Mahai'ula, Makalawena, Ka'ūpūlehu, Kīholo, Keawaiki, and Kapalaoa. Doubtless potatoes were planted on the upland of North Kona, on the lower slopes of Hualālai toward Pu'u Wa'awa'a, up to a considerable altitude in the rainy seasons. In recent times the flatlands of Pu'u Anahulu, having an elevation of 2,300 feet, have supported a number of patches planted by Hawaiian cowboys. (Handy et al., 1972:527-528)

3.2.4.4 Archaeological Reconnaissance Survey (1999⁵³)

In September 1999, Rechtman and Wolforth conducted an archaeological survey of a nine-acre parcel at Kīholo Bay in support of a land exchange that subsequently occurred between Doris and Earl Bakken and the State of Hawai'i. Because the intention of the landowners was to avoid directly impacting any archaeological resources that might be present within the study area, the strategy for the archaeological survey was to perform an intensive surface pedestrian reconnaissance survey of the study area, but to limit the investigation to non-destructive evaluation. Consequently, no dismantling of features or sub-surface testing was performed. Areas immediately adjacent to the nine-acre parcel were also surveyed to facilitate the placement of the proposed rerouting of the access road.

The survey report noted that the portion of the study area that lies *makai* of the current access road contained no sites. It further observed that this area had been significantly altered by mechanical means with clear evidence of past grading and bulldozer activity. In the area to the southwest of the existing Bakken parcel, particular attention was paid to identifying the course of the historically (and archaeologically) documented Kīholo Bay/Hu'ehu'e Ranch Trail. Within and immediately adjacent to the study area, thirteen sites (excluding the trail) containing a total of fifty-one features were identified. Those sites, and the features that they contain, are listed in Table 3.2.

The report concludes that all of the sites identified are believed to have been temporary habitations associated with the procurement of coastal resources. In assessing the significance of the sites based on the criteria contained in Hawai'i Administrative Rules §13-275, it concluded that all of them are significant under Criterion D (i.e., have yielded, or is likely to yield, information important for research on prehistory or history). Additionally, because of the presence of human remains within Site 21785, this site is considered significant under Criterion E as well. Significance Criterion E reads:

Have an important traditional cultural value to the native Hawaiian people or to another ethnic group of the state due to associations with traditional cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group's history and cultural identity.

⁵³ The 1999 archaeological survey described in this section notes one previous archaeological reconnaissance (Rosendahl 1982) in the project area. It indicates that that survey reported 15 feature designations (but provided no site designations assigned to 27 cultural features observed scattered over the access and beachfront roads under study. It also observed that 17 "walled shelters" and 6 cave shelters were also present. Finally, it noted that a possible historic cart road, a modified outcrop, an enclosure, and a cairn were also observed. As the survey was done for the Queen Ka'ahumanu Highway corridor, none of these features was close to the existing park facilities.

Table 3.1 Archaeological Sites Reported by Reinecke in 1930

Site 126. (a) Several large ruined platforms and many salt pans, in a perfect medley. (b) Recent walled shelter, house site behind it. (c) More ruined platforms. Then follows a considerable space where everything is so ruined as to be almost indistinguishable. (d) Traces of a very large pen.
Site 127. At the end of this pen (a) a swelling complex, consisting of a walled enclosure (walls 3 ½ feet wide and 2 ½ feet high, with gate), and including two enclosure-rooms with entrances and one without. About it are a house platform, two walled shelters, a salt pan, and various heaps of stone. (b) Beyond it on north a yard with a fine salt pan, c. 9x7x1/2, cemented carefully about the bottom. (c) Walled dwelling place, three enclosures. (d) Courtyard of large, flat whitened stones—may have been a salt pan there. (e) A considerable complex of walls and shelters, followed by a desert space of dunes.
Site 128. (a) A walled pen; adjoining it eight very fine examples of the local salt pan. (b) Three large pens adjoining this area and one another. On the <i>makai</i> side are very thick walls, and a shelter with cupboard. On the <i>mauka</i> side is a shelter with cupboard. (c) A little <i>mauka</i> are three salt pans. (d) A few sand-covered platforms, etc., to branch of Ka'ūpūlehu Flow. [near Pōhakuokahae]
Site 129. Luahinawai [Luahinewai] is a pond behind a black sand beach; no ruins. <u>Waia'elepi</u> is a shallow pond of practically fresh water. From the Ka'ūpūlehu Flow on is a grove of <i>kiawe</i> and the cattle pasturing under it have undoubtedly destroyed several sites. There is a pen behind Waia'elepi, where there has been a house or a cowboy's camp. Then some concrete salt pans and a fine terraced platform of stones [Muller's salt works]. There are traces of shelters at the foot of the dune of black pebbles. Remains of a pen with very thick, low walls on three sides. From here on is a continuous row of traces at the foot of the beach and under the <i>kiawe</i> . Especially noticeable are the large boulders at the back of the platforms, pens, or enclosed house sites—now it cannot be said which. Toward the north end of this area is a pen and a recent house site.
Site 130. Many shelters on the reddish lava block of the <i>kiawe</i> .
Site 131. Large cave [Keanaele] with three feet of almost fresh water.
Site 132. Two narrow pens extend north, enclosing the <i>kiawe</i> and stagnant pools. Behind them are two yards, with three house sites between them. Between the cave and the pens is a lot containing a house platform. There are two other very ruinous platforms outside, and a bordered, coral-strewn path running a short distance <i>mauka</i> through a few shelters. Back of the pens a considerable distance are many small hut sites or shelters. They may have been temporary structures. There is also a hollow fence on all but the perpendicular side, recent. Several waterholes, one walled up.
Site 133. Ruins of five modern houses at the south end of Kīhōlo Bay. There are many walls in this area. The area back of the ponds is difficult to penetrate due to the <i>kiawe</i> . I found only two ruins, a platform c. 75x25x0-1 and a rough heap that had been a medium-sized platform.
Site 134. Excellent stone platform at the south-end of the long lagoon, probably quite modern.
Site 135. The vitreous <i>pāhoehoe</i> of the 1859 flow bears no ruins at all. <u>Keawaiki</u> : At the south end of the <i>kiawe</i> grove are the ruins of several platforms, all very small. Two or three house sites can be distinguished. For most of the way the <i>kiawe</i> hides possible ruins. I thought that two platforms could be distinguished just south of a three-sided pen for shelter-dwelling. I did not see the <i>heiau</i> "a little <i>mauka</i> of the house"; it is named Kauualii [Pū'o'a-a-Ka'uali'i], after a chief of the place. The pond should be shown on the map at the extreme north end of Keawaiki; it is of slightly brackish water. About 200 yards farther is a large, deep, brackish pool.
Site 136. At a spot about one-eighth mile inland, <u>Kaluoo</u> , is an oasis of <i>lauhala</i> and <i>kiawe</i> , which I did not visit. At <u>Akuko</u> are three stagnant brackish pools. Here are a dwelling site, walls that probably surrounded two shelters, and three other shelters.
Site 137. Wiliwili [Weliweli] is a beach with <i>kiawe</i> and a few pools. There are traces of a few platforms.
Site 138. Kapalaoa. On the <i>a-a</i> where it gives place to the <i>pāhoehoe</i> are five or more rude shelters. The oasis is bounded at the south with a wall. By the gate is a small pen. On the beach just <i>makai</i> is some sort of site. The little headland within the line of the wall is a complex of small enclosures for salt-making. There are two small platforms, one or both being the <i>kuula</i> named Puakō. The oasis as far as Desha's house is cut up by stone walls, within them palms, a few wells now dry, platforms—at least five modern house platforms—and a shelter. On the brittle, easily chipped <i>pāhoehoe</i> by the southern gate are many petroglyphs. [Reinecke was told the story of Kuaiwa—which he was informed was a chief of this area—and how he lost his life to Pele. Kapalaoa is inhabited only by the family of Alapa'i. (Reinecke Ms. 1930:23-27)
Source: Reinecke ms. 1930

Table 3.2 Sites Recorded During 1999 Archaeological Survey

<i>SIHP No.</i>	<i>Feature No.</i>	<i>Feature Type</i>	<i>Size (m)</i>	<i>Opening</i>	<i>Condition</i>
21776	A	C-Shape	4.0 x 4.0	330°	Good
	B	C	5.3 x 4.8	320°	Poor
	C	C	3.0 x 2.8	280°	Fair
	D	C	5.0 x 4.5	0°	Poor
	E	C	4.0 x 4.0	314°	Fair
	F	C	3.8 x 3.8	350°	Fair
21777	-	U-Shape	11.5 x 8.8	332°	Fair
21778	-	C-Shape	4.3 x 3.8	325°	Good
21779	A	C-Shape	3.4 x 4.3	310°	Good
	B	C-Shape	4.3 x 4.3	8°	Good
	C	C-Shape	6.2 x 6.7	335°	Good
21780	A	Modified Overhang	-	-	Fair
	B	C-Shape	3.2 x 3.2	290°	Good
	C	C-Shape	4.6 x 3.9	340°	Good
	D	C-Shape	3.5 x 3.5	290°	Good
	E	C-Shape	4.2 x 4.3	308°	Fair
	F	Poss. Quarry	-	-	Good
	G	Slick	-	-	Good
21781	A	C-Shape	3.5 x 4.1	270°	Fair
	B	C-Shape	2.8 x 3.6	290°	Fair
	C	Stone Pile	-	-	Fair
	D	C-Shape	4.2 x 4.3	290°	Fair
21782	A	C-Shape	3.0 x 3.5	320°	Good
	B	C-Shape	4.0 x 3.8	320°	Good
	C	C-Shape	4.5 x 4.5	330°	Good
	D	C-Shape	3.5 x 3.8	320°	Fair
21783	A	C-Shape	3.3 x 3.9	280°	Good
	B	C-Shape	4.2 x 4.2	320°	Good
	C	C-Shape	3.6 x 3.6	270°	Good
	D	C-Shape	4.1 x 4.4	330°	Good
	E	U-Shape	6.6 x 5.8	325°	Good
21784	-	Blister Shelter	-	-	Good
21785	A	Platform	-	-	Fair
	B	Lava Tube Shelter	-	-	Good
	C	Poss. Quarry	-	-	Good
	D	Poss. Quarry	-	-	Good
21786	A	C-Shape	6.3 x 4.8	300°	Fair
	B	Enclosure	9.6 x 7.5	260°	Good
	C	C-Shape	3.7 x 3.7	285°	Good
21787	A	C-Shape	4.5 x 4.5	285°	Fair
	B	C-Shape	3.5 x 3.5	305°	Fair
	C	C-Shape	3.6 x 3.6	300°	Good
	D	C-Shape	4.2 x 4.2	320°	Good
	E	C-Shape	4.0 x 5.3	320°	Fair
	F	C-Shape	4.9 x 5.3	320°	Poor
	G	Stone Pile	-	-	Fair
	H	Slick	-	-	Good
21788	A	Enclosure	2.3 x 1.5	300°	Good
	B	Enclosure	2.5 x 2.0	120°	Good
	C	Enclosure	2.4 x 2.0	290°	Good
	D	Enclosure/Overhang	2.0 x 1.5	300°	Good
Note: Orientation stated in degrees North.					
Source: Rechtman and Wolforth, September 1999.					

3.2.4.5 Archaeological Field Work Conducted for the Present Master Plan

Recognizing that the existing archaeological data for the Kīholo State Park Reserve was insufficient for proper management and decision-making, the Division of State Parks commissioned a reconnaissance-level survey of the area. Undertaken from March through June 2011, the survey entailed a reconnaissance survey to identify all surface sites and lava tube openings within Kīholo State Park Reserve. Work included a systematic pedestrian survey of: (i) all areas not covered by the 1800-1801 and 1859 flow, (ii) a 100-foot strip along the edges of the flows and the shoreline, and (iii) exploration of all lava tubes to a distance of approximately 30 meters, excluding caves previously surveyed by State Parks.

Data collected during the course of the survey included the following:

- GPS coordinates for all isolated surface features and cave openings.
- Polygon coordinate data for the perimeters of archaeological complexes.
- Point data for lava tube openings within such complexes and linear data for trails.
- One or more photographs of each feature.
- Descriptive data for all previously undocumented, or insufficiently documented features and feature complexes.⁵⁴
- A determination of the extent to which there is evidence of use in lava tubes the approximately 100-foot-long portion closest to the entrance that could readily be surveyed and, if present, a brief description of the features/cultural material encountered.
- If burials are present, State Parks will be responsible for reporting the burials to SHPD and recommending appropriate treatment measures.

After determining that there was insufficient funds available for both a formal written report and electronic files that would be much more useful for long-term management, the Division of State Parks opted to obtain the results of the survey in a Google-Earth type product that allowed all data to be accessed electronically in a geodatabase suitable for use with other information available through the State's Geographic Information System and/or a more widely available web-based tools. Ultimately, the survey results were compiled in electronic files of archaeological feature coordinate data and feature data, with metadata, in a structure that can be joined to other geo-referenced databases/GIS. Maps of the features were sufficiently detailed to allow the features to be understood both in relationship to one another and to other environmental features. The specific datasets in the files are listed in Table 3.3. Table 3.4 summarizes the types of archaeological features which the 2011 survey documented within the park boundaries.

⁵⁴ Well-defined terms were used describe the individual architectural components of such features; including information on general topographic context (e.g., whether the feature is on topographic rise, in a swale or gully), the type of vegetative cover (if any), and the site's proximity to (or association with) anchialine ponds, if known.

Table 3.3 Data Files from Archaeological Field Work for Kīholo State Park Reserve

1. kiholo_site_data_20110802.pdf	-Site descriptions and photographs for 1,272 sites (1,879 pages).
2. kiholo_gdb.mdb	Geodatabase in ArcView 9.3.1 format that contains 3 features classes for archaeological sites. Each class includes a “feature_field_number” field for temporary site numbers, and a “feature_list” field that has information about the types of sites that were found, such as “burial”, “lava tube”, “enclosure”, and “petroglyph.
i) site_point	Point locations for archaeological sites.
ii) site_line	Linear features for trails, walls and boundaries.
iii) site_polygon	Site complexes comprised of numerous individual sites. The geodatabase also contains two additional feature classes for Tax Map Parcel boundaries and lava flows in the area.
iv) kiholo_tm_k_adjusted	Adjusted parcel boundaries adapted from the State of Hawai‘i GIS distribution.
v) kiholo_lava_flows	Lava flow areas adapted from shape files distributed by the USGS. The map projection for the GIS data is UTM Zone 5N, and the datum is NAD83.
3. kiholo_site_database.mdb	Database application in Microsoft Access 2003 format that includes detailed information about each site. The key field for linking the GIS features to this site database is “feature_field_number” in the “feature_record294” table.
4. kiholo_archaeological_site_GIS.mxd	This Arcview 9.3.1 project file is an example that uses the archaeological site data developed for the Kīholo survey.
Source: The information was developed by T.S. Dye and Colleagues, Archaeologists, Inc. from fieldwork conducted in March – June, 2011 under contract to Planning Solutions, Inc.	

Table 3.4 Summary of Feature Types at Kīholo State Park Reserve

<i>Feature Type</i>	<i>Feature Count</i>	<i>Feature Type</i>	<i>Feature Count</i>
‘A‘a Pit	5	Modern Refuse	130
Abrader Area	19	Mound	188
Abrader Quarry	27	Pāhoehoe Pit	0
Ahu	8	Partial Enclosure	148
Alignment	91	Petroglyph	59
Artifact (Isolated)	4	Platform	49
Burial (Human)	30	Pond	11
Burial (Dog)	1	Terrace	24
Cairn	47	Trail	85
Cupboard	7	Wall	105
Deposit	434	Well	2
Enclosure	186	Lava Tube (Natural)	381
Hōlua	1	Lava Tube (Traditional Features)	325
Total Number of Features			2,702
Source: T. Dye and Colleagues, Archaeologists, Inc. (August 8, 2011)			

3.3 POST-CONTACT HISTORY OF KĪHOLO

3.3.1 POST-CONTACT LAND USE PATTERNS

3.3.2 DESCRIPTIONS IN THE JOURNALS AND ARTICLES OF HISTORIC VISITORS (1778-1902)

3.3.2.1 Observations by Captain James Cook and Crew (1778-1779)

The earliest foreign accounts which included Kekaha of North Kona are found in the journals of Captain James Cook (Beaglehole 1967). The following journal entry of February 6, 1779 penned by Captain James King⁵⁵, describes the journey along the Kohala coast (north to south) and specifically described Kawaihae (given here as Toe-yah-ya) and lands to the south (Beaglehole 1967:607:1 and 608:2):

Although the Neern part of the bar which (the whole or part) is call'd Toe-yah-ya looks green & pleasant, yet as it is neither wooded or hardly any signs of culture, & a few houses, It is certainly some defect, & does not answer the purposes of what the natives cultivate. The s part appeared rocky & black, & partakes more of the land about Karakakooa⁵⁶. (Beaglehole 1967:525)

Later, in March 1779, while sailing north from Kealakekua, the ships passed the North Kona-South Kohala shoreline, including all the lands encompassed by Kīhōlo State Park Reserve. King compared the region to the arid shoreline of Ka'ū, and reported that there appeared to be few residents in the area:

We now come to Ko-Harra⁵⁷ the NW and last district. It is bounded by two tolerable high hills [thought to mean Hualālai and the Kohala Mountains], & the Coast forms a very extensive bay called Toe-yah-ya...In the head of the bay as far as we could judge distant the Country lookd tolerably, but the s side is partook of the same nature as Kao⁵⁸, and along the NE side of the bay close to which we Sailed, It is very little Cultivated, & we saw but few houses; the Peoples appearance shewd that they were the lowest Class that inhabited them...(Beaglehole 1967:608)

3.3.2.2 Journal of Captain George Vancouver

Captain George Vancouver accompanied James Cook on his visits to Hawai'i in 1778-1779. Vancouver returned to the Hawaiian Islands in 1793 and 1794, in command of his own exploring expedition (Vancouver 1967). In February 1793 and 1794, Vancouver visited Kawaihae (here rendered Toeaigh), and described the region to the south (into Kekaha) much as did Cook's crew in 1778-1779. Vancouver's observations include descriptions of Kawaihae village and environs (in 1793 Ke'eaumoku was the chief in residence at Kawaihae); a detailed account of salt making; the *morai* or *heiau* of Pu'u Koholā; and he also noted that the lands to the south of Kawaihae appeared to be unpopulated. From the account of his second visit to the South Kohala region, when Vancouver approached Kawaihae from Kealakekua, Vancouver recorded:⁵⁹

⁵⁵ Captain James King (1750-1784), Fellow of the Royal Society, accompanied Captain James Cook on his final voyage around the world.

⁵⁶ An archaic rendering of Kealakekua.

⁵⁷ An archaic rendering of Kohala.

⁵⁸ That is, Ka'ū.

⁵⁹ Vancouver used spelling and typographic conventions typical of the late 19th century. This includes use of what appears to modern readers to be the use of "f" (which is the long or medial letter "S"). Also, Vancouver's spelling of Hawaiian words appears to have been phonetic—that is, as he heard them—and thus very different from present usage.

February 27, 1794

In the forenoon of the 27th, we had a light breeze from the westward; with this we steered for the anchorage at Toeaigh...the adjacent shores were uninteresting, being chiefly composed of volcanic matter, and producing only a few detached groves of cocoa nut trees, with the appearance of little cultivation and very few inhabitants. The deficiency of the population on shore was amply compensated by the number of our friends accompanied us afloat in canoes of all descriptions... (Volume III:62)

February 28, 1794

The only circumstances that seem to render this a desirable stopping place, are the run of water, which however does not constantly flow; and the probability of procuring refreshments, from its contiguity to the fertile, and populous western part of the district of Koharra [Kohala], and the plains of Whymea [Waimea], lying behind the land that constitutes this part of the sea coast.

The country rises rather quickly from the sea side, and, so far as it could be seen on our approach, had no very promising aspect; it forms a kind of glacis, or inclined plane in front of the mountains, immediately behind [Volume III:63] which the plains of Whymea are stated to commence, which are reputed to be very rich and productive...(Volume III:64)

3.3.2.3 The Journal of William Ellis

Following the death of Kamehameha I in 1819, the Hawaiian religious, social, and political systems began undergoing radical change. Just moments after his death, Ka‘ahumanu proclaimed herself *Kuhina nui* (Prime Minister), and within six months the ancient *kapu* system was overthrown. Less than a year after Kamehameha’s death, Protestant missionaries arrived from America (cf. I‘i 1959, Kamakau 1961, and Fornander 1973). In 1823, British missionary William Ellis and members of the American Board of Commissioners of Foreign Missions (ABCFM) toured the island of Hawai‘i seeking out communities in which to establish church centers and schools for the Calvinist mission. Ellis’ writings (1963) generally offer readers important glimpses into the nature of native communities and history, as spoken at the time. As a part of his trip, with two visits to the Kawaihae-Kekaha region, Ellis and his party visited some of the coastal communities between Kawaihae and Kailua, including areas contained within Kīholo State Park Reserve: Kapalaoa, Kīholo, and Wainānālī‘i, as well as points further south including Ka‘ūpūlehu.

During his last visit to the lands of Kekaha, Ellis visited several of the coastal villages along the way. In the ahupua‘a of Pu‘u Anahulu and Pu‘u Wa‘awa‘a, Ellis stopped at Kapalaoa, Kīholo, and Wainānālī‘i. At that time, Kapalaoa was a village of approximately 22 houses. Ellis wrote:

About nine a.m. I stopped at Kaparaoa, a small village on the beach, containing twenty-two houses, where I found the people preparing their food for the ensuing day, on which they said the governor [Kuakini] has sent for them to do no work, neither cook any food. When the people were collected, I addressed them, and after answering a number of inquiries respecting the manner in which they should keep the Sabbath-day, again embarked aboard my canoe, and sailed to Wainanarii, where I landed, repaired to the house of Waipo, the chief, who, as soon as the object of my visit was known, directed the people to assemble at his house.

At Kaparaoa I saw a number of curiously carved wooden idols, which former belonged to an adjacent temple. I asked the natives if they would part with any? They said, Yes; and I should have purchased on, but had no means of conveying it away, for it was an unwieldy log of heavy wood, twelve or fourteen feet long, curiously carved, in rude and frightful imitation of the human figure.

After remaining there till two p.m. I left them making preparations to keep the Sabbath-day, according to the orders they had received from the governor.

Of Kamehameha I's fish-pond at Kīholo⁶⁰, Ellis wrote:

About four in the afternoon I landed at Kihoro, a straggling village, inhabited principally by fishermen. A number of people collected, to who I addressed a short discourse...[Ellis 1963:294]...This village exhibits another monument of the genius of Tamehameha. A small bay, perhaps half a mile across, runs inland a considerable distance. From one side of this bay, Tamehameha built a strong stone wall, six feet high in some places, and twenty feet wide, by which he had an excellent fish-pond not less than two miles in circumference. There were several arches in the wall, which were guarded by strong stakes driven into the ground so far apart as to admit the water of the sea; yet sufficiently close to prevent the fish from escaping. It was well stocked with fish, and water-fowl were seen swimming on its surface.

The people of this village, as well as the others through which I had passed, were preparing to keep the Sabbath, and the conversation naturally turned on the orders recently issued by the governor.

They said it was a bad thing to commit murder, infanticide, and theft, which also had been forbidden; that it would be well to abstain from these crimes; but, they said, they did not know of what advantage the palapala (instruction, &c.) would be.

I remained some time with them, and I told them I hoped missionaries would soon come to reside permanently at Kairua, wither I advised them to repair as frequently as possible, that they might participate in the advantages of instruction—be made better acquainted with the character of the true God, and the means of seeking his favor. (Ellis 1963:296)

Departing from Kīholo, Ellis passed Laemano (Ka-lae-manō), “a point of land formed by the last eruption of the great crater on Mouna-Huarari” (Ellis 1963:296). He also reported that he landed at the village of Ka‘ūpūlehu at night, and that the residents were all asleep. Thus from Ka‘ūpūlehu, Ellis sailed directly to Kailua. (Ellis 1963:296)

3.3.2.4 The Journals of Lorenzo Lyons and Cochrane Forbes (1835-1859)

In his journal Lyons described his walk along the *ala loa*, or main trail, along the coast from Kohala through the ahupua‘a of Pu‘u Anahulu and Pu‘u Wa‘awa‘a to Kailua, and recorded the following:

Aug. 8, 1843. Took the road from Kapalaoa to Kailua on foot. Passed the great fish pond at Kiholo, one of the artificial wonders of Hawaii; an immense work! A prodigious wall runs through a portion of the ocean, a channel for the water, etc. Half of Hawaii worked on it in the days of Kamehameha... (Doyle 1953:137)

During the time that Lyons was tending to his mission in South Kohala, Cochrane Forbes—who was acting as his South Kohala counterpart—visited him and reported having walked to Kīholo from Kailua, where he stayed for a short time, prior to continuing on to Wainānālī‘i and Kohala. Forbes (1984) described the 1841 journey with the following narrative:

Jany. 1. On the 29th left home for Kohala. [On Dec. 31]...had a long & tedious journey by land to Kiholo. Arrived there at dark. Our canoe with baggage had not got along bad sea & head wind, mumuku & hoolua blowing, Spent the night at Kiholo & preached. Next morning our canoe got along as far as Wainanalii where we took breakfast and leaving the canoe, a strong mumuku blowing, we came by land over the lava to Puakō arrived there about 3 o'clock and encamped with Daniela (Loli) one of Bro Lyons' deacons. Here we

⁶⁰ Based on historical accounts and Boundary Commission testimonies referenced in K. Maly's extensive research, it appears that the fish-pond at Kīholo was constructed at the order of Kamehameha I in ca. 1810.

spent the night and early thing mornng. The men returned for the baggage & brought it By land as the sea is rough & strong winds blowing...(Forbes 1984:91)

One of the significant events of this era that had an impact on travel and residency in the coastal region of South Kohala and North Kona was the February 1859 eruption of Mauna Loa. The eruption began at approximately 10,500 feet in elevation and in eight days it reached the ocean at Pu'u Anahulu-Pu'u Wa'awa'a, where Kīholo State Park Preserve is now located, destroying the community of Wainānāli'i and the great fishpond at Kīholo. In his annual mission report for the year 1859, Lyons wrote that the effects of the flow were felt throughout the Kekaha region:

...the heat of the volcanic stream that entered the sea near this place killed or frightened away all the fish...There remain the fruit of a few coconut trees, & the lauhala⁶¹ from the leaf of which the women busy themselves in making mats. The men can sometimes find a job of work that will bring them in something, i.e. if they can manage to obtain food, all of which comes from a distance. (Lyons in Barrère 1971:111)

3.3.2.5 Mai Kailua a hiki i Kīholo – From Kailua to Kīholo (1875)

On 1875, a native resident of the Kailua vicinity wrote a letter to the editor of the Hawaiian newspaper, *Kū 'Ōko'a*, responding to a letter which had been previously published in the paper (written by a visitor to Kona), describing the plight of the Kekaha region. It had been reported that a drought on Hawai'i was causing difficulty for crop production, and a "famine" was occurring. In the following letter, J.P. Pu'uokupa, responding to the account and described the situation as he knew it from living upon the land:

...The people who live in the area around Kailua are not bothered by the famine. They all have food. There are sweet potatoes and taro. These are the foods of these lands. There are at this time, breadfruit bearing fruit at Honokōhau on the side of the Kailua, and at Kaloko, Kohanaiki, Ooma and the Kalaoas where lives K.P. [the author]. All of these lands are cultivated. There is land on which coffee is cultivated, where taro and sweet potatoes are cultivated, and land livestock is raised. All of us living from Kailua to Kalaoa are not in famine, there is nothing we lack for the well being of our bodies.

Mokuola⁶² is seen clearly upon the ocean, like the featherless back of the 'ukeke. So it is in the uplands where one may wander gathering what is needed, as far as Kiholo which opens like the mouth of a long house into the wind. It is there that the bow of the boats may safely land upon the shore. The livelihood of the people there is fishing and the raising of livestock. The people of the uplands of Napuu are farmers, and as is the custom of those people of the backlands, they all eat in the morning and then go to work. So it is with all of the native people of these lands, they are a people that are well off...

*...As was said earlier, coffee is the plant of value on these lands, and so, is the raising of livestock. From the payments for those products, the people are well off and they have built wooden houses. If you come here you shall see that it is true. Fish are also something which benefits the people. The people who make the pai ai on Maui bring it to Kona and trade it. Some people also trade their pot for the coffee of the natives here...(J.P. Puuokupa, in *Kū 'Ōko'a* November 27, 1875)*

3.3.2.6 Travel Along the Coastal Roads and Trails in 1880

George Bowser, editor of the *Hawaiian Kingdom Statistical Guide and Commercial Directory and Tourists' Guide* (1880) wrote about various statistics and places of interest around the Hawaiian Islands. In his narratives about the Island of Hawai'i, Bowser described travel along the *ala nui*

⁶¹ The fruit of the *hala* tree (*Pandanus tectorius*) was a food used by Hawaiians in time of famine.

⁶² Moku-ola—the island of life—is a poetic reference to a small island in Hilo Bay which was known as a place of sanctuary, healing, and life. By poetic inference, the Kekaha region was described as a place of life and well-being.

aupuni (government road) and smaller *ala hele* (trail system) from Puakō to Kīholo, and from there to the uplands of Pu'u Wa'awa'a and Ka'ūpūlehu and on to Kailua-Kona. Excerpts from Bowser's narrative for the larger South Kohala-North Kona (i.e. Kekaha) region are included below as they may be applied to the general patterns of residency and customs of the region, including all the lands now encompassed by Kīholo State Park Reserve:

From Puakō we had a view of Mauna Hualālai, which is distant about twenty-five miles. The country all round is nothing but lava, although, near the sea, a scarcity of vegetation has established itself. On the shore, which is composed of lava-rock, there is an abundance of mussels and periwinkles, but not of a very large size. All the way from Waimea I had not seen a drop of water, but at Puakō I found a fine spring of excellent water. It is some ten or fifteen feet from the edge of the sea, and is called by the natives Makahiwa. The land, which gradually slopes up from the shore at Puakō to Mauna Hualālai, is almost devoid of vegetation, and in the whole district there is not a tree to be seen.

From Puakō to Kalāhuipua'a is about four miles. The traveler cannot mistake the road in this district, as the paths are always plainly marked. The road to Kalāhuipua'a is along the sea beach, and is in good order. A few shrubs are growing along the route, but on my left I had nothing but a sea of lava. At this place [Kalāhuipua'a] there are several waterholes in small groves of cocoanut trees. There is a splendid view from here of the south side of the Island of Maui, which is something short of thirty miles away, in a crow line.

On the road to this place we passed over the scene of the lava flow of 1859, one of the grandest that has ever been seen in Hawaii. Here the lava is turned and twisted in all directions. This stream of lava reached to the sea from its source on the north flank of Maunaloa (about thirty miles distant in a straight line) in the incredibly short space of three [sic] days. One of the pieces of mischief it did was to destroy a splendid fish pond and its contents. There is still a pool of water left to mark the place where the fish pond used to be.

From Kalāhuipua'a to Kiholo, my next halting place, the road leaves the sea beach and turns inland in a southerly direction [as seen from a distance]. On the way we saw the great lava flow from 1801, which burst out from the base of Mauna Hualālai, not more than six miles from the sea. There is nothing to be seen all the way but lava; lava to the right of you, lava to the left of you, lava ahead of you, lava behind you, and lava beneath you; the road for a dozen miles or more is composed of nothing but clinkers of every size. The tourist, on his way southwards, will probably keep to this inland road until it leads him upwards into woodland country, and so on to Kailua. The route I had laid out for myself involved a detour to Kiholo, which is reached by a side-track that returns towards the coast over a barren and waterless expanse of lava.

There is, indeed, no water to be had anywhere after leaving Kalāhuipua'a until the traveler reaches Kiholo, nor from that place again until within a few miles of Kailua, which is the next coast town to be visited.

Kiholo is situated on a small inlet of the sea, and in its neighborhood the lava has, at some time, run right down to the sea...In the foreground the sea of dark grey lava, far off, some patches of grass which are anything but green, but which, nevertheless, supply food for numbers of goats, and in the background the fine mountain Hualālai. Around the village area a few cocoanut groves, but they are small, and the trees are of stunted growth. Accommodation can be had by anyone who visits the place at the house of a native named

Kauai⁶³, who will also find plenty of grass and water for your horse. There is a splendid bathing place, and plenty of fish are to be had, and fishing for those who desire it.

From Kiholo the road southwards is rough and laborious. Perpetual travelling over lava is very hard upon our horses, and it is impossible to travel faster than the slowest walk. On the road we met with some awful chasms of unknown depth and numberless cracks and fissures in the lava. Some twelve miles from Kiholo we began to cross the western shoulder of Mauna Hualālai. (Bowser 1880:546-548)

3.3.2.7 **The Roads of Kohala and Kona (1902)**

In 1902, Charles Baldwin penned a series of articles in the magazine, *Hawaii's Young People*, describing the “Geography of Hawaii.” In his discussion about the roads on the island of Hawai‘i, he presented readers with a good description of travel between Kohala and Kona. Baldwin wrote:

In travelling around the other islands of the group, we usually follow the seashore, but with Hawaii the case is different, for, to avoid waste regions and to accommodate the inhabitants, the road goes far inland in places. As the government could not always afford to build more than one road around the “big” island, that one was put where it would be of the most use to the greatest number of people.

During my first tour around Hawaii I met a gentleman who said that he had driven around the island. I had always supposed that this was impossible, as there was only a trail between Kohala and Kona, but there was his buggy and horse which he had purchased in Hilo. Later, I discovered what he had done—and others like him, who claim that they have driven around Hawaii. Putting his horse and wagon on the little steamer Upolu, he had sailed around to Kailua; but as the Upolu has since been wrecked, you cannot now “drive” around Hawaii.

In a year or two the wagon road which is now building over the lava between Waimea and Kona [the Pu‘u Wa‘awa‘a -Pu‘u Anahulu Road being built under the supervision of Eben Low] will have been completed and then one can drive around the island. But this section now being constructed, as well as that portion over the lava between Kona and Kau, will be rough traveling.

Travelers from Kohala to Kona usually take the trail over the lava from Kawaihae. Most people speak of this as a journey to be avoided, but, with a horse that is used to traveling over lava, the ride is not an unpleasant one, particularly if we make an early start from Kawaihae, thus reaching Kiholo before the lava has had time to get thoroughly heated. Twenty miles of the trail is over lava; the first portion, that between Kawaihae and Kiholo, being the worst. Nowhere else in the world may one see so many recent lava flows as are gathered in this region. Most of them are aa flows. The ride is certainly a unique one, and consequently interesting... (Baldwin 1902:46)

3.3.2.8 **Ka Huaka‘i Lawai‘a i Kapalaoa – The Fishing Trip to Kapalaoa**

In 1926, Rev. Stephen L. Desha Sr., editor of the Hawaiian newspaper, *Ka Hōkū o Hawai‘i*, penned a series of articles that described Kapalaoa and practices of the native families of the coastal portion of Nāpu‘u (i.e., Pu‘u Wa‘awa‘a and Pu‘u Anahulu) and the wider region Kekaha. In the article, he told readers about the work of Reverend George “Holokahiki” Ka‘ōnohimaka, who was the beloved elder leader of the churches of the Kekaha region of North Kona. Desha reported that it was Ka‘ōnohimaka who founded the school and church at Kapalaoa (ca. 1880), on the family land of D. Alapa‘i Kahinu (Alapa‘i) (*Ka Hōkū O Hawai‘i*, August 10, 1926:3). It was while on visits to Kapalaoa, that Desha himself developed with great love for the area—in 1928 Desha purchased

⁶³ Kaua‘i, an elderly resident from Kīholo, was interviewed by J.S. Emerson on August 30, 1883 (Bishop Museum HEN I:473). From him, Emerson learned about several sites and traditions of Nāpu‘u (accounts cited later with Emerson’s work). Kaua‘i was an elder of several participants in the oral history of Nāpu‘u compiled by K. Maly.

Kapalaoa Homestead Lot No. 39. The following excerpts from Desha's articles provide readers with an overview of traditions of Kapalaoa, a description of the Kekaha community in the early twentieth century. He also introduces readers to several of the families who traveled on the *ala hele* and *ala loa* of the region. Writing in the third party, Desha reported:

Several weeks ago, our editor took a break and went to the shore at a place called Kapalaoa near the boundary of North Kona and South Kohala, close to the place called 'Anaeho'omalu. There are three houses at this place called Kapalaoa, they are the pandanus thatched house of D.A. Kahinu, known by the name of Alapai, and the house of his family, and a school house which was gotten from his when he got his 17 acre homestead lot, and the house of the late Kimo Hale (James Purdy), which his daughters now own. They are Mrs. Maka'ai of Pu'u Anahulu and Mrs. Lindsey of Waimea. It was in their home that the editor, his family, and some guests were hosted...

The Reason that the Name "Kapalaoa" was Given. Here is a little interesting tale about the name given to this place. At one time in the distant past, there was living along these shores, a chiefess whose name was Ke Ali'i o Wahine Kuaīwa (the Chiefess Kuaīwa) and there were multitudes of people dwelling in her presence. There were two kinds of work done by the people who dwelled on this land at that time, that was ka 'oihana hana pa'akai (salt making) and ka oihana lawai'a (fishing).

One day, there drew near to the entrance of the chiefess Kuaīwa's house, an old woman with sagging skin. She was very old and her eyes were smeared with mucus. When the old woman met with the chiefess Kuaīwa, she asked if the chiefess could give her a little fish. Now the fishermen were just returning to the shore and their chiefess, with canoes filled with fish of all different kinds. Now perhaps because of the dirty nature of the old beggar woman, and because of the inflamed nature of her eyes, the chiefess felt no compassion for the old woman. So Kuaīwa answered her haughtily, denying the old beggar woman any fish. She pushed her away from the door and made rude remarks to her.

Not long after the time this old woman was pushed away, the chiefess Kuaīwa was resting in her house with her ipukai i'a (bowl of fish) placed before her. There erupted from a place behind where her house was situated a fire. The chiefess tried to run away, while taking up her ipukai punahele (cherished fish bowl), and attempted to save her life. Foremost in the chiefess' thoughts about her life, was her Lei Palaoa (whale tooth pendant) which she took from her neck and threw outside of the house. Where it fell, it immediately turned to stone. This stone in the shape of a whale tooth pendant is still there to this day. Also, a short distance away, is the body of the chiefess who was consumed by the fire of the old woman who she pushed away without compassion. She was turned into a stone as well. The stone body of the chiefess Kuaīwa may still be seen standing there to this day.

When she was overtaken by the fires of this supernatural old woman, her cherished ipukai i'a (fish bowl) also slipped from her hand. And just as the immeasurable wrath of this old woman had turned the Lei Palaoa into stone, and just as the chiefess had been turned into stone, so too, was the fish bowl covered by the fires and turned to stone by this supernatural woman. The ipukai may still be seen to this day, about 100 feet away from the stone body of the chiefess, Kuaīwa. The fish from within the ipukai were perhaps consumed by this supernatural woman of the fire. But only the ipukai remains, there are no fish in it.

As a result of the Lei Palaoa of the chiefess Kuaīwa being turned into stone, this place came to be called KA-PALAOA [the-Whale-Tooth-Pendant]. And this place has been the home of many of the fishermen and those who make salt from ancient times, in this land of ours. There remains at this time, the home of D. Alapa'i Kahinu, on this kaha (shore) of Kapalaoa, as well as the family of Kimo Hale, the families of these two women who hosted us at this kaha mehameha (lonely shore), and who shared this tradition with us.

At the place where the stone body of the chiefess Kuaīwa is found, the water is shallow. It is at the sandy shore which is where 'Anaeho'omalū begins. At this little shallow place, there live many he'e o kaiuli (octopus which come up from the deep sea). In the months of September and October the he'e move up from the depths of the sea and dig their holes in this shallow water, and are a great benefit to the natives of the kaha wai 'ole o nā Kona (waterless shore of the Kona lands). It is not called this because there is no water, but because the water is not sweet. Most of the water of this shore is half salt water (brackish).

At the home of Kimo Hale, where his descendants reside, there is a punawai (spring) dug into the earth, a spring in the coral stones. The spring was made by the Hawaiians, by cooking some of the coral as in an imū, at the instruction of Mr. Spencer, the grandfather of Sam M. Spencer. The spring is known by the name "Pakana." The spring, made about fifty years ago, remains there to this day. It is from this spring that visitors obtained water while resting at the village of Kapalaoa, and through the graciousness of the family of Kimo Hale, who make the spring known to the visitors.

In the shallow waters of Kapalaoa, there are also many ku'una 'upena (net fishing spots), and more than enough fish may be caught in the nets, filling the fish bowls of the natives of this desirable shore. There is a boastful saying, that one "Lights the fire and is filled with joy, before going to catch the fish, which are placed jumping on the flames." The words are not true, but are said in boast of the good fishing. (S.L. Desha Sr., August 3, 1926)

Later, in the same series of articles, Desha wrote that by the 1870s, Revered George P. Ka'ōnohimaka assumed pastorate for the field of Kekaha, and through his efforts, at least six churches in the Kekaha region were established. The "Statistical Table of the Hawaiian Churches for 1877" identified G.P. Ka'ōnohimaka as the Pastor of the Kekaha Church, with a total of 174 members in good standing (Hawai'i State Archives, Lyons' Collection; M-96). Desha noted that the period he was writing about was the time when he was the minister of the churches at Kealakekua and Lanakila (ca. 1889).

The following excerpts come from the August 17, 1926 issue of *Ka Hōkū O Hawai'i*, and describe travel along the coastal and *mauka-makai* trails of the region in the late nineteenth century:

During the tenure of Rev. G.P. Ka'ōnohimaka, as Minister of the Churches of Kekaha, he worked with true patience. He traveled the "kihapai laula" (broad field or expansive parish) on his donkey, keeping his work in the various sections of the kikapai laula. There were times when he would begin his journey by going to a section of Nāpu'u (The Hills), that is Puuanahulu and Puuwaawaa. Then when he was done there, he would go down to Kapalaoa, at the place known as Anaehoomalu. When he was finished there, he would travel to the various places, being Keawaiki, Kiholo, Ka'ūpūlehu, Kukio, Makalawena, Mahaiula, and Honokōhau and Kaloko. Kaonohimaka would then return to the uplands of Kohanaiki and Kalaoa. He would be gone for several weeks at a time till he returned once again to his home. He would sleep as a guest in the homes of the brethren.

There were many Church Elders (luna ekalasia) in these places where the people dwelt. In these various places, there were many residents and the prayer services would be held in the homes of some of the people, if there was no school house or meeting house at certain places.

It was the custom of the people he visited to give him gifts of various kinds... One time while on one of his journeys to Nāpu'u to hold a meeting, when the gathering was over, he was given a chicken. He took the chicken, held it in his hand, and then secured it to the saddle of his very patient donkey. This was a good and patient donkey who took him everywhere. Holding on to his umbrella, Ka'ōnohimaka departed, to go down to Kapalaoa, and hold a meeting with the families of the shore.

Shortly after he passed the place called “Puu Anahulu,” the chicken began fluttering all around, which greatly startled the donkey, and caused him to turn around. So the favorite donkey of Reverend Ka‘ōnohimaka threw him off with his umbrella, which broke in the fall. Fortunately Reverend Ka‘ōnohimaka was not hurt in the fall, and the donkey did not run away, leaving him in the middle of the pāhoehoe fields. Instead the donkey came back and with a smile, Reverend Ka‘ōnohimaka got back on and continued his journey...(Desha in Ka Hōkū O Hawai‘i, August 17, 1926:3)

3.3.3 POST CONTACT POPULATION AND LAND USE

Population and land use are interrelated. The number of people that an area can support is a function of the natural characteristics of the land, the size and skills of the population, and the external markets that influence both. This section summarizes the information that is available about the way in which population in the Kīholo area has changed from the middle of the 19th century to the present.

3.3.3.1 Population

Up until the middle of the 19th century, a small population of Hawaiians continued to live within the area that is now the Kīholo State Park Reserve, much as it had in pre-contact times. Prior to the 1859 lava flow, most of those were probably in a small village at Wainānālī‘i. However, by the 1850s herds of feral goats and wild cattle began to make significant impacts in the region and the 1859 lava flow overran the houses, fishponds, and salt beds, causing the inhabitants, to flee. From that time onward the coastal population was more focused along Kīholo Bay itself.

Documentation on the churches and schools showed two schools in the area in the 1840s. One was at Wainānālī‘i, where a man by the name of Kalua taught 18 students. The other was at Kīholo, where Punihaole was the teacher of 21 students. The lava flow of 1859 destroyed the Wainānālī‘i school, and it was not rebuilt. In 1865, School Inspector Charles Gulick, conducted a detailed survey of 85 of the 94 “common schools” on the island of Hawai‘i, but did not reach Kīholo. The 1873 report on the schools of North Kona did not contain information on the school at Kīholo. The number of students had declined further by the time of the 1880 census, and consisted of eight boys and three girls. The school was situated in the church. In view of the relatively large family size and high percentage of school attendance that was typical at the time, this student population probably correlated with a total population that was no more than two or three times that size.

By 1898, the coastal region schools of Kekaha were in decline, and the mauka school at Pu‘u Anahulu was replacing the Kīholo school. Oral history interviews (cited in Volume II) describe a process of seasonal residency—when school was in session or during droughts, families with children lived in the uplands; when school was out, or other activities called for it, the families lived at Kapalaoa, Keawaiki, Kīholo, and Ka‘ūpūlehu.

An 1898 report to the Department of Public Instruction noted four houses and 13 children present at Kīholo. It also reported that the church there is of stone, roofless and windowless. Observing that “...nothing grows there but a few halas and some hawani [loulou] trees. All their food except fish is brought there. It’s down on the beach. There ought not to be any school there, for people shouldn’t live there.” Apparently the words were taken to heart, because the Kīholo school had reportedly been abandoned by the turn of the century; from that time school instruction only took place at Pu‘u Anahulu. There were simply not enough students nearby to justify continued operation of these educational facilities.

During the mid-1870s, there were still a number of people involved in subsistence agriculture in the uplands and fishing at Kīholo. By 1924, most of the people were gone and the land was quiet. Reportedly, Kīholo, which had once been a populated place, had not one Hawaiian living there, only one Japanese man, who worked for Robert Hind as a caretaker of the land and house.

The permanent population of Kīholo has remained relatively small, but the construction of several large residences over the past few decades, as well as the continued part-time use of dwellings owned

by families long associated with the area, have provided a residential presence within the area that is now encompassed by the park.

3.3.3.2 Land Use

The first formal ranching efforts on the Pu‘u Wa‘awa‘a-Pu‘u Anahulu lands were initiated under a lease granted by Kamehameha V to three Hawaiian lessees in 1863. The lease was subsequently let out to Francis Spencer in 1865, and most of the Nāpu‘u lands were controlled by him for ranching through the early 1890s. Spencer’s lease ended in 1895, and portions of Pu‘u Anahulu were subdivided into homesteads for native tenants, the remainder of the Nāpu‘u lands were leased to the partnership of Eben Low and Robert Hind, and the Pu‘u Wa‘awa‘a Ranch was established. By 1905 Robert Hind controlled all of the ranching interests.

George Bowser, editor of *The Hawaiian Kingdom Statistical and Commercial Directory and Tourists Guide* (1880) described travel along the *ala nui aupuni* (government road) and smaller *ala hele* (trail system) from Puakō to Kīholo, and to the uplands of Pu‘u Wa‘awa‘a-Ka‘ūpūlehu, and on to Kailua. He noted the absence of any uses on the two great lava flows that cross the Kīholo State Park Reserve, saying: “There is nothing to be seen all the way but lava; lava to the right of you, lava to the left of you, lava ahead of you, lava behind you, and lava beneath you; the road for a dozen miles or more is composed of nothing but clinkers of every size.” The same source reports sparse patches of grass at Kīholo Bay, as well as a few small cocoanut groves composed of stunted trees around the village. Fish, on the other hand, were reported as being plentiful. The same traveler reported that the road from Kīholo southwards is rough and laborious, making movement parallel to the shoreline slow and hard on the horses. From the description it appears that the population and degree of use was low. Government records concerning the condition of roads in the region show that they were generally poor, particularly in areas affected by the 1859 lava flows, and that the resulting retardation of transport adversely affected the population and economy of the Kīholo area from the time of the great eruption onward.

Ranching in Hawai‘i began in 1793-1794, when Captain George Vancouver of the British Navy, introduced the first cattle to the islands, offering them as gifts to Kamehameha I. At the request of Vancouver, Kamehameha tabooed the killing of cattle (except excess bulls) for ten years; both men felt that the establishment of cattle herds would not only be of advantage to the native people but would also enhance the value of the islands as a commercial depot and rendezvous. The ban, which was extended several times after the original one expired, led to a great increase in the number of cattle, which spread through the mountain lands of Mauna Kea, Mauna Loa and Hualālai.

To help control the growing herds, Kamehameha I hired foreigners to hunt the *pipi ‘āhiu* (wild cattle), one of the first being John Palmer Parker (who later founded Parker Ranch). By the 1820s the hides, meat, and tallow of the wild cattle were growing in commercial value. Whaling ships had begun regularly making their way to Kealakekua, Kawaihae, Lāhainā, Honolulu, and other island harbors so their ships could be restocked with needed provisions, including fresh and salted beef. This was timely for the kingdom because the economy was suffering as the high chiefs spent more than they earned and the sandalwood that had been one of the most valuable trade items of the kingdom was exhausted. By about 1830 Kamehameha III had vaqueros (Mexican-Spanish cow-hands) brought to the islands to teach the Hawaiians the skills of herding and handling cattle, and by the 1870s the Hawaiian cowboy (*paniolo*) was an established part of the economy and the culture.

Much of the initial growth of ranching (1824-1861) was related to the market for meat created by the whaling ships that stopped in the Hawaiian Islands for replenishment. During that period, nearly all of the cattle belonged either to the King, the government, other chiefs close to the King, and a few foreigners who had been granted the right to handle the cattle. By 1851 there were around 20,000 cattle on the island of Hawai‘i, and approximately 12,000 of them were wild. The wild cattle were hunted almost solely for their hides, and the hunting was so intense that it drastically reduced the wild population (and, therefore, the number of people who could make their living from hunting them).

Offsetting this was an increase in ranching, and this had a transformative effect on native land use, life, and ecosystems, particularly in the upper *kula* plains and in the cool forest lands, which captured water from clouds, dew and rain. The introduced ungulates stripped large areas bare of vegetation and water, and this reduced the ability of native families to sustain themselves. Thus, while the absence of a significant cattle population in the Kīholo area meant that there were no substantial direct impacts there, ranching affected the population indirectly by making traditional agriculture less productive and, therefore, less attractive.

Numerous historical observations—as those cited in the preceding article and other sections of this study—regarding the demise of Hawaiian forest lands and the impacts of cattle and other introduced animals on native tenants of the land, were causing great alarm to Kingdom residents from the mid-1800s. The result was early efforts at the development of conservation clauses in leases of Hawaiian lands to be used for ranching purposes. As early as the 1870s (Francis Spencer’s lease of Pu‘u Anahulu), and throughout the 1890s to 1950s lease of Pu‘u Wa‘awa‘a-Pu‘u Anahulu to the Hinds, lessees were required to implement a wide variety of conservation activities. The tradition of requiring conservation actions is still specified (though implementation is problematic) in clauses of the present State leases of Pu‘u Anahulu-Pu‘u Wa‘awa‘a.

Early in their tenancy on the government lands of Pu‘u Wa‘awa‘a and Pu‘u Anahulu, Eben P. Low, Robert Hind, and various family members and associates began efforts at acquiring parcels of the lands in fee simple title. By 1914, Robert Hind began acquiring title to portions of, or all of the homestead lots in Pu‘u Anahulu from the native residents, and by the late 1920s he began consolidating his interests in Pu‘u Wa‘awa‘a Ranch (including the lease lands of Pu‘u Anahulu and Pu‘u Wa‘awa‘a and the various homestead parcels he had acquired) under the corporation name “Robert Hind, Limited.” Pu‘u Wa‘awa‘a Ranch was eventually comprised of a total of about 128,000 acres, only a small part of which were actually good for cattle. By one estimate, just under 100,000 acres were waste land covered with lava flows, 28,000 acres were marginal for grazing, and only 1,500 were really good grazing lands or suitable for cultivated crops (100 acres). Of this total, the corporation owned only 300 acres in fee simple; it leased the remainder from the government. The portion of this land that was judged best for grazing was located at 5,000 feet elevation.

During the late 1920s and 1930s, a total of about thirty miles of fences, half stone and half wire, existed on the ranch, nearly all of them at higher elevations (i.e., outside the boundaries of the Kīholo State Park Reserve). During that period the ranch supported about 2,000 Herefords, and about 500 head, ranging between two and three years of age and dressing out at 500 pounds were marketed annually, nearly all being sent to Honolulu via the interisland steamers that called at Kailua-Kona. The ranch maintained about sixty light horses and raised about ten mules per year. It had few pigs or sheep, but it kept about two hundred dairy cattle. These were the young calves from the Hind-Clarke dairy in Honolulu which are carried to the calving age at Pu‘u Wa‘awa‘a Ranch and then sent back to the dairy in Honolulu again.

3.3.3.3 Trails and Access

Ala hele (trails) are not often thought of as a separate land use, but as they form an integral part of the cultural landscape of Nāpu‘u, they deserve some discussion here. Native accounts cited earlier in this study provide readers with descriptions of trails—those running laterally with the shore, and those that run *mauka-makai* (towards the uplands). The *ala hele* provided accesses for local and regional travel, subsistence activities, cultural and religious purposes, and for communication between extended families and communities.

Maly’s summary of historical accounts describe at least two trails, “*ala loa*” of regional importance that cross through the Nāpu‘u region. One *ala loa* was *makai* (near the shore) linking coastal communities and resources together, the other one was *mauka*, providing travelers with access to inland communities and resources. The upland trail also allowed for more direct travel between Kona, Waimea, and the mountain lands. In addition to *ala hele* and *ala loa*, one of the most

important types of trails found in Nāpu‘u are those which were generally known as “*ala pi‘i uka*” or “*ala pi‘i mauna*” (trails which ascend to the uplands or mountain). These are the trails that are now generally referred to as *mauka-makai* trails.

Because ancient trails were established to provide travelers with standardized and relatively safe access to a variety of resources, the trails were (and remain) important features of the cultural landscape. A wide variety of cultural resources are found along the trails. These include permanent and temporary residences, enclosures and exclosures, wall alignments, agricultural complexes, resting places, resource collection sites, ceremonial features, *ilina* (burial sites), petroglyphs, caves, subsidiary trails, and other sites of significance to the families who once lived near the trails. The trails themselves, also exhibit a variety of construction methods.⁶⁴

Western contact brought about changes in the methods of travel (horses and other hooved animals were introduced to supplement foot travel). By the mid-nineteenth century, wheeled carts were being used on some of the trails. In Nāpu‘u, portions of both the nearshore and upland *ala hele-ala loa* were straightened out, widened, and smoothed over, while other sections were simply abandoned for newer more direct routes, some of which took travel away from the shoreline. In 1847, King Kamehameha III instituted a program that modified many old trail alignments, making them a part of a system of “roads” called the “*Ala Nui Aupuni*” or Government Roads. Work on the roads was funded in part by government appropriations, and through the labor or financial contributions of area residents and prisoners working off penalties. In the Nāpu‘u region, sections of the *alanui aupuni* (that is, the Kīholo-Kanikū Road and Kona-Waimea Road) are lined with curbstones; elevated; and/or made with stone-filled “bridges” in areas that level out the contour of the roadway. These *alanui aupuni* became the main routes of travel for most who crossed through the region, while the smaller trails between the shore and mountain lands continued to be used by native tenants of the lands, and as a part of the ranching interests that developed in Pu‘u Wa‘awa‘a and Pu‘u Anahulu.

Maly (2011) identified several traditional and historic trails of Pu‘u Wa‘awa‘a and vicinity referenced in native accounts, historical records, and oral history interviews with elder *kama‘āina* of the region:

- (1) Kīholo-Pu‘u Wa‘awa‘a Wagon Trail. As it presently exists, this trail was made ca. 1900 by the Robert Hind-Eben Low partnership, following their securing of the lease on the Government lands of Pu‘u Wa‘awa‘a; and a smaller fee-simple holding in the ahupua‘a. The trail was used to facilitate transportation between the uplands (ranch headquarters) and the Kīholo landing; lumber for the historic “Pihanakalani” house of the Hind family was transported via this trail. Families used the trail through the 1960s.
- (3) Kīholo-Pu‘u Anahulu Trail. Basically the ancient ahupua‘a trail, this *ala hele* passes through the Pu‘u Anahulu Homesteads, through the subdivision (under houses...), out to Pu‘u Huluhulu, and down to Pu‘u Wa‘awa‘a (hill).
- (4) Kīholo-Hu‘ehu‘e Trail. The *Alanui Aupuni*, modified by order of the King in 1847-1848, and generally overlying the ancient Keala‘ehu Trail which ran from North Kona, through the Kona-Ka‘ū boundary.
- (5) “Ala Kahakai.” This name is not the traditional name of the trail. It is the *Ala Loa*, portions of which were modified by order of 1847-1848, into the *Alanui Aupuni*.
- (6) Inland Alaloha Trail. There are at least two major trails—described in traditions and oral historical accounts—that pass through the mauka reaches of Pu‘u Wa‘awa‘a. One passes off of Keala‘ehu (‘Akāhipu‘u section) to Pu‘u Wa‘awa‘a and Pu‘u Anahulu, and continues out to Waimea (Kealaku‘i – the Reservation Trail). The other, the Nā‘ōhule‘elua Trail, cuts further

⁶⁴ In Nāpu‘u, “ancient” trail construction methods included the making of worn paths on *pāhoehoe* or ‘*a‘ā* lava surfaces, curbstone and coral-cobble lined trails, or cobble stepping stone pavements, and trails across sandy shores and dry rocky soils.

mauka, connecting with the plateau lands trail at Pu‘u Koko, and then allowing access to Hilo, Mauna Kea, and Waiki‘i-Waimea. Beyond Pu‘u Wa‘awa‘a’s upper reaches, this trail also connected to the Ahu-a-‘Umi and Keauhou Trails.

- (7) Hualālai Trail. This is the Kīleo Trail, which facilitated access to the summit region of Hualālai from Pu‘u Wa‘awa‘a, and also connected with the Nā‘ōhule‘elua Trail.

These historic trails connect resources extending from the shore to the mountain lands and are, therefore of cultural significance and use of the trails needs to be managed so as to protect these values. Establishment of a *kama‘āina* stewardship program and that includes the assembly and maintenance of interpretive reference materials would facilitate wise use and care of the resources in Pu‘u Wa‘awa‘a.

3.3.4 CULTURAL AND SEASONAL TRADITIONS

Maly concludes that historical accounts and oral history interviews with native residents of Pu‘u Anahulu and Pu‘u Wa‘awa‘a describe a system of residency in the region founded on familial relationships and knowledge of the land. The historic families of Pu‘u Anahulu and Pu‘u Wa‘awa‘a shared – and through their descendents continue to share – an intimate relationship with the ‘*ohana*’ of neighboring communities. Historically, these communities were part of an interwoven cultural landscape based on kinship which bound together areas such as Kapalaoa, Keawaiki, Kīholo, Ka‘ūpulehu, Kūki‘o, Makalawena, Kalaoa, and Kohanaiki, and extended into the South Kohala area as well. It was perhaps the nature of the landscape of *Kekaha-wai-‘ole* (the waterless Kekaha region), that brought the families together, not only within individual *ahupua‘a*, but also on a regional level. By living and working within the ‘*ohana*’, or extended family units, a wide variety of skills and knowledge were brought together, and resources—those purposefully cultivated and those collected from the environment—from the uplands to the fisheries, were pooled together and exchanged to support the extended families and communities.

For the families of Pu‘u Anahulu and Pu‘u Wa‘awa‘a, there is a custom of seasonal travel between the uplands and the sheltered coves along the shore that is rooted in antiquity. In a series of traditional accounts penned by the native historian J.W.H.I. Kihe (a Pu‘u Anahulu Homestead resident), Kihe and his collaborators presented readers with a traditional account of the custom:

*‘Oia ka wā e ne‘e ana ka lā iā Kona,
hele a malo‘o ka ‘āina i ka ‘ai kupakupa ‘ia e ka lā,
a o nā kānaka, nā li‘i o Kona,
pūhe‘e aku la a noho i kahakai kāhi
o ka wai e ola ai nā kānaka.*

It was during the season when the sun moved over Kona,
Drying and devouring the land,
That the chiefs and people fled from the uplands
To dwell along the shore where water could be found
To give life to the people. (April 15, 1917)

Another saying, perhaps the most famous one of the Nāpu‘u-Kekaha region, also offers insight into the depth of the cultural attachment native residents share with their natural environment, likening the *makai* movement of the people to *lehua* blossoms drifting down to the sea (J.W.H.I Kihe in *Ka Hōkū o Hawai‘i*, February 21, 1928):

*Ola aku la ka ‘āina kaha,
ua pua ka lehua ia ke kai*

The natives of the Kaha lands have life,

The *lehua* blossoms are upon the sea!

This saying describes the seasonal practice of the natives of this region, who during the winter planting season lived in the uplands, where they cultivated their crops under the shelter of the *lehua* trees. When the fishing season arrived with warmer weather, the natives would travel to the shore, where the fishing canoe fleets could be seen floating upon the sea like *lehua* blossoms. It was as a result of this knowledge of the interplay of seasons and resources, and the relationship between land, ocean, and community, that the residents of Pu'u Anahulu, Pu'u Wa'awa'a, and the broader Kekaha region flourished.

As described previously, the native Hawaiians managed their lands according to the ahupua'a system of resource allocation. This system defined care of, and access to natural resources, within specific land divisions called ahupua'a. In well watered districts with rich soils, it appears that the system of boundary and resource management remained generally intact throughout the nineteenth century. However, historical accounts of the lands now incorporated into Kīholo State Park Reserve and surrounds, describes a system of caring for and sharing resources on a regional level, rather than relying primarily upon the resources of a single ahupua'a. It may never be known if this pattern of regional (inter-ahupua'a) access to resources in Kekaha was ancient, or if it was a response to changing times—e.g. the development of ranching operations in the area, formalization of a land ownership system, and a declining native Hawaiian population.

By the late nineteenth century, the coastal communities of Pu'u Anahulu and Pu'u Wa'awa'a consisted of only a few households, with residency focusing in the uplands or even out of the district. Depending on kinship ties and weather conditions, the families of these areas still traveled to and took up residency at areas along the coast, and individuals who lived on the shore made seasonal journeys to the uplands as well. In areas like Makalawena, Ka'ūpūlehu, Kīholo, Kapalaoa, and Puakō, where natural resources were generally favorable, a few families were able to maintain residences into the 1930s. Oral history interviews with area *kūpuna* (elders), record that even after the last native residents left their coastal dwellings (which occurred by the early 1930s), they continued to return to the shore seasonally for the collection of resources and sustenance of the families (cf., Kelly 1971; Springer 1985, 1989, 1992; Maly 1997, 1998 a and b, and 1999).

3.4 ORAL HISTORICAL ACCOUNTS FROM THE FAMILIES OF NĀPU'U

3.4.1 OVERVIEW AND METHODOLOGY OF THE KĪHOLO–NĀPU'U ORAL HISTORY PROGRAMS

Recording oral history interviews is an important part of the historical review process. Because the experiences conveyed through interviews are personal, the narratives are richer and more animated than those that may be typically found in reports that are purely academic or archival in nature. Through the process of conducting oral history interviews, things are learned that are at times overlooked in other forms of documentation. The interviews also help demonstrate how certain knowledge is handed down through time, from generation to generation. Thus, oral historical narratives provide both present and future generations with an opportunity to understand the cultural attachment or relationship shared between people and their natural-cultural environments.⁶⁵

The oral historical research conducted for Kīholo was performed in a manner consistent with federal and state laws and guidelines for such studies. In addition to two interviews with 14 participants conducted specifically as part of the master planning effort, several other interview programs are

⁶⁵ As used by Maly, the term “Cultural Attachment” embodies the tangible and intangible values of a culture. It is how a people identify with and personify the environment (both natural and man-made) around them. Cultural attachment is demonstrated in the intimate relationship (developed over generations of experiences) that people of a particular culture share with their landscape—for example, the geographic features, natural phenomena and resources, and traditional sites etc., that make up their surroundings. This attachment to environment bears direct relationship to the beliefs, practices, cultural evolution, and identity of a people (cf. James Kent, 1995).

referenced in the oral history citations below.⁶⁶ While preparing to conduct the recent interviews Maly and other members of the study team developed a general approach and questions to help direct the oral history interviews. The questionnaire outline established the general direction of the interviews, but it did not limit interviewees to those topics. Various aspects of general and personal family histories and personal experiences which stood out as important to the interview participants and which arose during the course of the discussions were recorded as well.

The general question outline for the interviews included the following.

- Name, contact information, and interview date/place.
- Date and place of birth, and name of parents.
- Information on where and by whom the interviewee was raised and other family details (e.g., additional family background pertinent to the Kīholo study area, generations of family residency in area, time period of residency, and the kinds of information learned/activities participated in, and how learned.
- Naming of the *ahupua‘a* or sections of the land that are of particular significance in the history of the land and to native practices...
- Knowledge of *heiau* (or other ceremonial sites), other cultural resources (for example – *kū‘ula*, *ilina*...), and families or practices associated with those sites.
- Knowledge of land based *ko‘a* (cross *ahupua‘a*) — ocean based *ko‘a*; *kilo i‘a* (fish spotting stations) locations and types of fish? Names of *heiau* and *ko‘a*...
- Burial sites, practices, beliefs, and areas or sites of concern (ancient unmarked, historic marked/unmarked, family)...Representing who and when interred.
- Villages or house sites; church; stores; community activities. Names of native- and resident-families and where did they previously lived.
- Fishing practices (i.e., where occurred or occurring, types of fish; names of fishermen; and what protocols were observed. (Such as: permission granted, practices and methods of collection.)
- Who were/are the other families that came and/or come to collect area resources, and protocol?
- Gathering practices (who and what). Salt making. Shoreline and *mauka-makai* trail accesses.
- Personal family histories of travel upon the trail.

⁶⁶ Nearly all of the participants in the Nāpu‘u oral history program are descended from the native families granted homestead lands at Pu‘u Anahulu as a part of the Land Act of 1895. As noted earlier, most of the native Hawaiian homestead applicants themselves were descended from individuals who had resided in the lands Nāpu‘u or adjacent lands of Kekaha for generations prior to the establishment of the homestead program. Interviewees who were not descendant of the native and traditional residents of Nāpu‘u were either descended from the founders of Pu‘u Wa‘awa‘a Ranch (descendants of the Robert Hind and Eben Low families), or individuals who had personally worked the ranch lands and who were identified as being very knowledgeable of the cultural-historical landscape of Nāpu‘u.

As a part of the larger interview programs cited in this study, the eldest surviving members of the native families of the Kīholo–Nāpu‘u region were asked to, and did participate in the interviews. Unfortunately, since those earlier interviews many of the *kūpuna* (elders) passed away. The primary participants in the 2011 oral history interviews included (in alphabetical order): Tracy-Mae U‘ilani Ha‘o (Nāpu‘u ‘ohana), Mike Hind (Hui Aloha Kīholo), Jenny Hind- Mitchell (Hui Aloha Kīholo), Ku‘ulei Keākealani (Nāpu‘u ‘ohana and Hui Aloha Kīholo), Robert Kamuela Sonny Keākealani (Nāpu‘u ‘ohana), Leina‘ala Keākealani Lightner (Nāpu‘u ‘ohana), Shirley-Ann Kau‘ilani Keākealani Wilcox (Nāpu‘u ‘ohana), Robert Liwai Mitchell (Nāpu‘u ‘ohana), Kamehanamauloa Tachera (Nāpu‘u ‘ohana), and Ku‘unahenani Tachera (Nāpu‘u ‘ohana).

Additional 2011 Interview Program Attendees Included: Luisa Castro (State Parks), Casey Cho (Community), Randy Clarke (Hui Aloha Kīholo), Mike Donoho (Hui Aloha Kīholo), Kamanawa Hind, and Shinji Inaba (Community).

Historic Interviews (Several participants in the 2011 interviews also participated in earlier programs): Raymond Keawe Alapa‘i, Gordon Alapa‘i, Howard Alapa‘i, Lois Alapa‘i-Akao, Nancy Alapa‘i-Hepa, Geo. Kinoulu Kahanani, Sr., Miki Kato, Caroline Kiniha‘a Keākealani- Pereira, Luika Ka‘uhane (Keākealani), Charles Mitchell and Edith Kau‘ihelawaleokeawaihi Ka‘ilihiwa Mitchell, William “Billy” Hāwawaikaleonāmanuonākanahale Paris, Jr., Robert Ka‘iwa Punihaole, Sr., Elizabeth “Tita” K. Ruddle-Spielman, and Coco Vredenburg Hind.

- Historic Land Use: Agricultural and Ranching Activities. The relationship with other ranches; shipping from shore; routes traveled.
- Ranch management of land resources (for example – fencing; planting activities; hunting and other practices).
- What events of your youth stand out in your memory?
- Do you have any early photographs of the area?
- Do you have any recommendations on caring for the natural and cultural resources of Kīholo and vicinity? Are there particular sites or locations (such as traditional sites, family homesteads, and *ilina* etc.) that are of cultural-historical significance or concern to you?
- Do you have recommendations — such as cultural resource- and site-protection needs in the Kīholo vicinity, that can help guide development of the state park programs? Can you describe sites and define boundaries of those sites/locations and of the area of access via the trail/road ...

In addition to questions focused on their background knowledge of the Kīholo area, another level of questions for the Kīholo State Wilderness Park program was utilized to help focus on management needs for the park's master planning process. These questions, integrated into the question outline above, included, but were not limited to:

- (1) What resources within the park are important to preserve or restore? Why?
- (8) What is important to teach visitors to the park? Why?
- (9) What would you plan for protecting, restoring, or teaching about the parklands? Why?
- (10) What would you change in how the Kīholo parklands have been or are managed? How should the changes be made?
- (11) What is good, or what do you like about the Kīholo curatorship program?
- (12) How would you like to be kept informed about management and developments with Kīholo State Wilderness Park?

The results of the historical documentary research and the oral history programs provide the State Land Managers, families of Kīholo–Nāpu‘u, members of Hui Aloha Kīholo and interested parties with detailed historical documentation pertaining to some of the significant cultural and natural features of the landscape of the Kīholo–Nāpu‘u region. Thus, through this information, readers will gain a greater understanding of the depth of the relationship—the cultural attachment—that native Hawaiian families of Nāpu‘u share with their *‘āina kula‘iwi* (land which is the resting place of their ancestors' bones).

The documentation also provides readers with a record of significant changes which have occurred upon the land—some from natural causes, and others directly the result of human activities. While there are strong feelings about some management practices which have been allowed through on-going Territorial and State management of the Kīholo–Nāpu‘u region—practices which some interviewees believe have led to resource degradation—the interviewees also express hope for the future and share recommendations on how to improve the situation. To that end, the interviews provide readers with foundational documentation for implementation of an *ahupua‘a*-based program focusing on long-term care, management, restoration and interpretation of the natural and cultural landscape of the Kīholo–Nāpu‘u region.

3.4.2 OVERVIEW OF KAMA‘ĀINA DOCUMENTATION AND RECOMMENDATIONS

The interviews document a number of areas of cultural significance. The resources described in the interviews fall into several categories, including but not limited to:

- (1) The cultural-geographic landscape—cultural and natural resources are viewed as one and the same in the Hawaiian mind;

- (2) Sites associated with native Hawaiian religious and ceremonial practices, extend from the shore to the upland forests;
- (3) *Ala loa* and *ala hele* (regional and inner *ahupuaʻa* trail systems). Trails include the *Alanui Kuʻi* (across the Puʻu Waʻawaʻa-Puʻu Anahulu forest lands, extending between Kona and Kohala); The Kīholo-Puʻu Waʻawaʻa Trail; the Puʻu Waʻawaʻa- Kīleo-Keauhou Trail; and numerous trails across the Nāpuʻu lands;
- (4) Sites associated with temporary and long-term native habitation (shelters, modified caves, and burials), and homestead activities;
- (5) Coastal and near shore fisheries, marine resources collection areas, and *kāheka* and *loko paʻakai* (natural and modified salt making ponds);
- (6) Land division and paddock boundary markers; and
- (7) Features and practices associated with ranching activities—including descriptions of historic and contemporary management practices, and the decline of the land under the latter management scheme.

The interviewees also discussed several areas of concern and recommendations for long-term protection and management of the cultural and natural resources of Nāpuʻu. A general summary of these comments and recommendations include, but are not limited to the following topics:

- (1) Protection of the natural and cultural features of the Kīholo–Nāpuʻu region. Among these are the sacred sites of the landscape, including ceremonial sites, *ilina* (burials), and places which are documented in the traditions of Kīholo– Nāpuʻu.
- (2) Support the curatorship program (Hui Aloha Kīholo) in establishing a center which would serve as a repository for artifacts, historic documents and land/resource management studies, and oral history collections, where the history of the land and people who have lived upon and worked the land can be taught, researched, and recorded. Interviewees believe that such a facility will help protect the history of the land and be invaluable in decision-making for future activities in Kīholo State Wilderness Park and the larger Puʻu Waʻawaʻa-Puʻu Anahulu *ahupuaʻa*. They envision programs offered at the Center seeking to interpret the cultural and natural resources and ranching history of Nāpuʻu and helping to encourage respectful use of the land and informed visitation to the area.
- (3) Provide input and guidance to the State of Hawaiʻi in the future management and treatment of cultural and natural resources of Kīholo State Wilderness Park and the larger Puʻu Waʻawaʻa-Puʻu Anahulu *ahupuaʻa*. Hui Aloha Kīholo and Nāpuʻu *ʻohana* members seek to help facilitate programs that will foster protection of resources in the Kīholo–Nāpuʻu region. Resources and subsistence activities of concern to the native families of the land include, but are not limited to management of the salt works, and *koʻa* (dedicated nearshore and offshore fishing grounds); and establishing a dynamic plan of sustainable resource development, carrying capacities and land/ocean use.
- (4) Respect the *ilina* (burials), *kahua hale* (residential features), *ala hele* (trails), *kaha pōhaku* (petroglyphs), and other sites within the Kīholo–Nāpuʻu region;
- (5) Work with the families who are descended from the *poʻe kahiko* (ancient people) of Nāpuʻu in determining proper treatment of *ilina* and other cultural sites and resources;
- (6) Encourage cultural and natural resources stewardship and “wise use” on behalf of all who touch the lands of the Kīholo–Nāpuʻu region.
- (7) Support the Hui Aloha Kīholo and Nāpuʻu *ʻohana* in the work of ensuring that the park and *ahupuaʻa* resources will be cared for and passed on to future generations.

3.4.2.1 September 6, 2011, Kīholo State Wilderness Park Oral History Interviews

On September 6, 2011, Kepā and Onaona Pomroy Maly interviewed eight members (three generations) of native Hawaiian families who have lived at Kīholo, Kapalaoa, and the larger Nāpu‘u region for many generations.⁶⁷ The gathering was made possible through the efforts of Ku‘ulei Keākealani, who has been given the *kuleana* by her family to work on behalf of the ‘āina, *kūpuna* and future generations in passing on the cultural legacy of their ancestral lands. The Hind family, which has been a part of the history of Nāpu‘u since the 1890s, allowed the interview to take place at a family home on the shore of Kīholo, sitting just south of the place now called Kaua‘i. The name Kaua‘i was given because it is the site of a house (stone and coral mortar) at which Kaua‘i, a *kūpuna* of the interview participants, lived. Elder family members of the interview participants, all but one of whom have passed away, shared their recollections with Maly in interviews conducted from the early 1990s to 2000. The knowledge and experiences shared by interviewees in this interview, has time depth and is rooted in the traditions of their elders.

The interviewees raised and/or discussed the following points:

- The ‘*ohana* participant ties spread from Kīholo to Kapalaoa and beyond.
- *Kūpuna* acknowledged and cared for ‘*aumākua* – family tied to *manō* (sharks).
- *Kūpuna* are buried across the land from coast to mountain regions. *Iliina* (burial places) must be protected from the desecration experienced over the last 20-plus years, where remains have been impacted by human intrusion. Interviewees suggested that cave burial sites be closed off whenever possible and recommended that burial features should be minimally signed to ensure that people are aware that impacting such site is punishable by law (e.g. HRS Chapter 6E).
- Families regularly traveled between the uplands and shore – seasonally families relied on the fresh/brackish water resources of the coastal lands. Today those places, like Keanalele are desecrated by careless use.
- Until the State of Hawai‘i acquired them, access to the coastal lands was controlled. Once the park was established the control was lost, and resources were abused – fisheries over harvested, cultural sites (burials, house sites, water ponds, and other sites were desecrated).
- Education and enforcement of rules and regulations is critical to long-term management and use of the Kīholo State Wilderness Park resources.
- There is concern among family members that for years they have been asked for information and guidance in management of the park and larger Nāpu‘u lands, but the input has lacked action. It is time to take action or lose what is left.
- The Hui Aloha Kīholo/‘*Ohana* curatorship and stewardship partnership with the State is a good program. ‘*Ohana* members are the one constant upon the land. Their knowledge and presence will help facilitate *pono* management and care of the resources so that Kīholo State Wilderness Park can be enjoyed by future generations.
- Temporary closure of the park is supported by the ‘*ohana*. The land and ocean needs time to rest. It was observed that over the last 20-plus years, some 28 to 30 species of fish have been radically impacted by over harvesting.
- When the park is reopened, there must be facilities for restrooms and rubbish receptacles with regular collection services. Rules and Regulations for park use/camping must be enforced, with penalties (e.g. fines and loss of future privileges) for failure to care for the land and resources.
- The land has a limited carrying capacity. This capacity must be the foundation of the planned camping program in Kīholo State Wilderness Park.

⁶⁷ The interviewees on this date included the following individuals: Robert Liwai Mitchell, Sr.; Robert Kamuela Sonny Keākealani; Shirley-Ann Kau‘ilani Keākealani; Ku‘ulei Keākealani; Leina‘ala Keākealani Lightner; Tracey Mae U‘ilani Ha‘o; Kamehanamuloa Tachera; and Ku‘unahenani Tachera.

- Luahinewai is a sacred and storied place. Efforts to ensure its long-term protection should be made.
- The “Loretta Lynn” house (Mula) should be developed as a management / interpretive facility for the park.
- Hui Aloha Kīholo (a curatorship partner with State Parks) should be supported in its efforts to assist the State in implementing long-term educational/interpretive and management programs in the park.
- Management of Kīholo State Wilderness Park should be done in an *ahupua‘a* context – the coastal lands relating to, and interconnected with, the natural and cultural resources of the *kula* and *mauka* lands.

3.4.2.2 September 7, 2011, Kīholo State Wilderness Park Oral History Interviews

Kepā and Onaona Pomroy Maly conducted this meeting/interview following a meeting and site visit with a group of more than a dozen individuals representing families with generational ties to lands of the Nāpu‘u region (former residents of Kīholo and Kapalaoa), members of Hui Aloha Kīholo, interested community members, Kīholo vicinity land owners, and representatives of the State of Hawai‘i (State Parks and other Divisions).⁶⁸ Arrangements for the meeting were coordinated by representatives of Hui Aloha Kīholo, and the group initially focused on the Division of State Parks’ plans for temporary closure of Kīholo State Park Reserve, cleanup of the land, development of controlled access points, and identification of camp sites. The discussion included a walk along the existing access route, with discussions of alternative gates and parking areas. During the walk, planners noted key aspects of possible alternatives and sketched a map showing gate and parking area alternatives. Upon returning to the “Loretta Lynn House” (an area called “Mula” by *kama‘āina* families) some state representatives and a land owner representative left, and a formal, recorded interview was conducted.

The group gathered in the shadow of the house and discussed their feelings and hopes for Kīholo. The ideas they expressed included the following:

- Hui Aloha Kīholo organized because of their attachment to place and alarm over the degradation of sites and resources since becoming a state park. Family/Hui members expressed their absolute commitment to Kīholo. They said it was not a choice for them; they had to step forward on behalf of the place.
- Hui Aloha Kīholo is committed to *pono* management of Kīholo State Park Reserve, working with the state and interested parties, and has raised money and work force resources to put into action programs of stewardship, which the state has been unable to undertake.
- *Ilina* (burial sites) are logically to be left undisturbed, though *kūpuna* have come to a consensus that because there are [outside] people who seem not to care, all burial caves must be sealed off to protect their contents.
- Hui Aloha Kīholo and ‘Ohana/community members have observed the desecration of the cultural sites, water resources, and fisheries that has occurred while there has been insufficient oversight of the land. The lack of facilities and enforcement has been a detriment in care of the park. It is believed that the State, Hui Aloha Kīholo, and other partners can develop a successful stewardship program that will ensure wise use by the public, safe and clean camping, habitat restoration and return viability to the fisheries. Hui Aloha Kīholo is committed to this mission, but is limited by the economic capacity to ensure it is fulfilled.

⁶⁸ Participants included Mike Hind, Jenny Hind-Mitchell, Ku‘ulei Keākealani, Mike Donoho, Kamanawa Hind, and Randy Clarke (all representing Hui Aloha Kīholo); Luisa Castro (representing the Division of State Parks); and Casey Cho and Shinji Inaba (representing the general community).

- All participants in the interview concurred that education and interpretation of the natural and cultural history of the Kīholo-Kapalaoa coastline, and larger Nāpu‘u region is a critical component of any master-planning process for long-term stewardship and access to the park’s resources.
- Hui Aloha Kīholo and community members expressed their belief that the “Loretta Lynn House” is an asset to the park program. They expressed the belief that it could serve as a base for park management and as an interpretive educational center. They noted that with Kīholo’s designation as a wilderness park, compliance with certain accessibility laws is less difficult than it would be in a different setting. Community members present during the meeting/interview all felt that some level of accessibility could be provided at reasonable cost and volunteered to assist in the work.
- Interview participants suggested that the upstairs section of the existing house—in addition to serving as a base of park management operations—could become a repository for records and more valuable artifactual collections, while accessible, wayside exhibit features could be designed in the open ground floor level of the house. Immediately to the steps and Waia‘elepī side of the house are found the Mula salt pans, which open up the door to interpretive programs.

3.5 OPPORTUNITIES & CONSTRAINTS RELEVANT TO THE MASTER PLAN

3.5.1 INTRODUCTION

As can be seen by the wide variety of archaeological, historical, and cultural research which has been presented above, the Kīholo State Park Reserve is a storehouse of Hawaiian history and culture. These properties include archaeological sites, oral traditions, living persons with deep attachment to the area, and native practices which are rooted in the land. As part of its commitment to developing an effective management regime for the Kīholo State Park Reserve, State Parks and its consultants have attempted to assemble as much of the known historical information as possible on the area and have conducted a comprehensive archaeological survey to document as much of the material legacy of the place. While this information has been recorded in an electronic, geospatial database that make it readily available to park planners and resource managers, so much of the heritage of Kīholo is sensitive to misuse or outright vandalism that the consensus between the *kahu* (*who is the “kahu”?*), *kūpuna*, and the park planners is that specific information about the precise locations of sensitive archaeological and historical sites and their contents not be included in this document.⁶⁹

While deferring to this important concern, it is possible to broadly characterize the types of features which exist within the park and to present a plan to preserve and manage them effectively for the benefit of future, and due reverence for past generations. The findings can be broadly categorized as (i) utilized anchialine pools; (ii) structures and habitation sites; (iii) trails; (iv) special function features such as *hōlua*; (v) utilized lava tubes and pits; (vi) burial sites; and (vii) petroglyphs.⁷⁰ Although some of these features are entirely man-made, many of them (e.g., utilized anchialine pools and lava tubes) represent the complex interaction of human and natural history, having both scientific and cultural significance.

3.5.2 OPPORTUNITIES AND CONSTRAINTS RELATED TO PHYSICAL FEATURES

3.5.2.1 Habitation Sites and Structures: Opportunities and Constraints

The earliest written records regarding the lands encompassed by Kīholo State Park Reserve indicate that these lands never had a large resident population. However, the population was much greater prior to the destruction caused by the lava flows of 1801-1802 and 1859 and before the overall depopulation of the island that resulted from diseases introduced by Europeans. Moreover, many of

⁶⁹ A *kahu* is defined by Pukui and Ebert (1986) as: an honored attendant, guardian, nurse, or keeper of ‘*unihipili* (spirit of the dead) bones...’ With regard to Kīholo State Park, a *kahu* is a person who has been entrusted with care and maintenance of a cherished Native Hawaiian cultural property, such as a burial.

⁷⁰ *Hōlua* are former concourses for the Hawaiian pastime of downhill sledding.

the people who resided permanently in the uplands spent part of the yearly cycle in the lowland coastal areas of Pu‘u Anahulu and Pu‘u Wa‘awa‘a. Thus, the park area was once home to a substantial community of native Hawaiians, who came there to fish and gather natural products along the shore. Evidence of the long history of human habitation in the area includes quarries, pits, mounds, alignments, walls, partial and complete enclosures, and terraces which once formed the foundations for larger structures. None of these features have been the subject of any restoration work and most are all in various states of neglect or disrepair.

The general principle of the Master Plan is that it is not desirable to encourage large numbers of people to make unsupervised visits to these sites. Instead, efforts should be made to ensure that such visits are supervised. If, and as, funds become available to conduct further interpretive analysis or restoration work, and to develop and implement interpretive programs they could become part of the overall park experience. Accordingly, the general rule will be that State Parks will forego the erection of signs or other infrastructure that would locate, interpret, or otherwise call attention to these features for the visiting public.

3.5.2.2 Trails: Opportunities and Constraints

In previous times, and with the exception of travel by canoe, foot trails were the principal means of conveyance in the Kekaha region. The original network of prehistoric Hawaiian foot trails, generally referred to as *ala loa* or *ala hele* crisscrossed the landscape, interconnecting geographic and social features which were important to the people of those times. In the early post-contact period, as Hawaiian society faced rapid change, an additional layer of trails was added to this network, the *ala nui aupuni*, or government trails (commonly referred to as the King’s Trail) constructed by the Kingdom of Hawai‘i. The great lava flows in 1801-02 and in 1859 destroyed sizeable sections of the traditional trails, and only those segments which later generations deemed economically important were re-built. In many places within the park, the trails that were not destroyed, as well as a few more modern ones, remain in use by park visitors. They represent both an archaeological-historical feature of interest in their own right as well as a means to access other features of interest such as abrading pits and petroglyphs.

The Master Plan concept for the existing trails at Kīholo State Park Reserve envisions the King’s Trail, or *ala nui*, acting as a spine running along the north-south axis of the park, more or less parallel to the coastline and Queen Ka‘ahumanu Highway, which also act as thoroughfares for pedestrian access. Points of interest along or near to this trail could be presented to park visitors with interpretive signage. Between these north-south lines, smaller *ala loa* and modern trails would intersect or extend to distal points of interest in generally *mauka-makai* orientation. Entry nodes would be provided in the north along the existing King’s Trail adjacent to the Waikoloa Resort area, and along the shoreline near Kapalaoa, where a petroglyph field of interest would be a point open to park visitors. In the south, the entry node would also be along the King’s Trail connecting it with lands further south and making it an integral segment of the Ala Kahakai National Historic Trail, operated by the National Park Service. This would allow for a broad range of interpretive efforts by the NPS, the Ala Kahakai Trail Association and Hui Kuapa, by Hui Aloha Kīholo, and by other interested programs and individuals.

Where certain trails lead or interact with sensitive sites, such as endangered species habitat or native Hawaiian burial grounds, signage would be omitted and interpretive efforts restricted. It is generally seen as counterproductive to introduce signage prohibiting certain behaviors, but a passive method involving directing people to appropriate trails and sites with signage and leaving sensitive areas unmarked is generally effective in keeping visitor traffic from having unwanted impacts on archaeological and historic resources.

3.5.2.3 Special-Function Features: Opportunities and Constraints

This category encompasses a broad range of archaeological and historic features within the park that are not easily categorized because they pertain to various peculiar uses in the area. While difficult to

categorize, these properties are nonetheless part of the important physical heritage of the area, reflecting the diversity of activities in pre-contact and early post-contact times. Examples of these sites include *hōlua* sledding course, *ko‘a* or fishing shrines, and abrading pits where stone implements were fashioned.

These features are all of intrinsic interest and could be incorporated into interpretive programs if and when such programs are established. However, as with other archaeological properties they are fragile and subject to theft, vandalism, and inadvertent damage, and the only way to avoid this is to discourage their unsupervised use.

Another factor important for consideration is that resources in this category are distributed throughout the park, sometimes in areas where access can be challenging. Publicizing their presence without improving access routes to them would increase the likelihood of injury as individuals unprepared for the challenges they will face over-reach their capabilities. This factor can also be addressed best by not disseminating detailed information about the resources and/or their location.

With the above qualities in mind, the Master Plan concept would involve identifying in public documents only those special function features which lie along, or near the *ala loa*, *ala nui*, or shoreline which are already well known and/or readily visible and identifying this subset of the features in this category with appropriate signage. Interpretive materials and activities focused on these sites would provide visitors with a sense of the complexity and depth of Hawaiian civilization while allowing other, more sensitive sites, to remain unnoticed and unvisited by the vast majority of park-goers. In addition, efforts would be made to identify points of interest which were not easily accessible from roads within Queen Ka‘ahumanu Highway or internal park roads as a control against theft, vandalism, or other impulsive behaviors which could further degrade these features.

3.5.2.4 Petroglyphs: Opportunities and Constraints

As noted in Section 3.2.4.1, as early as 1910 Stokes had documented the wealth of petroglyphs found in the Kekaha region, including areas now encompassed by the Kīholo State Park Reserve. T.S. Dye and Colleagues, Archaeologists, Inc. have documented in the course of the archaeological reconnaissance of the park, eight separate petroglyph fields containing these unique rock engravings of images and symbols. While these works of native art are an important part of the physical heritage of the park, the same soft *pāhoehoe* lava rock that makes incision possible also means that they are fragile and subject to intentional or inadvertent damage. State Parks, its consultants, and the State Archaeologist have together identified the petroglyphs listed in Table 3.5 that are near or adjacent to trails or the shoreline which are appropriate for visitation by park goers.

Table 3.5 Sites Suitable for Visitation

<i>Site No.</i>	<i>Location</i>	<i>Description</i>	<i>Interpretive Theme</i>	<i>Type of Visitation</i>
	South End of Kīholo Bay	Complex of walls, including cattle holding pen and driving chute built adjacent to 1801 <i>a'a</i> flow.	Ranching, Changing Economy	Self-guided; set of interpretive panels.
	Central Kīholo Bay, near end of current access road.	Complex of small shelters and habitation features, centered around a small <i>hōlua</i> .	Kīholo as a chiefly residence; site degradation and rehabilitation.	Self-guided; set of interpretive panels. Would require some restoration work.
	Undisclosed	Water cave, other large tube system nearby with arch cave.	Lava tube formation; fresh water aquifer/importance in a seemingly arid environment; legendary significance of water caves.	Guided; escorted tours into cave with proper safety management devices in place. Would likely require gating of cave entrance.
	Northern Kīholo Bay, adjacent to 1859 lava flow between highway and coastline.	<i>Hōlua</i> , high-status residential complex, margin of former fishpond destroyed by lava.	Kīholo as chiefly residence; Kamehameha's fishpond/destruction by 1859 flow; ranching.	Interpretive walking trail via King's Highway and foot trails to Shoreline. This site would require installation of interpretive waypoints with information provided at multiple stops (variety of delivery means possible). Possible interpretive "gateway" entrance from northern park section from adjacent private developments.
	Northern park boundary.	Extensive abrader manufacturing area, foot and cart trails, temporary habitation, petroglyphs.	Tool manufacture, trade; transportation, meaning of petroglyphs.	Interpretive walking trail via King's Highway and foot trails to shoreline. Would require installation of interpretive waypoints with information provided at multiple stops; a variety of delivery means are possible. Possible interpretive "gateway" entrance to northern park section from adjacent private developments (some presently exist at boundary).
	South end of Kīholo Bay at Lynn Residence.	Salt pan complex.	Salt manufacture exemplifying the change from subsistence to market economy.	Self-guided; set of interpretive panels.
1349	Adjacent to Queen Ka'ahumanu Highway	Complex of four large cave chambers.	Example of caves exemplifying traditional pattern of use and containing cultural deposits.	Guided; escorted tours into cave with proper safety management devices in place. Would likely require gating of cave entrance.

Source: Alan Carpenter, Division of State Parks, Department of Land and Natural Resources (2012)

3.5.2.5 Utilized Lava Tubes: Opportunities and Constraints

While lava tubes are technically a geological feature, they become archaeologically and culturally significant when they show signs of pre-contact use by native Hawaiians. They range in size from very small to very large, and a sizeable proportion of the lava tubes that have been identified within the boundaries of Kīholo State Park Reserve show signs of human use. For the purpose of this report, we are referring to this subset of all lava tubes as “utilized lava tubes”.

There are two sub-categories within the overall category of “utilized lava tubes” depending on whether or not burials are present. The lava tubes which are grouped into the first category are those tubes which show signs of human usage in the pre- and early post-contact period, and yet which do not contain human remains; this grouping is discussed in Section 3.5.2.5.1. The second category, utilized lava tubes with burials, is discussed in Section 3.5.2.5.2.

3.5.2.5.1 Utilized Lava Tubes without Burials: Opportunities and Constraints

Lava tubes were commonly used in prehistoric times as natural vaults, storing artifacts away from the effects. Many of these artifacts were left behind as the original native population moved away or died without leaving direct familial members to take over their possessions. In the relatively dry, protected environment of the lava tubes, these have tended to stay intact until disturbed or removed. Over the years, many of these have been stripped of cultural remains, either by persons seeking them for personal use or to sell on the open market for Hawaiian antiquities. However, many still contain artifacts that it is the State’s duty to protect.

In addition to issues related to the protection of their contents, lava tubes also pose a public safety risk. Subterranean caverns are unstable environments where there is always a chance of collapse. As such, the following policies are recommended for adoption and implementation:

- The public is to be discouraged from physically entering lava tubes except where it can be done in a supervised manner and where previous investigations have established the relative safety of the caves.
- In general, it is recommended that those tubes which are not close to roads and trails or are obscured by geology or vegetation simply be left alone.
- Those lava tubes which house cultural artifacts and are sufficiently close to public points of access to make public access relatively easy should be sealed with rock work, or other means including gates, to make entrance impossible.

This policy reflects both the need to safeguard the public and the desire of the native Hawaiian community for the protection of their cultural and physical heritage.

3.5.2.5.2 Utilized Lava Tubes with Burials: Opportunities and Constraints

Native Hawaiians attach great cultural and spiritual significance to the physical remains (known as *iwi*) of their ancestors, and interviews conducted with members of the native community throughout the region clearly underscore the deep reverence and concern which they feel for these properties. During the course of their archaeological inventory of Kīholo State Park Reserve, T.S. Dye and Colleagues, Archaeologists, Inc. located 30 burials of human remains (see Table 3.4), and it is possible that there are others extant which have not been documented. Many of the burials have been previously disturbed and one of the guiding principles of the Master Plan would be, to the extent possible, to prevent future disturbances of ancient burials in accordance with the wishes of the native Hawaiian community. Burials would remain unmarked and, where necessary to protect the interred from disturbance, would be sealed shut to prevent future access. They would not be subject to any interpretive programs or any undertaking that would identify their locations to the general public. Table 3.6, while withholding locational and identifying data, provides a sample of the survey information for a typical native Hawaiian burial site which would be sealed off per the Master Plan.

Table 3.6 Sample Kīholo Archaeological Reconnaissance Site Data for Burial Site

<i>Field Site (Sample)</i>			
Site Type:	Tube Opening	Age:	Traditional
Feature Type:	Burial, Lava Tube	Integrity:	Altered
Substrate:	Pāhoehoe	Topo Location:	Swale opening West
Vegetation:	Open Forest	Vegetation Cover:	Sparse
Field Notes: Small lava tube opening, about 1.5 m wide with a crawlable entry. Descends to crawlable chamber that extends about 8 m <i>mauka</i> , branches and continues to be crawlable. It extends 28 m southeast, where it opens to a crouchable chamber that is site 215. At the center of the 28 m tube, are human remains of a minimum of two adult individuals. One large, one small. Identifiable elements include two paired femur, three tibia, one cervical vertebrae, one right male <i>os coxae</i> , one radius, one heel bone, rib fragments, one scapula, and bones of the hand and foot. The <i>makai</i> chamber of the original opening extends greater than 10 m and becomes impassable.			
Source: T.S. Dye and Colleagues, Archaeologists, Inc. (August, 2011)			

3.5.2.6 Anchialine Pools: Opportunities and Constraints

As discussed in the preceding chapter, one of the interesting features along the Kīholo State Park Reserve coastline are anchialine pools. These anchialine pools are significant biologically, geologically, and have deep importance in the legends and lore of the area. At the present time, some of these anchialine pools are on private inholdings, while others are situated on public lands within the park. Many of the anchialine pools have been significantly degraded through improper use, vandalism, littering, and the introduction of alien species. Some of these pools, such as Luahinewai and the Queen's Bath, were important places in the Kekaha region in the pre- and early post-contact era but have now been biologically degraded and are no longer habitat for important native species.

Recognizing both the fact that most of the above-ground pools have already been biologically degraded and the near impossibility of effectively blocking access to them, no physical barriers (such as fencing) are proposed. However, signage at historical points of access indicating that the pools are culturally significant would encourage park users to utilize the pools in a sensitive and responsible manner and provide information on ways to discover more information about their biology and cultural function and value. No trails would be created to lead people to these features, nor would there be any other form of infrastructure such as trash receptacles or restroom facilities. Where a pool held special cultural importance, a placard or other marker could be used to inform visitors of the legendary significance of the pool and to impress upon them the sensitive nature of the site.

With regard to subterranean anchialine pools which still contain intact native ecosystems, the plan recommends that no trails, markers, signage or other means of indicating their presence be created. If needed, entrances could be sealed with native rock work, with the intent of preventing further access or disturbance of these fragile features. In this way, park users would still be able to enjoy the above ground anchialine pools and learn of their cultural relevance while being prevented from accessing subterranean pools which still contain important biological properties.

3.5.3 OPPORTUNITIES AND CONSTRAINTS RELATED TO CULTURAL/HISTORICAL PROGRAMS

The archaeological/historical/cultural properties located within Kīholo State Park Reserve are largely unmanaged at the present time. In some cases, this is of little importance because of the characteristics of the site. For example, a small remnant piece of an old stone wall that is not part of a site complex and is away from heavily used trails may not require management because it is neither susceptible to damage (as it might be if it were located in an area where someone might be tempted to dismantle it and re-use the rocks for another purpose) or of high interpretive value. In other cases, such as a feature that is part of a site complex that reflects previous use patterns may offer substantial interpretive opportunity, the absence of an effective means of public interpretation represents a significant loss of potential value. Similarly, the absence of active intervention to secure lava tubes

with burials and/or pristine anchialine pools means that they are likely to continue to suffer incursions by park users and to have their resources continue to degrade over time.

Funding Interpretive Programs within State Parks' Budget. Taking advantage of the interpretive program opportunities that are present at Kīholo will require financial resources that are not present in the Division of State Parks budget and are unlikely to be added to it for the foreseeable future. Even if some additional park funding were to become available, State Parks will, of necessity, almost certainly channel the dollars towards protecting the most sensitive resources from depredation (e.g., sealing caves with burials) before earmarking funds for interpretive programs. This is not in keeping with the hopes of many in the area, but it is consistent with the State's budget realities. Because of this, and because designation as a State Wilderness Park expresses different priorities than would designation as a State Historical Park (such as Lapakahi), it does not appear fruitful to include substantial interpretive programs as a core item in the park Master Plan.

Other Sources of Funding for Interpretive Programs. At the same time, the achievements of Hui Aloha Kīholo within the Kīholo State Park Reserve and of other grass roots community groups working at other State Parks show that there are opportunities for others to use the resources at Kīholo as part of interpretive programs that outside parties develop and operate. Accordingly, it is strongly recommended that the Division of State Parks encourage other groups to develop interpretive programs that take advantage of the resources and to facilitate such use by remaining flexible in its requirements.

The comprehensive GIS database of archaeological and historical properties within the Kīholo State Park Reserve that has been developed as part of the master planning process will facilitate the development of effective programs. It should be shared as needed with entities that wish to develop such programs and who can demonstrate their interest and good intentions. Because of the danger that the information that it contains could be misused by individuals interested in removing artifacts or who are simply disinclined to be respectful of the sites and their contents, detailed information should not be made available indiscriminately.

The experiences and knowledge of place, as described by native families of the land through the oral history interviews, provides readers with important guidance with respect to opportunities for management of the Kīholo State Park Reserve and larger lands of the Nāpu'u region. Developing partnerships between State Parks and other community-based participants in the park programs, families of the land, the State recognized stewardship organization, Hui Aloha Kīholo, along with other interested parties, will help achieve the multi-faceted goals and objectives for Kīholo.

Interim Oversight. Interviews have indicated a community concern that opening Kīholo prior to the establishment of the kinds of interpretive programs that have been suggested will increase the risk of damage, both inadvertent and deliberate, to valuable cultural resources. Community members have asked that the State maintain heightened vigilance during this period to help forestall irreparable damage. Interim signs should be placed on sensitive cave sites pending permanent sealing of these features.

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CHAPTER 4 – PARK OPPORTUNITIES

The people who are likely to visit the Kīholo State Park are diverse, but can be broadly conceptualized as representing two groups: day users and overnight campers. Both groups include both Hawai‘i Island residents and visitors (i.e., people who live elsewhere in the state or beyond its shores). These users are drawn to Kīholo by the wide range of existing recreational and natural resources which make Kīholo unique (see Figure 4.1). Kīholo State Wilderness Park presents an opportunity to provide this wilderness park experience to the growing resident and visitor population in West Hawai‘i, while balancing this increasing demand with the needs of careful resource management and protection.

4.1 CAMPING OPPORTUNITIES

While some visitors to the island do engage in coastal camping, the majority of the camping population is comprised of island residents. The Kona coast does not have adequate coastal camping amenities to meet the demand of island residents. The cabins at Hāpuna Beach State Recreation Area and the campgrounds at Spencer Beach Park in South Kohala provide some camping opportunities well north of the project site, and Kekaha Kai State Park may offer some additional campgrounds in the future, but the absence of legally established and maintained coastal campgrounds has become an increasing regional problem. With continued regional growth and the establishment of the Ala Kahakai National Historic Trail, the demand for campsites is likely to increase in the future. The major limitation governing the provision of campsites are the sustainable capacity of park resources, the attendant public health and safety issues which camping creates, and the lack of existing infrastructure.

As previously noted, at the time work on the Master Plan began, there was no means of obtaining legal permission to camp anywhere within the Kīholo State Park Reserve.⁷¹ The temporary closing of the park and the subsequent establishment of the Interim Management Plan now in effect created a permit system that now allows the Division of State Parks to issue camping permits as provided for in HAR §13-146-51. The maximum authorized use under this Interim Management Plan is 80 people per night (maximum of 10 people at each of eight campsites). All park design alternatives considered in this document will include a similar level of regulation regarding camping.

The Division of State Park’s campsite reservation system was not constructed in such a way as to allow ready access to the details in the reservations database. Summary information is available, however, and Table 4.1 summarizes information from that source. In view of the fact that camping is allowed on only three nights per week, it is clear from these data, as well as from anecdotal information provided by Hui Aloha Kīholo and State Parks staff, that the campsites are fully used. The magnitude of unmet demand is hard to gauge precisely, but there is a sense from those familiar with the area that the facilities would continue to be fully, or nearly fully, booked even if the number of available campsite-nights were increased by 50 to 100 percent.

This could be done by either increasing the number of campsites or by increasing the number of nights on which camping is allowed. However, because a disproportionate percentage of the park users are local residents whose work-commitments make them more likely to have time to camp on weekends than on weekdays, an increase in the number of campsites would better address the demand than would increasing the number of days on which camping is allowed. Some interest has been expressed in having one campsite able to accommodate groups larger than the 10-person maximum at the existing campsites. This would not be open to the general public but would be made available only to groups interested in conducting service work (i.e., work aimed at maintaining and/or improving the park resources).

⁷¹ Because Kīholo was officially a “Park Reserve” rather than an official State Park, State Parks could not legally issue camping permits there. As a result, all camping there was technically illegal.

Table 4.1 Kīholo Camping Statistics: FY2012

<i>Item</i>	<i>Amount</i>
Number of Permits Issued	376
Number of Permit-Nights	647
Total Number of People	1,861
Number of Residents	1,594
Number of Non-Residents	267
Average Length of Stay (nights)	2
Number of cancellations	5
Note: Data is from inception of the permit system in November 2011 through the June 30, 2012, end of the 2012 fiscal year.	
Source: 10/30/2012 12:56 PM e-mail from Curt A. Cottrell to Dean Takebayashi with Kīholo camping stats for FY12	

The data in the table show that it is principally local residents who are using Kīholo. They accounted for approximately 85 percent of all those issued permits during the first year the Interim Management Plan was in place.

4.2 HIKING OPPORTUNITIES

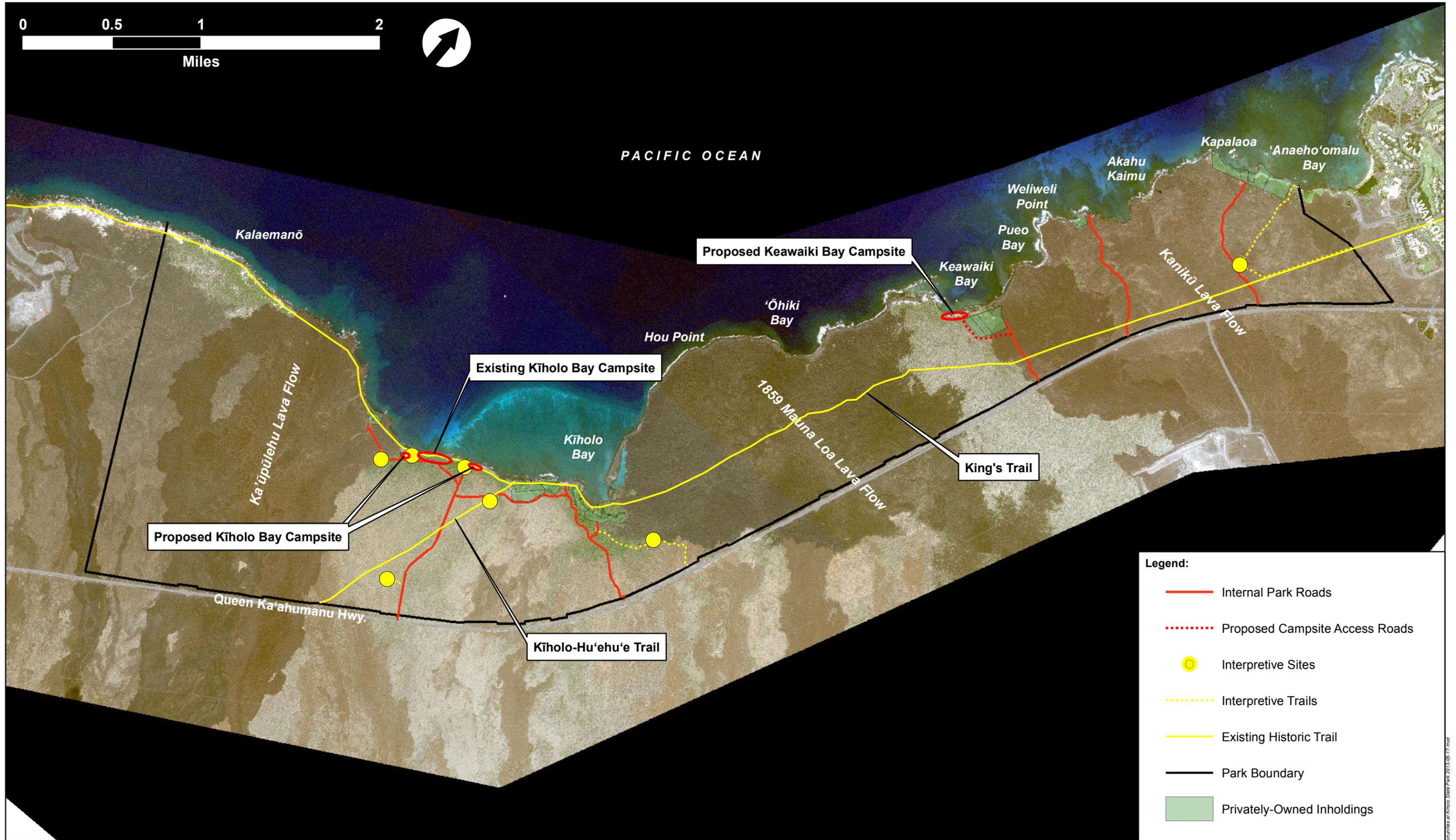
There are many existing trails within Kīholo State Park. Currently, there are 42.1 miles of trails throughout the park reserve:

- Kīholo-Pu‘u Wa‘awa‘a (9.6 mi.),
- Kīholo-Pu‘u Anahulu (4.1 mi.),
- Kīholo-Hu‘ehu‘e (6.9 mi.),
- Ala Kahakai (8.7 mi),
- Ala Loa Inland Trail (4.4 mi.); and
- Hualālai Trail (8.4 mi.).⁷²

As a wilderness, Kīholo State Park possesses many opportunities for both coastal and inland hiking experiences, but relatively little in the way of amenities which can make those trails more accessible to the public. Lateral coastal trails, the King’s Trail, and smaller *mauka-makai* trails all provide visitors to the park with a varied wilderness experience. Currently, these trails are, with the exception of the King’s Trail, totally unmarked and hikers must rely on personal knowledge of the area or alternative sources of geographic information. Caution is needed as the jagged, exposed lava rock can be treacherous; there is intense heat from the sun, there are no sources of fresh water within the park reserve, and it can be difficult for emergency service personnel to reach persons who experience difficulties.

No quantitative data are available on the use of the various trails, but observations made during many days of field work by various scientists and anecdotal information from a range of individuals who have spent much time in the area indicates that usage is light. Few people appear interested in hiking the length of any of the named trails, and the great majority of trail use is by individuals walking along the shoreline adjacent to Kīholo Bay.

⁷² Referred to as Historic Trails, the Kīholo-Hu‘ehu‘e trail extends beyond Pu‘u Wa‘awa‘a to the south across lands owned by Kamehameha Schools-Bishop Estate, ending at Highway 190. The Hualālai Trail extends beyond Pu‘u Wa‘awa‘a to the south across lands also owned by Kamehameha Schools, ending at the summit of Hualālai.



Legend:

- Internal Park Roads
- - - Proposed Campsite Access Roads
- Interpretive Sites
- - - Interpretive Trails
- Existing Historic Trail
- Park Boundary
- Privately-Owned Inholdings

Prepared For:
 State Parks Division
 Dept. of Land & Natural Resources
 State of Hawai'i

Prepared By:
 **PLANNING SOLUTIONS**

Source:
 -State of Hawai'i GIS
 -MapMart, Inc.

Project:
 Kīholo State Park Master Plan & EIS

Figure 4.1:
Recreational Opportunities at Kīholo State Park

Figure 4.1: Recreational Opportunities at Kīholo State Park 2013-05-17.mxd

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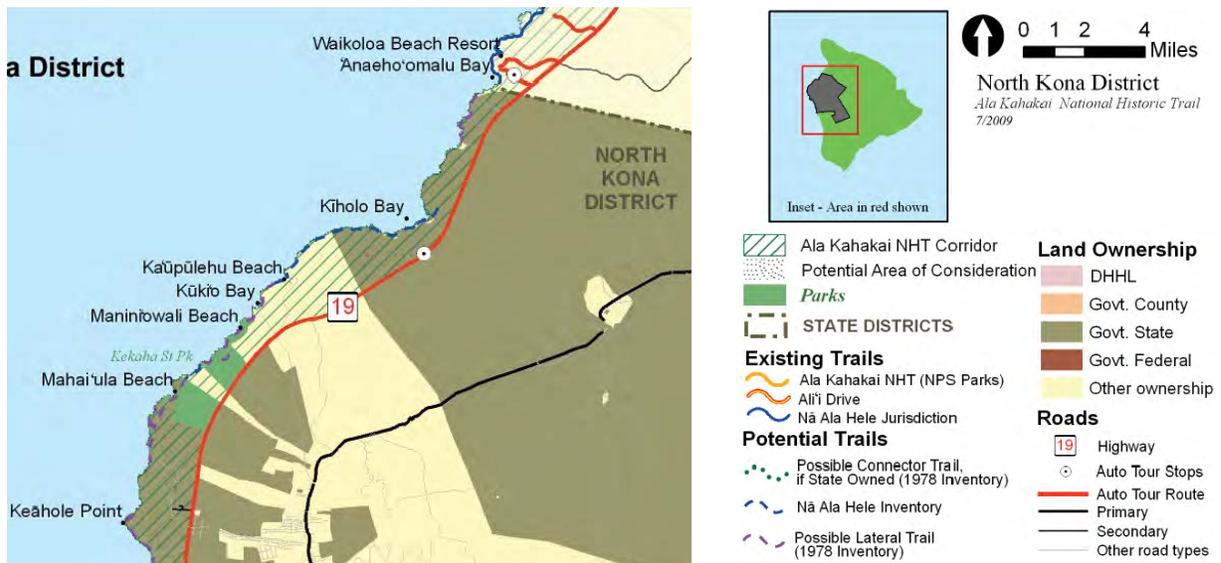
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Any new trails should be designed to meet trail design standards. For a wilderness park such as is envisioned at Kīholo, not all trails need to be “accessible” as called for in the Americans with Disabilities Act (ADA) of 1990, as amended. However, the goal is to have at least one parking/picnic area adjacent to the beach at Kīholo that is ADA compliant. In addition to the parking stall, this could include a concrete pathway that leads to beach/picnic tables, a toilet, and a campsite.

The opportunity exists to increase hikers’ use of the coastal trail and/or to develop boat landings that could be part of a water-trail along the coastline. This is the “Bluewater Trail” concept developed as part of the State of Hawai‘i’s “Recreational Renaissance”.⁷³ This would support kayaking along the coast with two or more stops in Kīholo (Keawaiki Bay and Kīholo Bay). The concept would also make camping possible in areas accessible only by kayaks and canoes. Usage of such a boating “trail” is likely to be relatively light, but it would add another type of recreational opportunity.

State Parks is supportive of the Comprehensive Management Plan that the National Park Service (NPS) has developed for the Ala Kahakai National Historic Trail. The plan, which represents the overall management strategy for an approximate fifteen year period, designates the entire area between Queen Ka‘ahumanu Highway and the Ocean as the corridor for the portion of the trail that passes through Kīholo State Park Reserve (see Figure 4.2). The Ala Kahakai takes many forms within the 8+-mile stretch of the trail that passes through Kīholo State Park Reserve. At the northern (‘Anaeho‘omalu Bay) end, it is well-marked and largely restored to its late 19th-century condition as it crosses the barren lava. Further south the trail becomes much less well-defined and from the northern end of Kīholo Bay southward runs along the shoreline.

Figure 4.2 Ala Kahakai Corridor through Kīholo State Park



Source: *Ala Kahakai National Historic Trail Comprehensive Management Plan, Map 6*

⁷³ Announced in 2009, the “Recreational Renaissance” was conceived as a re-birth in the way Hawai‘i cares for its land and ocean recreational spaces, its natural and cultural resources, and the people who use its State Parks, small boat harbors, boat ramps, hiking trails, natural area reserves, forest reserves and beaches. The program’s goal is “to restore, reinvigorate and preserve our parks, trails, and ocean recreation facilities; enhance our environmental and cultural assets; provide safe outdoor spaces for residents and visitors to enjoy; and maintain our recreational infrastructure.”

State Parks and the National Park Service have agreed to continue working together on the trail system within the park, and the NPS, in turn, has indicated that it is interested in assisting by providing resources and interpretation where it is appropriate, but no Kīholo-specific funds have yet been allocated.

4.3 BIKING OPPORTUNITIES

Most areas of Kīholo State Park Reserve are not conducive to biking. The rough lava fields and the sandy shorelines are best experienced by park-goers on foot. Queen Ka‘ahumanu Highway is a very popular route for biking along the Kona Coastline and is part of the route followed by participants in the popular and world-renowned Ironman World Triathlon Championship.

4.4 PICNICKING

Picnicking is a popular pastime along portions of the shoreline, with most of it being concentrated in the relatively accessible areas nearest Kīholo Bay. With its shaded backshore area, Kīholo Bay is frequented by picnickers, and facilities such as tables and/or a comfort station could be expanded in this area. Since this is one of the few park areas which is accessible to refuse collection vehicles, making additional picnic areas and tables available could have the effect of concentrating this activity in an area where impacts could be managed. An important consideration in the planning for picnicking activities at the park is the absence of municipal water supply, which makes fire control an important consideration. For this and other reasons, cooking is best limited to shoreline campsites where adequate facilities, such as grill pits, can be provided.

4.5 LAVA TUBES

Proper management of access to lava tubes is challenging because of the large number of tubes and the absence of effective means of limiting access. Those containing water features are of particular concern, as they represent a special hazard and are sought out by visitors. While state law prohibits public entry into the caves without the landowner’s permission, the lack of fencing or adequate staffing makes this impossible to enforce. No trail development or signage should be planned that would route people near the most sensitive features (e.g. caves with human remains). To the extent practical, trail use should be managed by encouraging people to take advantage of resources that are the least sensitive rather than by trying to establish and enforce restrictions on approaching the most sensitive, which will most likely be closed or gated. Working with caving organizations to allow guided visitation to selected caves could help divert attention away from those caves that contain sensitive remains.

4.6 OCEAN RECREATION OPPORTUNITIES

Sandy beach areas within the park, as at Kīholo Bay and Keawaiki Bay, are popular with both residents and visitors. These areas are ideal for passive recreational activities such as swimming, sunbathing, and diving. The area waters are generally calm, and the warm, sandy environment and wide open view planes are qualities which enhance the relaxed, outdoor atmosphere valued by park-goers.

A wide variety of other ocean-related activities are available along the park’s 8 miles of shoreline. In addition to beach-going opportunities, fishing is popular along portions of the rockier coastline near Hou Point, as well as from the sandier beaches of Keawaiki and Kīholo Bay. Please note that Kīholo Bay is a fisheries management area and gill nets are prohibited. Diving, snorkeling, kayaking, and canoeing are also popular in the area and can continue to be important recreational opportunities. Kayaking and canoeing, in particular, can be tied in with camping under the Blue Water Trail concept discussed in Section 4.2.

4.7 INTERPRETIVE AND EDUCATIONAL PROGRAM OPPORTUNITIES

Appropriate to its previous designation as a State Park Reserve, the park has previously not had any interpretive programs or infrastructure. In planning for Kīholo State Wilderness Park, all alternatives will incorporate interpretive programs designed to enhance the park visitors' experience and to evoke a sense of understanding, awareness, and involvement with the natural and cultural heritage of its unique environment. Using a variety of interpretive devices and materials, programs designed to highlight the culture and history of the area can encompass recreational and educational objectives, while encouraging appropriate and respectful use of the fragile, often irreplaceable, park resources. All interpretive programs at Kīholo State Wilderness Park will focus on educating visitors about the natural environment and native Hawaiian cultural adaptation to the coastal Nāpu'u region. The theme and amenities which are proposed for park interpretive programs are summarized in this development plan and will be detailed further in a separate interpretive plan for the park.

A principal objective of the interpretive programs at Kīholo State Wilderness Park is to promote the use of traditional place names. Traditional native Hawaiian place names tie together people, place, and history. While most park visitors will not have a command of the Hawaiian language, the translation of important place names can provide insight into pre- and early post-contact use, history, and significance of various locations within the park. Insofar as possible, traditional place names and their associated *mo'olelo* will be incorporated into all interpretive signs, placards, talks, tours, maps or other interpretive undertakings.

Another important task of the interpretive efforts at Kīholo will involve contacting and consulting with the *kūpuna*, native Hawaiian cultural practitioners, and other informed persons throughout the development and implementation of interpretive programs at the park. The interpretive programs will rely on the participation and guidance of these human resources as guides, teachers, and *kūpuna* with the purpose of creating a park experience enriched by the history and culture of these lands.

Passive interpretive opportunities at the park include signs, placards, displays, and exhibits which can be developed and placed in appropriate locations to provide visitors with archaeological, historical, or cultural background information and enhance their understanding of park features. These signs and other passive interpretive installations can provide information about natural and cultural resources, the activities and facilities available in the park, park rules, and precautionary safety information.

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CHAPTER 5 – MASTER PLAN ALTERNATIVES

5.1 INTRODUCTION

5.1.1 PHYSICAL DESIGN ALTERNATIVES

As noted in Chapter 1, when the State of Hawai‘i, Board of Land and Natural Resources approved of and recommended to the Governor the issuance of an executive order setting aside the lands of Kīholo State Park Reserve, it envisioned that the eight-mile long wild coastline stretching from Pu‘uwa‘awa‘a northward through Pu‘u Anahulu to the southern end of ‘Anaeho‘omalū Bay area would remain largely undeveloped. This would allow the area to provide a semi-wilderness experience in the midst of a rapidly developing region. This precept has remained at the heart of all the park master planning work that has been carried out to date.

Visions for the Park. Planners began by using the background research information described in Chapters 2 and 3, together with the assessment of opportunities presented in Chapter 4, to develop several alternative “visions” for the park.⁷⁴ The “visioning” followed the directives outlined in the 2002 draft *Management Plan for the Ahupua‘a of Pu‘u Wa‘awa‘a and the Makai Lands of Pu‘u Anahulu*. Five alternative visions presented at the public meetings in the fall of 2011 were narrowed to the three fundamental alternatives which are described in this chapter. Then, draft plans implementing each vision were formulated using information collected in the background research process.

Master Plan Alternatives. The remainder of this chapter describes the alternatives, defines specific objectives for each of them, and identifies the principal features of the three different use concepts.⁷⁵ Table 5.1 summarizes the key features of each master plan alternative. Two of the three are for development of Kīholo State Park Reserve as a State Wilderness Park, with minimal improvements and retention of the existing wild character which attracts people to the area. The third alternative envisions retaining the existing State Park Reserve designation.⁷⁶

5.1.2 HABITAT MANAGEMENT AND INTERPRETIVE PROGRAM MODULES

In addition to choosing between alternative levels of intensity with regard to public access and use within the park, there are several types of programs which could be attached to, or pursued in combination with, any of the three alternatives under consideration. Consequently, this document addresses these as “program modules” that can be implemented regardless of which physical development concept is selected. Because they are relevant regardless of which of the physical design alternatives is selected, these modules are discussed separately in Chapter 6. However, as they inform some of what is included in the discussion of alternatives that is in this chapter, readers may wish to refer to it as they consider the layout alternatives presented in this chapter.

⁷⁴ The term “vision” was used because these were not detailed plans. Instead, they were broad concepts intended to inform the selection of the individual activities and facilities for incorporation into the design program for the park.

⁷⁵ As discussed in Chapter 1, the Division of State Parks determined that the present master planning process consider only those recreational and other activities that are consistent with Kīholo’s development as a State Wilderness Park. Hence, while the alternatives were formulated to allow consideration of different types of natural and cultural resource preservation and recreational facility development, all are in keeping with the “Wilderness Park” designation.

⁷⁶ That alternative would entail halting some of the activities (e.g., overnight camping) currently being allowed under the Interim Management Plan. It is intended principally as the basis of the “No Action Alternative” that must be considered in the environmental impact statement that will be prepared for Kīholo State Park Reserve. Individuals wishing to access the shoreline or other features within the Kīholo State Park Reserve would have to walk in from drop-off points along the highway or access it from the north or south along one of the existing trails. Given that the present use is primarily of overnight campers who rely on proximity to their vehicle and day-visitors that come to the beach and park close by, such a restriction would greatly curtail the existing use.

Table 5.1 Summary of Master Plan Alternatives

<i>Alternative</i>	<i>Summary Description</i>
<p>Alternative 1: Focused Camping</p>	<p>The Focused Camping Alternative, discussed in Section 5.2:</p> <ul style="list-style-type: none"> • Allows day-visitors to access the existing vehicular parking area located in back of the southern side of the Kīholo Bay shoreline during daylight hours. • Allows a limited (by permit) amount of car-camping on designated sites behind the central part of Kīholo Bay. Permit holders would be monitored as needed to ensure compliance with park rules. A discussion is also provided regarding expanded camping opportunities at Kīholo Bay. • Provides for the installation and operation of basic sanitation facilities near the camping sites and day-use parking areas. • Has recommended (but optional) program “modules” that provide: <ul style="list-style-type: none"> ○ Supervised access to selected resources, including petroglyphs, archaeological sites, anchialine ponds, beach strand vegetation, and lava tubes which have been specifically identified by State Parks archaeologists as appropriate for visitation. ○ Habitat restoration via such things as ungulate control, vegetation restoration, fisheries management, etc. ○ Archaeological and cultural interpretation opportunities and support.
<p>Alternative 2: Multi-Node Camping/Access Alternative</p>	<p>The Multi-Node Camping/Access Alternative outlined in Section 5.3 expands upon the camping opportunities provided by the Focused Camping/Access Alternative, providing campsites at Keawaiki Bay as well as Kīholo. Like the first alternative, the Multi-Node Camping/Access Alternative has desired (but optional) management modules aimed at returning previously disturbed areas to a natural state, strongly enforcing rules on limits to access and proactively curtailing entry to all caves and archaeological sites using both signage and enforcement patrols.</p> <p>The additional camping area(s) which would be provided under this alternative could be made accessible either by vehicle, or limited to walk-in users only. Furthermore, additional campsites could be designed to accommodate larger groups, weekday camping, or other alternative arrangements should the Division wish to do so.</p>
<p>Continuation as Park Reserve Alternative (No Action)</p>	<p>The Park Reserve Alternative allows for that possibility and the continuation of minimal management efforts at Kīholo. Under this alternative, only passive preservation measures would be pursued, including either limiting <u>all</u> access, or prohibiting all public camping or vehicular access, allowing only pedestrian access <i>makai</i> of Queen Ka’ahumanu Highway. This alternative is equivalent to a “no action” alternative and would be treated as such in the environmental assessment documents supporting the Master Plan. It is also conceptually very similar to the “Wildland Alternative” that the Division of State Parks presented at public meetings in Kona and in Hilo in late September, 2011. As discussed in Section 5.4, this alternative would involve little or no new interpretive programs, infrastructure, or other facility development.</p>

5.1.3 COMMON FEATURES

The following precepts are central to all three alternatives:

- Protecting the park’s unique shoreline and upland regions by creating a sustainable long-term plan for the management of its physical, scenic, cultural, natural and recreational resources;
- Preserving and maintaining the historic and archaeological heritage of Kīholo and the integrity of traditional activities there; and
- Recognizing the rights and contributions of the individuals whose homes are surrounded by Kīholo’s park lands.

In keeping with the State's intention of keeping Kīholo a wilderness area, none of the alternatives involves substantial physical development on the property. Instead, they differ from one another largely in the extent to which they would provide space and infrastructure (e.g., road access, sanitation facilities, etc.) for low-intensity recreational use and interpretive activities.

In accordance with the need to preserve the wilderness character of Kīholo to the greatest extent possible consistent with its use as a State Park or its maintenance as a State Park Reserve, all of the alternatives restrict vehicular access.

5.1.4 ORGANIZATION OF THE CHAPTER

The remainder of this chapter is organized into the following major parts.

- Section 5.2 describes a concept that focuses camping and the most intensive types of day-uses in a single area in back of Kīholo Bay. It outlines the infrastructure, operational, and maintenance requirements for the concept. Finally, it describes some of the measures that will be undertaken to manage specific resources within the park boundaries, supplementing the more general discussion (i.e., management of caves, trails, cultural resources, etc.) that is included in the next chapter.
- Section 5.3 describes a concept that provides camping and other related facilities at a second location in addition to those identified in the first concept.
- Section 5.4 describes the “No Action” alternative, which involves leaving the “Park Reserve” designation unchanged.

5.2 ALT-1: FOCUSED CAMPING/ACCESS ALTERNATIVE

5.2.1 FOCUSED CAMPING/ACCESS ALTERNATIVE VISION AND OBJECTIVES

This alternative envisions the State allowing limited (by permit only) overnight camping at up to ten designated campsites adjacent to Kīholo Bay. Day use of the Kīholo Bay area would be allowed as well, and vehicular parking would be allowed during the day in the existing parking area behind the western side of the beach. Vehicular access to other shoreline areas (e.g., Keawaiki) would be prohibited with signage and through active enforcement. The level of control, maintenance, and security in the areas around the campgrounds would be maintained or increased relative to levels under the existing Interim Management Plan. While not a pedestrian-access only wilderness area, Kīholo would be maintained as a quiet retreat for families and groups and from which visitors could stage their exploration of the adjacent bay, shoreline area, trails, and other natural and cultural features. In addition to letting the natural conditions discourage access, caves containing burials and other sensitive material would be physically sealed. In addition to barring unpermitted access to certain sites, signage and active management/enforcement of regulations would develop park visitors' awareness of the sensitivity of archaeological and cultural resources. This signage would be intended to direct park visitors to a series of sites which have been identified as appropriate for visitation while passively diverting attention away from sensitive areas.

The principal objectives of this Alternative are to:

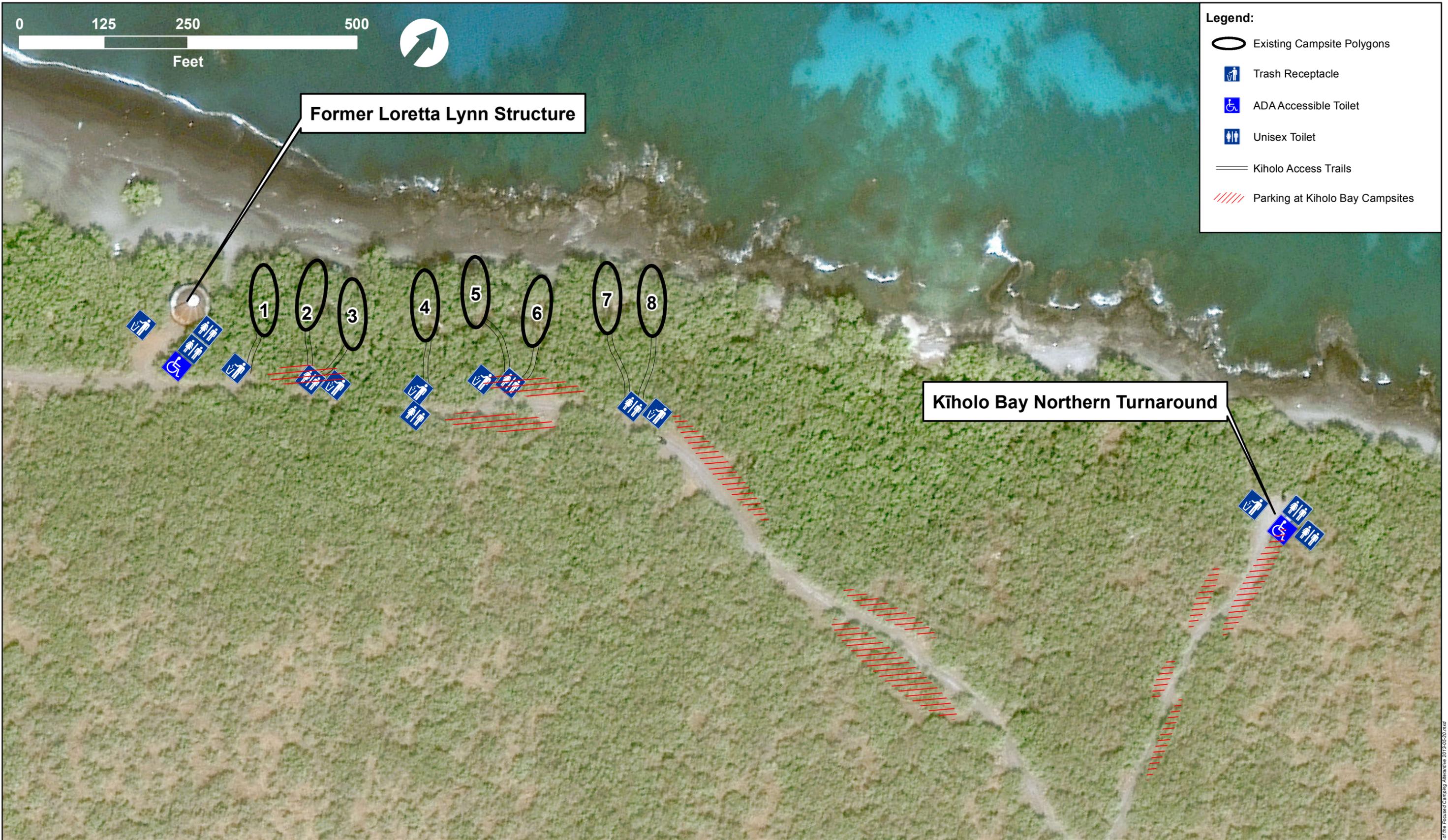
- Encourage the preservation of a low-density “shoreline retreat” adjacent to Kīholo Bay by providing a small number of improved, intensively managed, overnight camping opportunities in the area behind the beach.
- Limit vehicular access to the park, and in particular the beach, and to minimize all other intrusive behaviors such as loud music, high concentrations of people, and raucous partying that detract from the wilderness experience.
- Protect the park resources (natural and man-made) by concentrating visitors in specific areas and increasing oversight so that it is more difficult for persons to carry on with disruptive behavior and/or damage/deface natural sites.

- Limit vehicles other than those using the beach campsites to specific areas and roadways, and prevent off-road vehicle use on beaches and elsewhere in the park.
- Improve the attractiveness and usability of the trail network, directing hiker interest with interpretive signage, while discouraging off-trail excursions.
- Provide design guidelines for signage, trail development and maintenance, and campsite location and appearance.
- Provide a means of monitoring the type and intensity of park use to determine what additional management (if any) is needed in order for a wilderness experience to remain available to park users.
- Maintain the quality of existing roads and utilities used by inholders.

5.2.2 PRINCIPAL FEATURES OF THE FOCUSED CAMPING/ACCESS ALTERNATIVE

The principal features of the focused access/camping alternative are summarized below. The locations of the proposed improvements in the Kīholo Bay Area are shown in Figure 5.1. A number of these have already been put in place as part of the Kīholo Interim Management Plan, but these could be altered or supplemented as part of the long-term management program:

- The installation and maintenance of a vehicular parking area for day users of the park in the existing cleared area behind the southern side of Kīholo Bay.
- The creation of eight to ten (8-10) formal campsites at selected “behind-the-beach” locations along the southern portion of the Kīholo Bay with individualized parking located adjacent to the campsites. Users would no longer be allowed to access the campsites from the beach side, but would instead reach them using short walkways from defined parking spaces off of the existing access road.
- Many of the program modules discussed in Chapter 6 could be supported by community service groups working with the guidance of State Parks and the curator (presently Hui Aloha Kīholo).
- The establishment of a slightly larger group camping area on the southern side of the Loretta Lynn house that would make a group campsite available for use by organizations involved in service trips or educational visits to Kīholo. This site could be made available for weekday camping, which is currently not possible under the Interim Management Plan.
- The Focused Camping/Access Alternative foregoes substantial new roadway development within the park area but requires the creation of defined parking places and short campsite walkways so that campers can enter the campsites from the *mauka* rather than *makai* side and without driving on the beach. The one exception to this could be improvements to interconnection between Queen Ka‘ahumanu Highway and the park access road.
- This alternative calls for waterless portable toilets and trash receptacles to be provided at the large public parking area at the southern end of the bay near the Loretta Lynn structure, principally for the use of day visitors. Additional portable toilets and trash receptacles would also be provided for campers along the access road adjacent to the planned campsites.
- This alternative envisions a small baseyard area (including covered space) near the existing public parking area behind Kīholo Beach that provides secure storage for equipment and supplies needed to operate and maintain the park.
- The Alternative accommodates the Ala Kahakai Trail through the property.
- This alternative provides for the existing rough shoreline trail to the north and south to be maintained regularly to ensure that the route remains visible to users. No trail upgrades (e.g., smoothing or widening surfaces) that are likely to substantially increase trail usage are included in this alternative, but improved signage would be provided that could encourage some additional focused activity.



Prepared For:
State Parks Division
Dept. of Land & Natural Resources
State of Hawai'i

Prepared By:
 **PLANNING SOLUTIONS**

Source:
-State of Hawai'i GIS
-MapMart, Inc.

Project:
Kīholo State Park Master Plan

Figure 5.1:
Principal Features of Focused Camping Alternative

Figure 5.1: Principal Features of the Focused Camping Alternative 2013-05-20.mxd

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- The Focused Camping/Access plan limits new disturbance, but does not provide for previously disturbed areas (e.g., areas once used as campsites) to be restored to a natural state.
- The plan calls for the State to post signs with the appropriate Hawai‘i Revised Statutes rules to allow for enforcement by DOCARE and, if necessary, by the Hawai‘i County Police Department (HPD). It also provides that State Parks will maintain sufficient managerial presence to strongly enforce rules limiting access, prohibiting illegal camping and fishing; and severely restricting access to all caves and archaeological sites.
- For the safety of visitors and park resources this plan calls for all sensitive caves to be sealed or otherwise closed off, preventing unauthorized access. Footpaths, signs, brochures, and possibly smartphone apps could be released calling attention to archaeological and historical sites of interest which have been deemed appropriate for visitation, but no infrastructure would be created that would improve access to sensitive sites. Conceptually, visitors would be actively encouraged to visit a subset of appropriate sites and passively discouraged from access to sensitive features.

5.2.3 INFRASTRUCTURE FOR FOCUSED CAMPING ALTERNATIVE

5.2.3.1 Kīholo Bay Access from Highway

The existing vehicular access to the Kīholo Bay portion of the park consists of roads constructed many years ago when only a few, very low density uses were present along the shoreline. As public knowledge of Kīholo and the number of people — both residents and visitors — present in the region (and on the island) has dramatically increased, so have the number of persons visiting the Kīholo shoreline. In order to accommodate the increased usage, roadway improvements are highly desirable.

By far the most important of the needed upgrades is to the intersection with Queen Ka‘ahumanu Highway. At present it consists of a simple T-Intersection. There is no sign indicating that the roadway provides access to Kīholo Bay, and there are no deceleration or acceleration lanes. The absence of the acceleration/deceleration lanes at the existing Kīholo Bay intersection is widely recognized as undesirable from a safety standpoint. While it is perhaps tolerable while Kīholo retains its “Park Reserve” status, it will be important to improve highway access if Kīholo is upgraded to full State Park status.

5.2.3.1.1 Queen Ka‘ahumanu Highway/Kīholo Bay Access Alternatives Considered

Three fundamental Queen Ka‘ahumanu Highway/Kīholo Bay Access alternatives were considered during the park master planning process.

No Action. The first possibility is that State Parks opts to allow the current situation to persist. However, in order to do so, they would have to acquire the approval of DOT-Highways, as the intersection would now be the convergence of a public road with a public highway, and not simply a “driveway” access onto a public road. Since the current state of the intersection is not consistent with DOT policies and guidelines, it is unlikely that such an approval would be given.

Improve Existing Access Road. Under this option, State Parks would work with DOT-Highways to develop an entirely new intersection with acceleration, deceleration, and storage lanes. This approach provides for a new intersection much like the one serving the scenic lookout several hundred yards north of the park entrance, requiring a similar investment of time and money to design and construct. In addition, this option could require the relocation of the portion of the park access road closest to the intersection, so that the new lanes serving it would not conflict with the acceleration and deceleration lanes recently created for the adjacent scenic lookout. If the acceleration and deceleration lanes built under this option were of similar length as those for the scenic lookout, this could push the park entrance hundreds of feet south of its present location, even if DOT-Highways did not request any additional separation between the end of the scenic lookout’s acceleration lane and the beginning of a Kīholo deceleration lane. Thus, this approach would likely also require an additional segment of new unpaved road within the park connecting the newly designed entrance intersection to the existing access road and asking DOT-Highways to move the existing approved

access point to Kīhōlo Bay hundreds of feet to the south to further distance it from the scenic lookout. In view of the presence of a substantial drainageway and numerous identified archaeological/cultural sites in the area through which the alignment would have to pass, this option has substantial drawbacks from both a physical design and cost standpoints.

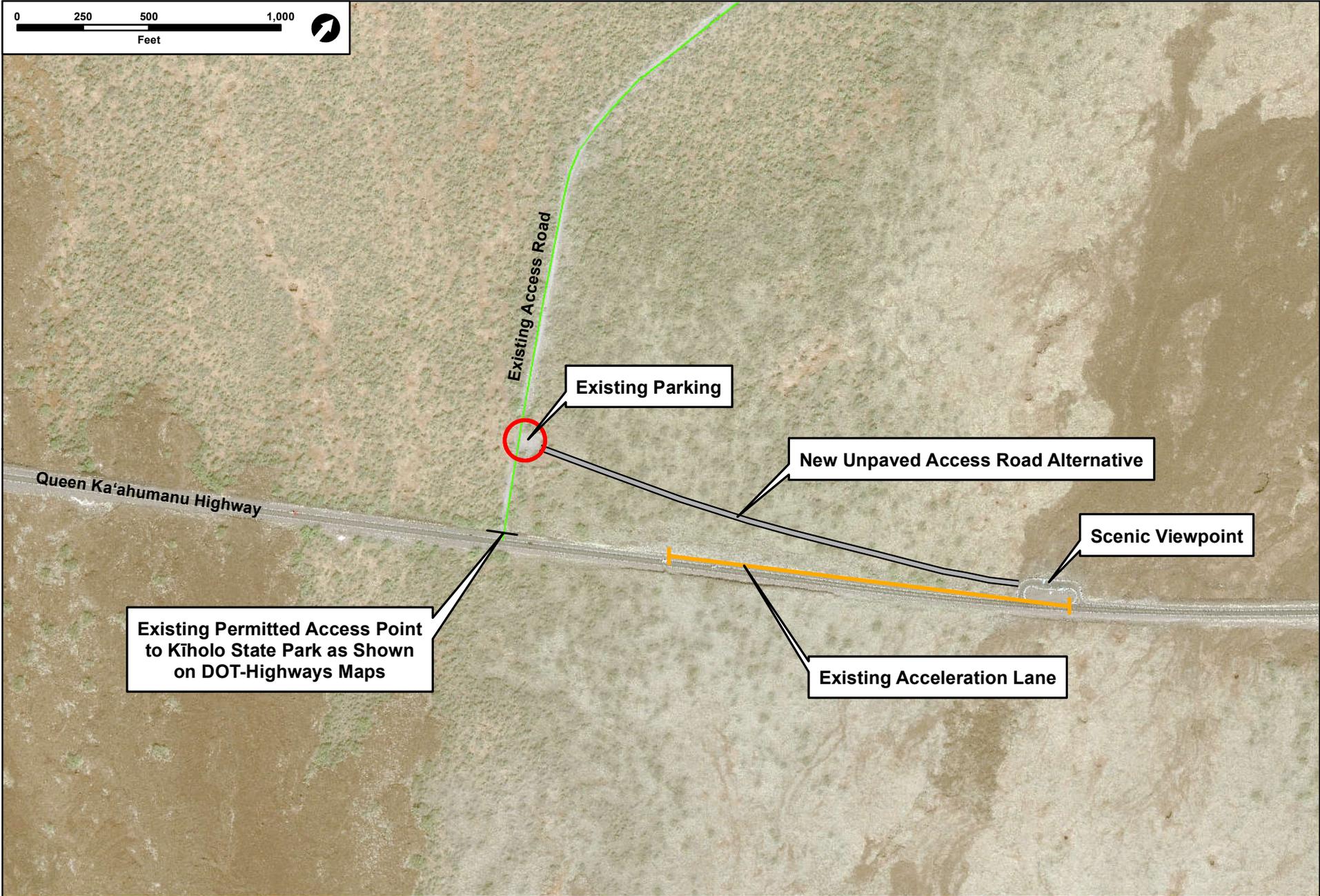
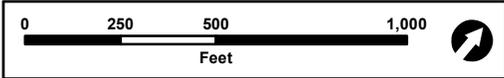
- On the physical design side, creating a large new intersection does not create the most appropriate introduction to a “wilderness” experience. Instead, it puts it on the level of all of the other intersections that have been constructed along the Kona/Kohala shoreline over the past four decades.
- On a purely practical level, the presence of the acceleration lane for the scenic overlook just to the north probably makes it impossible to provide satisfactory acceleration/deceleration lanes without shifting the location of the *mauka* end of the Kīhōlo Bay access road at least a short distance to the south.
- The cost of creating the turn lanes would be high. A precise estimate would require much more detailed engineering than was possible or is appropriate for this report. However rough estimates based on the cost of recently completed highway intersections with Queen Ka‘ahumanu Highway place it on the order of \$500,000 or more.

Connect with Scenic Lookout Access Road. This approach entails construction of a new section of unpaved road from the scenic lookout southeastward and generally parallel to the highway, to join the existing access road in the vicinity of the upper parking area some 300 feet *makai* of the highway. Visitors to either the scenic lookout or the park would share the same (existing) point of highway ingress and egress, using the acceleration, deceleration, and storage lanes which are already present. This concept possesses several advantages over the previous two options: (i) it uses the existing highway intersection improvements; (ii) it obviates any conflict between drivers visiting the park and others searching for the scenic lookout; (iii) it eliminates the possibility of hazardous left turns by drivers headed north across southbound traffic to access the existing park entrance; and (iv) it protects bicyclists from drivers shifting onto the shoulder to wait for gaps in traffic to accomplish their illegal turns into the park. Under this alternative drivers entering and exiting the park would simply turn in or out of the new gravel access road into the parking area of the scenic viewpoint, and then enter or exit Queen Ka‘ahumanu Highway via the acceleration and deceleration lanes already in place.

5.2.3.1.2 Preferred Queen Ka‘ahumanu Highway/Kīhōlo Bay Access

After evaluating the possibilities described above, planners concluded that the Scenic Lookout Access Road option, which takes advantage of existing highway improvements a short distance north of existing Kīhōlo entrance road, is the preferred resolution to this challenge. This option has been coordinated with DOT-Highways and they have indicated that they are open to the possibility and willing to review and comment on a design based on the concept.

As noted above, this approach would require the construction of a new section of unpaved road from the scenic lookout southwest across a section of *pāhoehoe* lava to join with the existing park access road—possibly in the vicinity of the existing upper parking area—approximately 300 feet *makai* of the highway. Figure 5.2 depicts the conceptual alignment of the new road, which would be approximately 1,900 feet in length and 20 feet wide. Although the exact alignment of this road has not been determined, the majority of it would be within State Parks property; only the first stretch of road as it leaves the scenic overlook would be within the highway right-of-way. Based on a conservative cost estimate of \$75-\$100 per lineal foot for grading and base course, the cost is unlikely to exceed \$200,000, and could be considerably less. A preliminary field check of the area along the route indicates that it will not affect any identified historic or archaeological features and will not pass over any important lava tubes. A more detailed survey would be conducted during the final design of the road, and there is sufficient space for re-routing should anything unexpected be encountered.



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 State Parks Division
 Dept. of Land & Natural Resources
 State of Hawai'i

Prepared By:
 **PLANNING SOLUTIONS**

Source:
 -State of Hawai'i GIS
 -ESRI Satellite Imagery

Project:
 Kīholo State Park
 Master Plan

Figure 5.2
Proposed Queen Kaahumanu Highway - Kiholo Bay Access Map

Other Internal Park Roadways. Other than the Queen Ka‘ahumanu Highway access road shift outlined above, no new vehicular roads would be created under this alternative. However, all major existing roadways in the park, as shown in Figure 2.14 and Figure 2.16 would be maintained in their present form for use by park users, inholders, service vehicles, and emergency services access. Generally, for these roadways, the continued use of gravel surfaces is appropriate within the park and will be the preferred method for creation and upkeep of internal park roadways. Exceptions to this approach occur only in places where grades are sufficiently steep, or the turning radius is sufficiently sharp, that an asphalt surface is called for in order to prevent undue slipping during startup or turning.

5.2.3.2 Campsites

The campsites envisioned as part of Alternative 1 are, at minimum, identical to those established for permit-only camping under the interim management program. There are eight such campsites at Kīholo Bay, strung along the shoreline north of the former Loretta Lynn residence (see Figure 5.3 for prototypical campsites). Each campsite consists of an area cleared of vegetation, fronting the ocean, is equipped with a fire pit with a metal grill for cooking food, and has a sign posting the campsite number and park regulations. Most, but not all, campsites are also equipped with a picnic table. The campsites may be accessed either from the lateral shoreline trail, or via small cleared trails leading to the southern branch of the park access road. The trails are marked with white stones for better visibility at night. A trash receptacle and portable toilet is placed at the head of each pair of trails, four toilets and four waste trash cans in total, serving the eight campsites.

Use of these campsites requires a permit obtainable through the Department of Land and Natural Resources, Division of State Parks online Wiki-Permits website. At the present time, camping is permitted from Friday through Sunday nights; no camping is permitted during other weekdays.

The demand for campsites at Kīholo exceeds the number allowed under the Interim Management Plan. If park managers conclude from ongoing experience that additional camping would not overtax existing natural resources, additional campsites at Kīholo Bay could be provided. This could be done by creating four to six additional campsites on the south side of the Loretta Lynn house and/or creating a few (three to four) campsites immediately north of the existing campsites and access road cul-de-sac (see Figure 5.4 for a conceptual layout of expanded camping opportunities focused at Kīholo Bay).

With regard to the area to the south of the Loretta Lynn house, this space is sufficiently large that it could be used (by grouping campsites together) to accommodate groups larger than the ten person maximum for which each of the other campsites is designed. However, as larger groups have a tendency to create disturbances that rarely occur if the campsites are restricted to the 10-person limit presently adhered to, it is recommended that: (i) such use be restricted to carefully screened groups making service visits to the park and (ii) large group use ordinarily be limited to times when the smaller campsites are not in use.

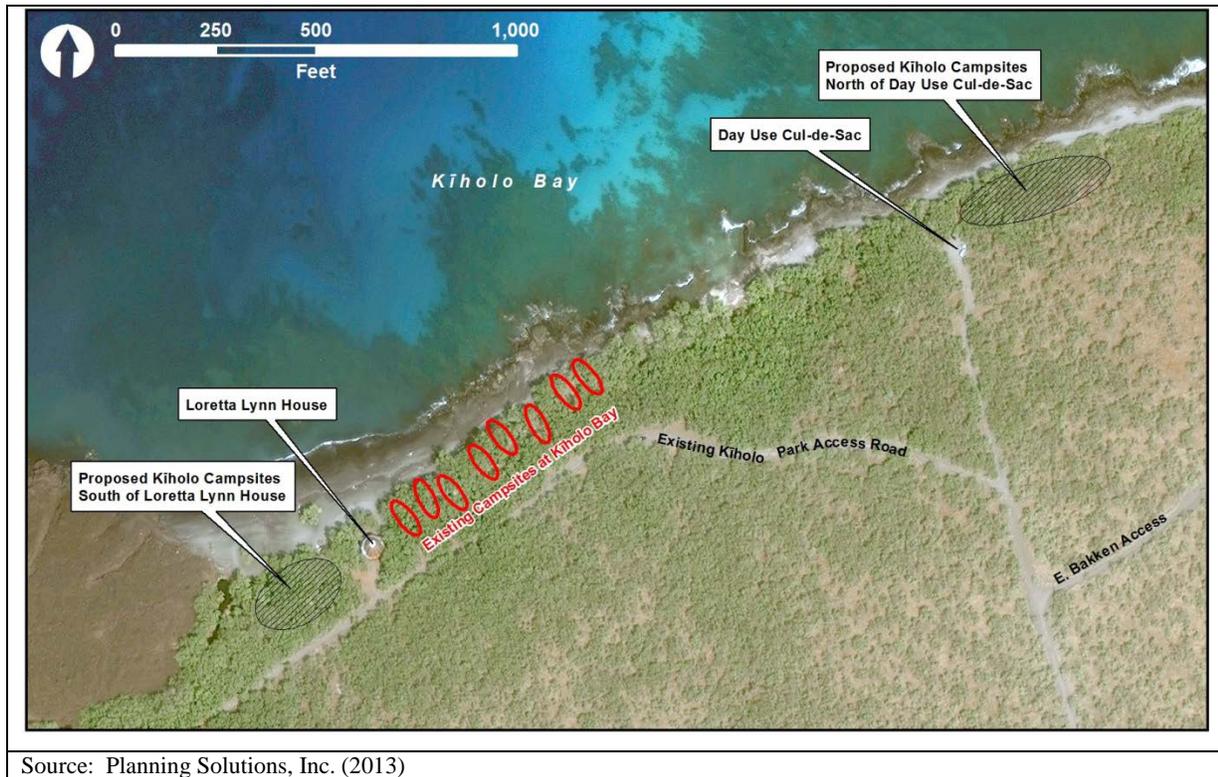
5.2.3.1 Picnic Areas

As previously noted, there is a table at most of the campsites at Kīholo Bay, but these are available to day-visitors only when the campsites are not occupied by overnight campers (i.e., mostly mid-week). The proposed park plan calls for several additional picnic areas. These would be located near the northern and southern turnarounds on the main access road.

Figure 5.3 Prototypical Campsites: Kīholo Bay

	
<p><i>General appearance of campsite.</i></p>	<p><i>Typical fire pit with metal grate.</i></p>
	
<p><i>Signs identifying campground/stating park regulations.</i></p>	<p><i>Portable toilet and trash receptacle.</i></p>
	
<p><i>Typical picnic table found at most campsites.</i></p>	<p><i>Signage identifying campsite by number.</i></p>
<p>Source: Planning Solutions, Inc. (2012)</p>	

Figure 5.4 Expanded Camping Opportunities at Kīholo Bay



5.2.4 PARK OPERATIONS AND MANAGEMENT FOR FOCUSED CAMPING ALTERNATIVE

5.2.4.1 Staffing

5.2.4.1.1 State Parks Staffing

If Kīholo is to become the safe, attractive recreational spot that it is intended to be, the Division of State Parks must provide adequate staffing. This, in turn, requires that the State establish one or more permanent staff positions that will allow the Division to hire Interpretive Park Technicians (park rangers). The park rangers will act as a liaison between visitors and park resources, ensuring the development and implementation of the programs outlined in this Master Plan.⁷⁷ Park rangers will have park-wide responsibilities, balancing their focus between areas of intensive human activity such as campsites and parking areas, with regular patrols of undeveloped areas and trails in more remote sections of the park. Their presence is absolutely essential in a park that is as large, and sparsely populated with users as Kīholo, and if funding shortfalls prevent the Division from providing adequate numbers it should consider restricting public access until such time as funding is returned to adequate levels. These State-funded positions could operate and/or coordinate interpretive programs, assist agencies and resource officials in the management of park resources, and work with park visitors, service volunteers, and curators.

The State Parks Interpretive Program Manager will supervise the park ranger(s), determining the direction of the State-initiated interpretive programs carried out and establishing policies for operations at Kīholo State Park. In some instances, the Departmental Volunteer Coordinator (DVC)

⁷⁷ Job duties for “Interpretive Park Technicians” include providing interpretive services for visitors (talks, tours, and interaction in the park setting that includes providing information about park resources, safety, and rules), conducting visitor surveys, drafting and distributing interpretive materials, coordinating volunteer projects, and assisting with resource management (monitor resources, implement projects, and work with professional staff).

may assist in organizing large volunteer-based projects at the park, but the DVC will coordinate any such efforts with the park rangers and with curators (see Section 5.2.4.1.3 for discussion of curators).

Kīholo State Park, in addition to its rich natural and cultural heritage, has the advantage of having a deeply committed and supportive curator group in the form of Hui Aloha Kīholo. Because of the nature of the relationship between this park and the people who care deeply for it, it would be very helpful if State Parks let certain principles guide its selection of park rangers:

- State Parks should work with the curators, giving them an advisory voice in the ranger selection process.
- Ranger(s) should be encouraged to act with care for visitors and curators, preferring a persuasive role to one of enforcement.
- Ranger(s) should be willing to work with the community and curators as partners, willing to listen and give people a voice in the management process.

As evidenced by the success of its curator agreement with Hui Aloha Kīholo, creating an operational environment of partnership between State staff, curators, service groups, and the island community State Parks can magnify the efficacy of its operations. Over time, as funding becomes available and interpretive facilities become feasible, staffing could increase to allow for additional park rangers and a dedicated park manager who would oversee the implementation of this Master Plan and coordinate operational staff, curators, volunteers, and public activities. In the interim, in lieu of State-funded positions, aspects of this role could be turned over to Hui Aloha Kīholo in their role as park curators who would identify operational needs, service projects, and problems and work with service groups to coordinate resource management initiatives with prior approval by the State.

5.2.4.1.2 DLNR Technical Staff

The technical and professional staff within the Department of Land and Natural Resources has been integral to the creation of this Master Plan. These professionals, including planners, archaeologists, botanists, and biologists have and will continue to be vital to the development and implementation of various resource management programs and policies of the park. Along with staff of State Parks, the Division of Aquatic Resources (DAR) and the State Historic Preservation Division (SHPD) will both be directly involved with resource management activities within the park and, over time, the development of interpretive and educational programs. DAR currently operates a Fisheries Management Area at Kīholo Bay and is considering additional resource surveys (e.g., creel surveys and/or fish-count transects) to track resource abundance and protections in coastal waters at the park. Information of this nature should be routinely reported to State Parks so that this information can guide, and be incorporated into, management decisions by State Parks planning and maintenance staff.

5.2.4.1.3 Hui Aloha Kīholo Curatorship

The curatorship agreement currently in place at Kīholo (see Appendix B) has been central to the progress in achieving the goals that the State has set for Kīholo State Park Reserve. As discussed in Section 1.6.2, Hui Aloha Kīholo's goal is the respectful stewardship of land and waters of Kīholo for cultural, community, ecological, sustenance, and spiritual purposes, and it has brought expertise, commitment, dedicated citizenship, and other resources to the effort that would not otherwise have been available. Since 2007, it has coordinated a variety of programs including community service days, anchialine pool restoration, shoreline trail improvements, the removal of tons of trash and marine debris, and provided funding for four portable toilets to accommodate visitors at Kīholo, supplementing those provided by State Parks. The group has also collaborated with the DLNR's resource divisions including State Parks, Conservation and Resources Enforcement (DOCARE), Aquatic Resources (DAR), Forestry and Wildlife (DOFAW) as well as the Pu'u Wa'awa'a Advisory Council, the U.S. Forest Service, the National Park Service, and other groups on a variety of Kīholo-based issues, including illegal fishing, marine, and coastal research, shoreline trails, feral animal management, and fresh water resource management.

Hui Aloha Kīhōlo's efforts extend beyond coordinating with State agencies to provide adequate infrastructure for the area. Acting as a 501(c)(3) nonprofit community organization, it is seeking private sources of funding to establish interpretive programs at the park. If it is successful in its efforts, Hui Aloha Kīhōlo would use grant money that it receives to work with the State and volunteers to train individuals to conduct cultural interpretive and marine education programs. These persons could give interpretive talks, supervise educational events, and lead outdoor classroom activities. The Hui has the ability to draw on the long experience and deep knowledge of *kūpuna* and *kumu* native to the region, who can participate in the planning and execution of various activities to promote an understanding and knowledge of cultural and historic traditions associated with the park and its resources, such as traditional practices relating to fishing, aquaculture, and resource management. As the curatorship program continues to develop, Hui Aloha Kīhōlo could host various workshops on resource management and cultural traditions, drawing on the knowledge and skills of these *kūpuna*.

The experience to date strongly suggests that realizing Kīhōlo's full potential as a State Park will require State Parks to foster the organization's continuing close involvement in the area at both a planning and implementation level. Linking the land, the living community, and State Parks, the curatorship agreement has the effect of drawing in more resources than State Parks can muster alone and allowing everyone to act in the most efficient and cost-effective ways on behalf of Kīhōlo. For these reasons, it is important that State Parks continue the organization's involvement by extending the curatorship agreement with Hui Aloha Kīhōlo.

5.2.4.2 Service Groups and Volunteers

Alongside the curatorship agreement with Hui Aloha Kīhōlo, State Parks should seek out opportunities to partner with other community groups. Some of these opportunities could involve resource management, such as participation in creel surveys, trail maintenance, and anchialine pond restoration. Previous examples of this include volunteer work days, ongoing since 2007 where service groups worked with Hui Aloha Kīhōlo and State Parks to establish parking areas away from the beach, trash removal, and noxious weed removal from Waiaelepī Pond. There are also numerous groups planning or currently conducting research and restoration projects at Kīhōlo State Park, including The Nature Conservancy and a group of University of Hawai'i researchers (from both Hilo and Mānoa campuses), collaborating with the Institute of Pacific Islands Forestry (IPIF) to conduct research funded by the Office of the Experimental Program to Stimulate Competitive Research (EPSCoR, part of the National Science Foundation).

Service and volunteer groups at Kīhōlo State Park could participate in the enrichment of the park in a variety of ways:

- Individuals, such as fishermen, who are already visiting the park can be used to monitor resources and collect empirical data.
- Research programs (e.g., HETF and EPSCoR) can share their data and findings with the Division of State Parks, helping them assess conditions and determine needs for resource protection and adaptive management.
- Community groups can help clean up litter, restore trails, control vegetation, and assist in minor facility repairs such as campsite maintenance.

Park rangers, curators, and community volunteers can work in coordination with State Parks, with the assistance of the DLNR Volunteer Coordinator to establish these programs.

One possible way to encourage and facilitate this type of community activism and involvement at Kīhōlo State Park is to provide a group camping area (see Section 5.2.3.2) which would be available to service groups, so that they would be able to come to the park, engage in their service project, and camp there at day's end. Discussions with State Parks, Hui Aloha Kīhōlo, and park planners have indicated that campsite could be established in one of two places: (i) just to the south of the Loretta

Lynn structure, between it and Waiaalepī Pond; or (ii) by simply assigning larger groups to several of the 10-person campsites fronting Kīholo Bay that are adjacent to one another. To ensure that the kinds of activities that service groups perform at Kīholo is most supportive of the area's broader needs rather than just their own, possibly narrower interests, the curator and State Parks should consider posting a list of those tasks which they believe most need to be undertaken and providing a fast-track approval process for such requests. This would not preclude groups from seeking approval of activities that are not on this official "wish list", but it would channel organizations' energy in directions which best fit the overall objectives of the park.

5.2.4.3 Park 'Ohana

At present, there are a growing number of groups interested in participating in the development of Kīholo State Park. The success of the present curatorship agreement with Hui Aloha Kīholo and State Parks could serve as a model for the involvement of other community groups. In addition, Hui Aloha Kīholo has expressed their view that their *kuleana*, the area for which they feel most responsible, is centered on Kīholo Bay and that they would welcome the involvement of other groups wishing to curate other areas in the park such as at Kalaemanō, Keawaiki Bay, or 'Anaeho'omalu Bay. The large size of the park means that there is ample opportunity for other groups to take ownership of specific places and resources, and discussions held during preparation of the Master Plan indicate that the likelihood of obtaining such additional support will be enhanced if State Parks actively seeks out such partners.

Alongside programs initiated by private interests, the State has opportunities to invite or create additional participation. As an example, Kīholo Bay is currently identified as a Fisheries Management Area by the Division of Aquatic Resources. DAR could form a citizens' advisory committee to oversee a development of a management plan which balances the needs of fishermen with the need to carefully protect and restore fisheries in the coastal waters of Kīholo State Park. Such a committee, along with providing valuable insight into resource usage and health could help monitor and enforce fishery rules. State Parks should actively pursue the development of relationships with other *'ohana* with ties to various resources and places in the park to help it identify issues, address management problems, and propose solutions to challenges.

5.2.4.4 Park Safety and Security

Providing for the safety of park visitors is a guiding principle and of paramount importance to the Division of State Parks. Further, protecting State Parks facilities and resources is also vitally important. The large size and wild, undeveloped nature of the park means that law enforcement and emergency response times can be longer than would otherwise be the case. It can also have the effect of limiting the degree and frequency of enforcement oversight. Because of the challenges that exist at Kīholo State Park, the Division has created multiple layers of oversight and enforcement to help maintain the safety and security of park visitors and resources.

Park Ranger. A Park Interpretive Technician, a.k.a .park ranger, will be present during regular park hours. The presence and oversight of the State employee(s) will discourage vandalism of park resources and provide park visitors with a point of contact in the event of a crime or other disturbance. The park ranger(s) will be provided with a mobile telephone and the contact number will be prominently displayed on signs within the park, allowing park visitors to contact the ranger directly in the event of an emergency. The ranger will also be equipped with an all-terrain service vehicle, but due to the wild nature of much of the park, many portions of the park will remain accessible only by helicopter or on foot.

Gates. The purpose of the park is to be an open resource for the public. Currently, the park hours are posted as 7:00 a.m to 7:00 p.m. from April 1st to Labor Day, and from 7:00 a.m. to 8:00 p.m. from Labor Day to March 31st. The operating budget for the park is intended to allow State Parks to ensure that there are sufficient staff to open and close the park at the posted times. This is both a matter of

public safety and convenience, and if budgetary or other limitations make this goal difficult to achieve, State Parks should continue to attempt to have others (such as the curator) perform that task.

The focused camping alternative (Alternative 1) calls for the creation of one entirely new roadway segment within Kīholo State Park. The addition consists of the roadway needed to connect the existing access road with the existing scenic viewpoint access. In addition to the new roadway segment, it entails the creation or continuance of gates at certain points on the existing roads to act as a management tool, helping to control the flow of vehicles into the park. This is done both to maintain a safe environment where vehicles travel only on approved roadways, and to protect the wild and unimproved nature of the park lands. Gates will limit vehicular access to the park to approved areas and times. The locations of gates at Kīholo State Park are, and would continue to be:

- At the top (i.e., Queen Ka‘ahumanu Highway end) of the park access road immediately adjacent to the scenic overlook parking area. This new gate would be open during normal park hours, as referenced above. Inholders, emergency service personnel (i.e., police, fire-fighters, EMS drivers, etc.) would have the key/combination needed to pass through this gate.
- At the entrance to the Bakken residence access road, which branches off the main park access road. This gate is for private inholding use only and will remain closed when not in use; park visitors will not be able to drive down this road.
- At the top of the Kīholo Bay campsite branch road that turns off from the park access road and proceeds southward towards the southern end of Kīholo Bay, the Loretta Lynn structure, and the designated camping areas there. As with the gate at the top of the access road, this gate will remain open during normal park hours.
- At the top of the Keawaiki Bay access road. This gate is for use by private inholders and may be used by service vehicles for special purposes, but will remain closed to park visitors at all time.
- New gates will be installed at the top of the access roads to the Weliweli and Kapalaoa inholdings. As with the Keawaiki Bay access road, these roads may be used by inholders and service vehicles, but will remain closed to park visitors at all times.

All gates should be strong, with heavy locking mechanisms which can withstand casual vandalism. Signage at all gates should include hours of operation and general information and/or rules about the park, including the mobile phone number for the park ranger(s). State Parks will coordinate with the curator (e.g., Hui Aloha Kīholo) in the event of an emergency or natural disaster (e.g., tsunami, earthquake, etc.) to ensure that park gates are open, allowing campers and other park visitors to exit the park promptly.

Telecommunications. Because of the remote and wild nature of the park, constant oversight is not practical and the fastest means of communication between park staff, park visitors, and emergency services is by mobile telephone. Park visitors should be reminded of this fact using signage and through the permitting process for camping. Park personnel will be provided with mobile telephones, allowing them to be contacted by park visitors, and to contact police, fire, and emergency medical services as needed.

5.2.4.5 Utilities and Telecommunications

There are no telephones, electrical, or fresh water utilities present in the park or called for under the Focused Camping Alternative. Park personnel will use mobile phones to contact each other and emergency services.

5.2.4.6 Curatorship Volunteers

While curators will not be officially deputized, if funding is not immediately available for park rangers, sufficient funding should be made available to continue the practice of deploying a uniformed curator as a park ranger, monitoring activities, checking permits, and educating the public regarding park regulations. The mere presence of uniformed persons with telephones is likely to improve the safety and security of the park. Training and instruction should be provided to these

individuals; the DLNR Volunteer Coordinator can assist in this process if and when necessary by organizing training. These volunteer activities can also be coordinated with the park caretakers and interpretive program specialists.

5.2.4.7 Warnings and Protection from Natural Hazards

The wild and unimproved conditions present at Kīholo State Park present the threat of natural hazards to park visitors. The relatively rugged condition of trails built on or even from lava rock, the intense sunlight, powerful wave action and currents, and precarious nature of lava tubes are examples of the types of potential hazards park visitors may face. Signs warning park visitors of various risks and of the measures to take to avoid them should be posted in locations which are close to improved areas of the park or trails, and which pose a particular hazard. At such a time as the Loretta Lynn structure or other interpretive center or kiosk is created at the park, information in the form of placards or brochures could be made available with both general and safety information. Also, as mobile phone technology advances, State Parks should consider making more general and safety information available via its website or as downloadable apps—this would reduce the need for printed materials and signs and allow park visitors to access information as needed.

In addition to distributing information to park visitors with signs, brochures, and electronic media, park rangers should receive specific training on how to conduct park operations in the event of fires, earthquakes, tsunamis, or other natural hazards. Instructions for appropriate visitors' responses to such emergencies should also be provided through signage and handed out with camping permits. Currently there are no Civil Defense warning sirens within audible range of Kīholo State Park Reserve; during emergencies, Hawai'i County Police Department officers park at the top of the access road and use their sirens and megaphones to warn park visitors and campers. Until such time as sirens are present, State Parks should coordinate with Civil Defense, Hawai'i County Fire Department (HFD), Hawai'i County Police Department (HPD), and Hui Aloha Kīholo to ensure that park visitors and campers are warned in the event of an emergency. In some other areas of the island, helicopters are used to provide warnings and this method could be applied at Kīholo as well. State Parks should also consider using texts, Twitter, or other digital media to alert campers (via their contact numbers) in the event of an emergency.

Fire Control. The lands of Pu'u Anahulu and Pu'u Wa'awa'a were known in times past as *Kekaha-wai-'ole*, the waterless land of Kekaha. Because of this arid landscape, fire is a constant threat to the safety of park visitors and presents a challenge for park management. This is especially true in areas near campsites, where the dry grass and branches could be easily ignited by cooking fires or other human activity. The nearest HFD station is located at Waikoloa, but there is no municipal water or dedicated fire suppression water supply present at Kīholo State Park Reserve and none of the Master Plan alternatives developed in this document call for the creation of such infrastructure. Therefore, along with the primary need for prevention, alternative firefighting methods must be developed.

The fire control plan for Kīholo State Park should include several layers of measures designed to minimize the risk to park visitors, personnel and property, including:

- Campsites should be equipped with dedicated fire pits, as has been the case under the interim park management plan. No open fires should be permitted outside of these areas, and use of portable stoves and burners should be strictly controlled and limited to specific areas.
- All campsites should have signs clearly stating fire control rules.
- A regime of landscape maintenance, carried out either by groundskeepers employed by State Parks, by volunteers coordinated by the park curators, or some combination of the two should be established in the vicinity of all campsites. The primary purpose of such a program of landscaping is to keep all cooking areas free of debris and dry trimmings to the extent practicable. Enough separation should be created to minimize the dangers of windblown sparks or coals reaching patches of dry vegetation.

- Trimmed vegetation should be collected and used for compost in vegetation restoration areas, if possible, or removed from campsites so as to avoid creating a fuel source for fires.
- Any structures, such as an equipment shed for park rangers or any interpretive structure, including the Loretta Lynn home should be equipped with chemical fire extinguishers. Staff should be trained in the use of these fire extinguishers and they should be tested frequently.
- Should additional funding become available, State Parks could establish brackish water wells and storage tanks to create a water supply for firefighting near the established campsites.
- In the event of fire, firefighters may use helicopters or other means to draw water from the ocean for firefighting purposes.

5.2.5 PARK MAINTENANCE FOR THE FOCUSED CAMPING ALTERNATIVE

Along with safety, sanitation is a guiding concern at all facilities operated by State Parks. At the present time, all maintenance equipment must be brought into the park for use, and then transported back out as there is no storage facility present within Kīholo State Park Reserve. Until such a time as the Loretta Lynn home or some other such structure has been created to function as a visitor or interpretive center, an equipment storage shed should be constructed near the campsites at Kīholo Bay for joint use by park rangers and groundskeepers.

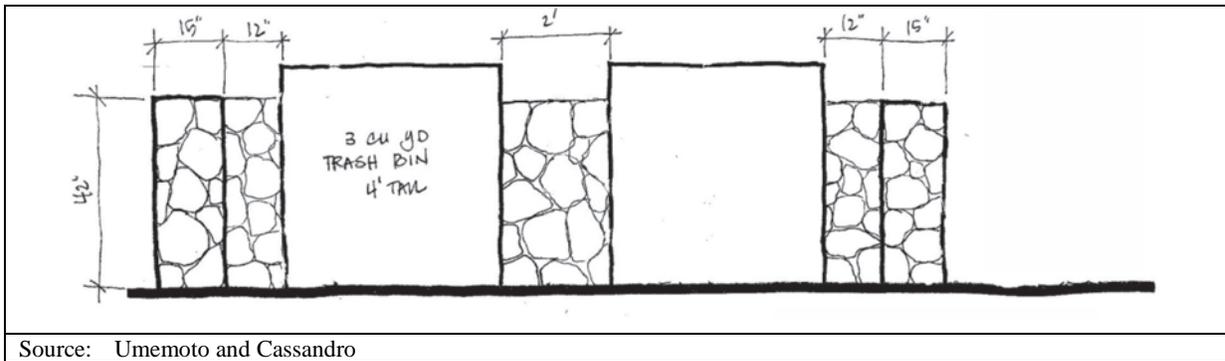
5.2.5.1 Solid Waste

Trash-can type solid waste receptacles will be present at all established campsites, adjacent to portable toilets and access roads for ease of service. In addition, a large dumpster receptacle will be present at the cul-de-sac near the Loretta Lynn structure for use by day visitors and groups (see Figure 5.5 for enclosure design concept). This solid waste will be picked up and disposed of by park personnel and/or contractors through regularly scheduled service trips.

Solid waste receptacles will be limited to areas with campsites and near parking areas at Kīholo Bay. Trailheads, beaches, fishing spots, and other areas of the park will not have solid waste receptacles. Signage will ask park visitors to pack out all that they bring in to minimize trash volumes and instill an ethic of environmental sensitivity.

Despite attempts to limit the amount of solid waste generated in the park and provisions for some refuse collection, it is inevitable that trash and debris will accumulate at Kīholo State Park over time as individuals fail to fully carry out their responsibilities. In the past, the park curators have organized very effective community cleanup days which mobilized State Parks staff, curators, and community members to collect and dispose of trash. This is particularly necessary in areas of the park which are not easily accessible by groundskeepers or other park staff, and if the Division of State Parks elects to create a group camping area, such community involvement could be conducted over several days. This would have the dual effect of improving conditions within the park while strengthening the community's ties to Kīholo State Park, fostering their sense of connection and responsibility for the area and its resources.

Figure 5.5 Design Concept for Trash Bin Enclosure



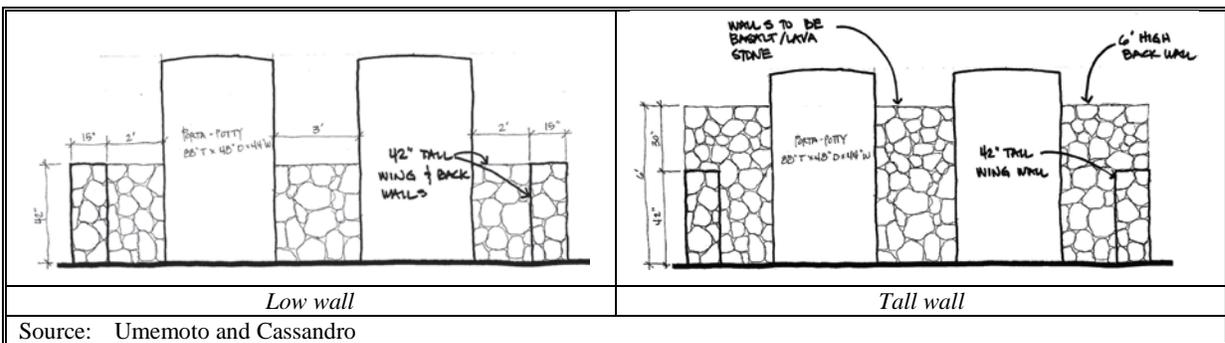
Green waste generated either from regular park maintenance or community cleanups should be chipped and composted for reuse in the park. Other organic material can be recycled or composted. State Parks should include funds in its operational budget for the park to keep equipment for mulching green waste at the equipment shed to be established near the Loretta Lynn structure.

5.2.5.2 Restroom Facilities

Because there is no municipal or park water supply available at Kīholo, self-contained toilets will be needed (including one or more ADA-accessible toilet). Because of their small size and relatively low capital cost, it is practical to place portable chemical toilets near points of activity and to adjust their number in response to observed use patterns. Because of this, they may offer the best option over the short term. Under the focused camping alternative, 8 to 10 portable toilets would be distributed along the access drive, parking areas, and campsites for use by campers and day visitors. Other areas of the park will not have toilets available, consistent with its status as a wilderness location. State Parks will be responsible for all costs associated with these portable toilets and should budget funds accordingly. The sole exception to this could be at the group campsite, where service groups could be required to pay for one or more additional toilets to meet their temporary needs at a cost over and above the price of the camping permit.

At present, the portable toilets are simply free-standing by the roadside. As the park becomes established, enclosures made of lava rock or some other native material could be created to mitigate the incongruous appearance of the portable toilets. Examples of design possibilities for these enclosures are shown in Figure 5.6.

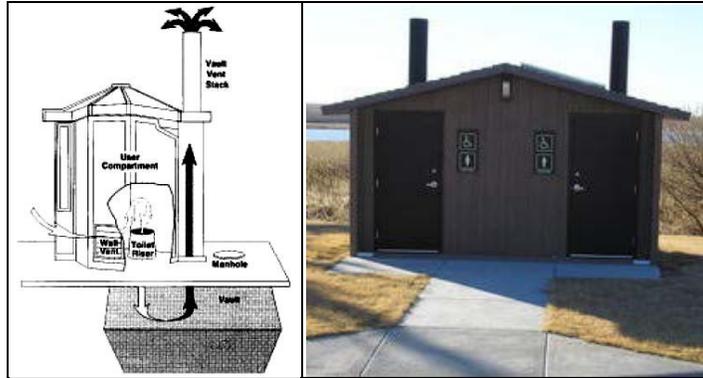
Figure 5.6 Design Concepts for Portable Toilet Enclosures



Other types of self-contained/zero-discharge toilets may ultimately prove more economical or desirable over the long term, particularly for use in areas that receive relatively high usage. Two

varieties that presently appear most appropriate for Kīholo are described briefly below. However, readers should note that the technology is constantly evolving and State Parks may ultimately choose to use different types of systems in specific situations. So long as these have equivalent or lesser discharges than the two discussed here, the potential effects will be similar.

- ***Vault Toilet.*** These hold waste in an underground vault or tank, usually between 750 and 1000 gallons in size (although much larger ones are in use). These vaults, which are made of concrete or plastic) are pumped out periodically, and the waste is hauled to municipal wastewater treatment plants. A typical vault toilet installation has the vault buried in the ground with a concrete slab poured in place directly over it (see illustration to right).



The building is installed on the slab with connections to the vault for the toilet and vent pipe. Vault toilets are designed to minimize odors, using a vent system so fresh air naturally flows through the building and out of the vault and vent pipe, but they are not perfect in this respect. In general, odors become a problem only when there is a total lack of wind and/or there is no sun to warm the vent stack in the roof (the warmth causes air to rise in the pipe, pulling smelly air out of the building).

- **Composting Toilet:** This type of toilet promotes aerobic decomposition and stabilization of human waste through the addition of a carbon source (e.g., wood shavings). Unlike a septic system, a composting toilet system relies on unsaturated conditions where aerobic bacteria break down wastes, just as they do in a yard waste composter. The main components of a composting toilet are a composting reactor connected to a dry or micro-flush toilet(s); a screened air inlet and an exhaust system to remove odors and heat, carbon dioxide, water vapor, and the by-products of aerobic decomposition; a mechanism to provide the necessary ventilation to support the aerobic organisms in the composter; a means of draining and managing excess liquid and leachate; process controls to optimize and facilitate management of the processes; and an access door for removal of the end-product. If sized and maintained properly a composting toilet breaks down waste to 10 to 30 percent of its original volume. The resulting soil-like material (humus) is periodically removed from beneath the toilet and buried or removed by a licensed septage hauler (Solomon, C. et al. 1998).



5.2.5.3 Vandalism and Theft

Vandalism increases the frequency and cost of park maintenance and detracts from park visitors’ experience. The control of vandalism is closely tied to the presence of park staff, particularly rangers, but also groundskeepers, DOCARE officers, park curators, and police officers. Another way to reduce the level of vandalism at Kīholo State Park is to keep the level of intrusive infrastructure such as signs and structures to a necessary minimum, providing fewer opportunities for vandals to damage property while remaining consistent with the park’s wilderness designation. This includes keeping the number of signs, prohibitions, and barriers to access park resources to a necessary minimum.

The connection of the community to the park is another important factor in controlling the level of vandalism at Kīhōlo. To the extent that people have a sense of ownership over the park, they will be less likely to engage in disruptive activity there, producing a self-policing effect. In addition, periodic community clean-up days organized in cooperation with park curators and community service groups will support regular maintenance of park facilities and resources. The continued involvement of members of Hui Aloha Kīhōlo provides a further strong link to the community that is likely to minimize vandalism.

5.2.5.4 Long-Term Facility Maintenance

The intense sun and corrosive salt air contribute to an accelerated pace of weathering of park structures and equipment. Areas which see higher levels of use, such as the access road, parking areas, and campsites in particular will need periodic maintenance, repair, or replacement. However, the Focused Camping Alternative calls for the installation of very little infrastructure which would require significant maintenance or frequent repairs, consistent with the park's wilderness designation. Because of the relatively minor and uncomplicated nature of much of the facility maintenance which will be required at Kīhōlo State Park, it is likely that State Parks could partner with the curators and community service groups to support a program of regular maintenance. Whenever possible, as broad a spectrum of the community as possible should be included in community service events.

5.2.6 CAVES MANAGEMENT PLAN

5.2.6.1 Purpose of Caves Management Plan

The caves present in the park are tubes formed by the lava as it cooled following eruptions, trapping gas and creating underground chambers of varying size and length. Because these features are prevalent in the native geology of the area, over time they became cultural features as well, being used for habitation, storage, and internment of bodies and burial goods. State Parks has specifically identified management of lava tubes as an important issue which should be addressed in the Master Plan for Kīhōlo State Park (see Section 1.9.2.4). These features are intrinsically interesting and attractive to some park visitors, but have historically remained relatively unmanaged. This has created a situation where people have been entering caves without proper equipment, removing cultural artifacts, damaging the resource, and on occasion, injuring themselves.

This state of affairs has led to the need for a comprehensive management plan for the caves at Kīhōlo State Park, which balances the desire to share this resource with park visitors with the need to maintain a safe experience and protect the cultural and natural resources which these caves often contain. This Caves Management Plan provides a classification of the types of caves present within the park, a palette of management options, and finally a set of place-specific recommendations.

5.2.6.2 Types of Caves Present

All of the caves within Kīhōlo State Park Reserve are, geologically speaking, similar. However, different caves can be distinguished by the various conditions found within them, and their past use in the archaeological and historical periods. The informal classification presented in Table 5.2, which gives greater priority to the caves' cultural history than to their natural resources, can be useful when discussing the various management options available to State Parks.

5.2.6.3 Caves Management Options

There is no precise count of the number of caves present at Kīhōlo State Park, and many caves have never been accurately surveyed or inventoried. In general, caves which are closer to roads, campsites, and trails require a higher level of management, and should be given higher priority for protection and/or interpretive development, than those which are in more remote sections of the park where fewer visitors are likely to visit or enter and should be given priority. Exceptions to this are those caves which are known to have been used as burial sites. The following are a series of management options that were developed in consultation with State Parks archaeologists as an integral part of this Caves Management Plan.

Table 5.2 Types of Caves Present at Kīholo State Park Reserve

<i>Class</i>	<i>Type</i>	<i>Description</i>
A	Burial Caves	These are caves which have been used in the pre-contact and early post-contact era for the internment of Native Hawaiians, with or without grave goods.
B	Cultural Properties	These caves possess pre- or post-contact cultural artifacts, but no known burials. These caves may or may not have been used as habitation sites in times past.
C	Water Caves	This class of caves has significant fresh water or seawater flowing through them. Some are well known and advertised in tourism-oriented websites and publications, but can pose a threat to human safety.
D	Other Caves	These are all other caves in the park which do not possess burials, cultural properties, or water resources and which have not been weathered or otherwise disturbed to the extent that they are compromised with regard to human safety.
E	Compromised Caves	These are caves which have weathered, or been otherwise disturbed (e.g., by earthquake) to the extent that they have been determined to be unsafe for entry.

Source: Planning Solutions, Inc. (2012)

Sealing Cave Entrances. Caves which have been identified as containing the remains of Native Hawaiians from the pre- and early post-contact periods should be sealed using some combination of native lava rock and cement, preventing any reentry. This is consistent with Native Hawaiian tradition, the known wishes of families with ancestral ties to these burials, and the recommendation of the State Parks archaeologists.

Barred Entrance. Under this option, selected caves would be fixed with metal bars sealing the entrance from casual entry but not blocking airflow or precluding the possibility of a locking gate mechanism that would allow entry by authorized persons. Most caves of significant size which contain cultural properties, or which have been compromised to the extent that they are unsafe for visitation (i.e., Classes B and E) can be barred in this manner. It is important to note that many caves have multiple entrances, and for this approach to be effective all entrances will first need to be located and then sealed. In some cases, the best option may be a combination of sealing most entrances completely while leaving one primary entrance barred and gated.

Internal Warning Signage. The majority of the caves (e.g., those in Classes C, D, and E) in Kīholo State Park Reserve do not contain cultural properties or burials, but are not places which State Parks wishes to encourage visitors to enter. While warning signs outside such caves might dissuade the majority of park visitors from breaking park rules, such signage can have the unintended effect of alerting looters or adventurers to the location of caves which they would not otherwise be aware of. Some visitors may feel that the mere prohibition on entry is reason enough to enter such caves. One solution to this situation proposed by State Parks archaeologists is to place signs some distance inside caves, warning entrants that they are there illegally and advising them of the dangers and legal penalties for trespassing. These signs would not be visible on the surface, but would be obvious to anyone entering these caves.

Open Caves. As noted previously, many caves within the park are obscured with vegetation or in areas of the park so remote that they are rarely, if ever, visited. In such instances it may neither be necessary nor cost-effective to bar access or post signage prohibiting entrance. One option is to

simply allow such caves to remain open and unmarked, allowing their inaccessibility to remain the best deterrent to entry.

5.2.7 TRAIL MANAGEMENT

5.2.7.1 Purpose of Trails and Trail Development

The trail system in Kīholo State Park must serve a variety of purposes and include the following:

- Maintain an ability to travel through the park lands along traditional and historic routes. In this instance not only the alignment is important, but the physical character of the trail as well.
- Provide a means of having an integrated park experience, i.e., of being able to traverse the entire wild section, not just to make small forays into separate and distinct sub-areas.
- Contribute to the functioning of the 175-mile long Ala Kahakai National Historic Trail by providing an alignment for it through Kīholo State Park.
- Link trails within Kīholo with a regional network of trails and wilderness/recreational areas.
- Allow fishermen to reach their traditional shoreline fishing spots in ways that are compatible with the maintenance of a wilderness environment.
- Provide pedestrian and hiking linkages that enable park users to reach specific resources and sites within the park that they are interested in.
- Discourage park users from accessing sensitive natural, archaeological, and cultural resources that are susceptible to disturbance.
- Avoid new trail construction where restoration of existing trails can serve the same purpose.
- Provide ADA accessible trails to the beach and shoreline where this can be done while still maintaining a sense of wildness. There will be limitations to the degree of accessibility, but signage will identify trails that are accessible and describe the degrees of challenge and difficulty.

5.2.7.2 Managing and Protecting Resources Along Trails

While trails are resources in and of themselves (especially historic trails), they often pass along or through important natural and cultural resources. Trail development and maintenance, trail signage, and the dissemination of information about the trails and the resources they access must be done in a way that minimizes the potential for harm (intentional or unintentional) to these areas from park users. In accordance with trail development guidance developed for the Ala Kahakai, a principal factor in decision-making relative to the trails within the park will include:

- Protection and provision of access, as appropriate, to protected natural, cultural, and recreational resources related to the Hawaiian culture;⁷⁸
- Protection of places where prehistoric and historic events associated with the *ala loa* took place and where their stories may be told; and
- Protection of significant natural areas and resources.

Generally, the most effective means of protecting resources from disturbance is to keep people away from them by making wise choices about trail alignment. This works well in areas where there are few existing trails, but it is not effective in the present situation where so many footpaths already exist. The relatively high density of valuable resources (particularly archaeological and cultural) at Kīholo adds to the challenge because it means that wherever trails are placed they are likely to be close to sensitive resources. Finally, the fact that a substantial proportion of the persons using the

⁷⁸ Opening a trail to public use can potentially impact sensitive historic, cultural and natural sites adjacent to the trail. State Historic Preservation Division (SHPD) requires management plans showing how potential impacts of public use will be mitigated. In addition impacts to native Hawaiian customary and traditional rights and practices, and the alleviation of those impacts need to be addressed in the management plan.

trail system are from other places and are, therefore, unfamiliar with the values attached to the resources and less-aware of the ways in which their actions can accidentally harm the resources they are visiting.

Certain characteristics of Kīholo work to temper the threat to the resources that increased visitation via the trail system could otherwise bring. First and foremost is the fact that there is no vehicle access to many of the areas, limiting the number of visitors to them, restricting the amount of potentially harmful material that visitors can bring to them to that which they can readily carry, and making it difficult to carry material away from the resources as souvenirs. When all factors are considered, in the case of Kīholo, these limitations are probably more advantageous than detrimental. Hence, care should be taken when deciding whether to establish and/or publicize the presence of trails and this should not be done unless State Parks has first taken affirmative steps to ensure that adequate oversight is in place. For the most part:

- Information about site-sensitivity should be presented in a general form at all of the points where visitors access the trail system. To the extent possible, the information should be couched in positive terms that point to the kinds of behavior that are desirable rather than as a long list of “don’ts”.
- Signs should not be erected close to the sensitive sites themselves without first determining that calling them out will not attract more, rather than less, of the behavior they are meant to discourage.
- Where buffers around sensitive areas are desired, natural buffers (such as a tangle of bushes or thorny trees) are preferred to artificial ones (such as metal fences).
- Site-specific plans for the treatment of special areas should be developed in conjunction with resource specialists and the Kīholo community. This should be done primarily if and when it appears that there is a champion that can spearhead the planning and help with implementation.
- A monitoring program should be developed for the more important sites and resources. State Parks staff should be assigned this specific responsibility, and it should be made a core duty of their jobs, not something that they are asked to do if and when time is available. Community groups and docents should be invited to become de facto observers to help with the monitoring; they should have clear lines of communications back to the park administrators and the park administrators should, in turn, be responsible for reporting back to the volunteers, keeping them apprised of the way in which the information they provide is being used to make management decisions.
- A periodic inventory status should be part of this program.

5.2.7.3 Trail Development and Maintenance

5.2.7.3.1 Pre-Contact and Historic Trails

As described elsewhere in this report, there are a number of named pre-contact and early historic period trails within Kīholo State Park Reserve (see Section 4.2). Many other trails and trail segments are present, with many of the traditional trails having become disconnected, either by lava flows or the spread of thick vegetation. Because these are often indicators of the presence of sensitive resources, we have not included maps of these in this report. Detailed data on their location and configuration was recorded during the survey work and is available to State Parks staff for use in managing the resource.

Restoring all of these historic trails would require funding well beyond that which is likely to be available. Moreover, many of them pass through inhospitable terrain and are unlikely to receive substantial use even if they were restored. Consequently, the park Master Plan recommends focusing the available resources on the following trails/trail categories:

- Trails that support interpretive programs that are discussed in Section 5.2.8.
- The portion of the *Ala Loa* that passes through the State’s lands at Kīholo. This includes both the King’s Trail to the north of Kīholo Bay and the shoreline trail that continues the route to the south.

- The shoreline trail that extends northward past Wainānāli'i as far as 'Anaeho'omalū.
- One selected trail that is reflective of the *mauka-makai* roads developed and used during the 19th century.

All of the work on existing trails that is undertaken within the park will be informed and generally adhere to the Nā Ala Hele Hawai'i Island Advisory Council Guidelines for the Treatment of Historic Hawaiian Trails. In particular, no relocation or destruction of historic trails will be undertaken unless a case-by-case examination of the situation shows that it is essential to the achievement of the overall purpose of the park and that the same ends cannot be achieved without altering the historic trail.

5.2.7.3.2 New Trails

Because of the large number of trails that are already present, the need to develop entirely new trails is limited and, to a great extent inadvisable. The exceptions are short paths that link parking areas with the shoreline in the vicinity of Kīholo Bay—which support the intensively used overnight camping and picnic areas—and the creation of trails providing access to, or linking a series of, interpretive sites. As much as possible these short connector trails/walkways will be made ADA accessible. In all cases the surfaces of trails will be made of natural materials native to the locale.

5.2.7.3.3 Ala Kahakai Trail.

The Ala Kahakai is intended to join together existing traditional trails with sections of new trail, creating a unified trail corridor along the Island of Hawai'i's coastline. The path will be identified by signage and maintained by the National Park Service (NPS), in partnership with State agencies, private landowners, and interested community groups. Because of the anticipated increase in use, newer segments will be designed to withstand heavier foot traffic with less frequent maintenance than traditional trail segments. Insofar as practicable, it is the long term intention of NPS to make sections of the park ADA compliant through design and maintenance.

5.2.8 CULTURAL RESOURCE INTERPRETIVE PLAN

5.2.8.1 Criteria for Inclusion of Cultural Resources in the Interpretive Plan

Preparation of a detailed cultural resources management plan for all of the cultural resources at Kīholo was beyond the scope of this park master planning effort. Instead, this plan focuses on selected cultural resources which planners, subject area specialists, and members of the Kīholo community felt were most appropriate for presentation to the broader public.

State Parks expects to prepare a separate Cultural Resources Management Plan which will detail specific measures for the management and preservation of cultural resources on State Park lands at Kīholo State Park. The park possesses a wealth of cultural resources, some of which are culturally or physically sensitive. While the complete Cultural Resource Management Plan will encompass all cultural resources within the park, this document provides general management guidelines for that subset of the park's cultural resources which have, as of this date, been identified by State Parks' archaeologists as being appropriate for visitation and interpretive efforts.

With regard to archaeological and historic properties, it is the policy of State Parks to preserve everything. Because state parks are generally low-density developments specifically dedicated to preservation of open space and wild, unimproved environments, facilities can be relocated or redesigned to avoid impacts to cultural properties. Where this is not possible for some other compelling reason, site development will seek to minimize impacts as much as possible.

In acknowledgment of the above policies, State Parks has identified a subset of cultural resources within the park that are appropriate for visitation, and which can be the subject of infrastructure improvements and interpretive efforts. Sites which meet the following criteria may be considered, but are not necessarily, appropriate:

1. *Sensitivity*. The absence of culturally sensitive properties, such as burials, which are not appropriate for visitation.

2. Accessibility. Their relative proximity to existing or planned infrastructure such as roads, trails, or campsites.
3. Historicity. Their relevance in providing information and insight into a specific period of the parklands history.
4. Interest. Sites possessing native interest to park visitors, making them attractive places for interpretive work.

Specific examples of sites which have been judged to meet the above criteria are provided in Section 5.2.8.2.3. Where necessary, these sites would be cleared of vegetation, connected by trails (where that is not already the case), and restored where necessary.

5.2.8.2 Cultural Resource Interpretive Plan Outline

The purpose of this Cultural Resource Interpretive Plan is to identify the resources and provide the guidelines necessary to complete the design, fabrication, and installation of interpretive media and to suggest site restoration and management possibilities. This media and site work is intended to educate the public about the parklands and the people who have inhabited it over the centuries, explaining how archaeological and historical sites preserve a narrative of the past. This plan is limited to sites which meet the criteria outlined in Section 5.2.8.2 and which have been selected by State Parks personnel.

5.2.8.2.1 Interpretive Media

New technologies provide alternatives for disseminating interpretive information which might have once been limited to printed media and permanent signs. Park planners should consider incorporating the following five categories of media into interpretive works: text, graphics, audio, visual, and electronic.

Text. This category of media includes (but is not limited to) printed signs and placards, which could be permanently established at certain sites. These text installations can provide a brief commentary on the site, either alone or in combination with a graphic element such as a photograph or artist’s original composition. In general, use of signs and placards should be given preference over brochures, as the Focused Camping Alternative does not anticipate kiosks or other means for disseminating printed brochures, which can also create additional cost and waste.

Graphics. Certain signs or placards, as noted above, could include pictures or photographs which help park visitors understand the site being interpreted more clearly. In combination with text, images can help explain the significance of a place or how a site might have been used or appeared in times past. Certain sites, such as *hōlua* and *heiau*, may receive particular benefit from an image helping visitors visualize how it might have appeared. In other cases, photographs of a site dating from the time of its use could be used to illustrate the past.

Audio-Visual & Electronic. A combination of audio and visual media could be made available via the Kīholo State Park website, providing a wide variety of information including interpretive narration of specific sites, *oli* or traditional Hawaiian chants, and *mo’olelo* (traditional tales) presented in combination with still images or video which help to summarize pertinent information about a site and its archaeological or historical significance. Such audio-visual and electronic information could be retrieved on smart phones or tablets using a scannable Quick Response (QR) code, such as the one pictured at left, a two-dimensional square bar code. Park visitors could come to an interpretive site, download a scanning application (or “app”) which reads QR codes, and then scan QR codes mounted on interpretive signs, opening a park informational webpage on their phone’s internet browser. The webpage would then provide an



extension of on-site interpretive signage, including additional information and links; the entire process can take less than a minute. As indicated by the photograph to the right, State Parks has already begun the process of placing QR codes on its signs at Kīholo State Park, allowing visitors to scan a code which takes them directly to the application page for camping permits.

All of the proposed interpretive media in this plan should be unified in terms of signage design elements, signage materials, as well as their format and content. Preliminary interpretive panels should be developed for each of the sites described in Section 5.2.8.2.3 below. These panels should be developed based on research included in Chapter 3, photographs and other archival materials, site visits, interviews with individuals familiar with the history of the parklands, and other sources of information on the culture and history of Pu‘u Anahulu and Pu‘u Wa‘awa‘a. The types of media selected (i.e., text, graphics, electronic media accessible by QR codes, etc.) will determine the level of detail to be included within the park displays and related links.

5.2.8.2.2 Sign and Panel Concept

The graphic content of the interpretive displays called for under this Master Plan should conform to the standards set forth in the Hawai‘i State Parks Manual for Signage. Interpretive signage should be constructed from materials which are durable, cost effective, resistant to weathering and vandalism, and either native to or consistent with the existing natural environment. Historic narratives for the signage can be obtained from *He Mo‘olelo ‘Āina Nāpu‘u – Traditions of Pu‘u Wa‘awa‘a and Pu‘u Anahulu Lands of Kīholo State Wilderness Park* (2011), prepared by Kumu Pono Associates, LLC. Also, Hui Aloha Kīholo and other Native Hawaiian organizations with historic connections to this region may also be able to contribute insights into the pre-contact and early post-contact history of the parklands and its uses. Native Hawaiian communities may provide narratives of the past that interpret archaeological sites from a different viewpoint than modern archaeology does. To the extent possible, the incorporation of traditional Hawaiian *mo‘olelo* (stories), place names, and *wahi pana* (legendary sites) will improve the park experience and broaden the appeal of interpretive displays.

5.2.8.2.3 Sites Selected for Visitation and Interpretation

State Parks personnel have identified the seven cultural sites in Table 5.3 below that they believe are particularly suitable for infrastructure improvements and interpretive work. Over time, as funds become available, additional sites could be included in this program.

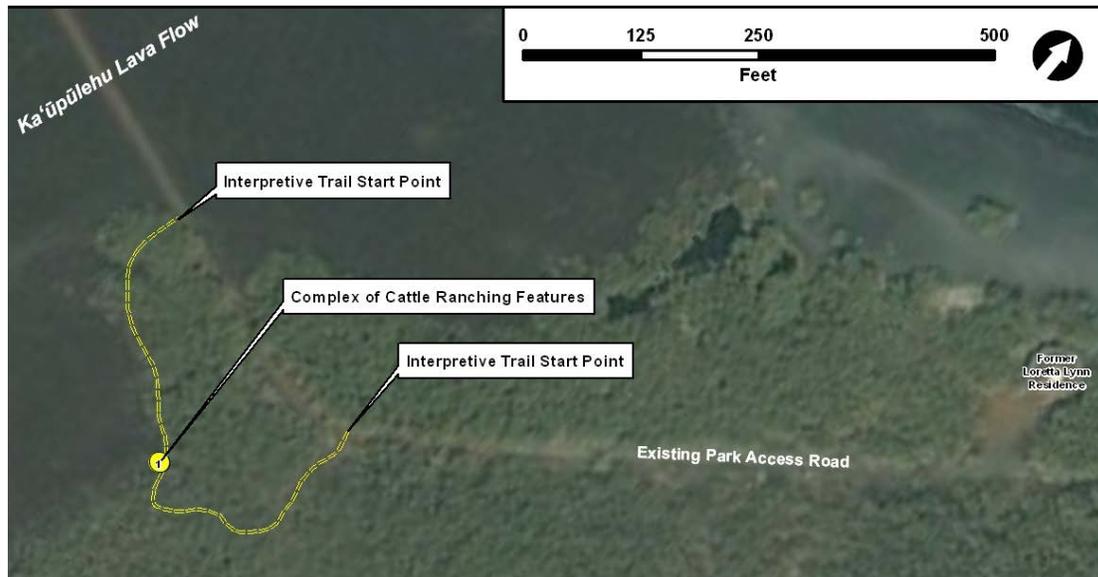
Site No. 1 Ranching Complex. The location of this feature is just south of the Loretta Lynn structure on the mauka side of the access road leading past Waiaelepī and Luahinewai. Its location is depicted in Figure 5.7 below. It is a complex of walls, pens, and chutes built from the native lava rock, formerly used to herd and contain cattle, as well as some residential sites which may either be associated with the ranching features or subsequent construction, perhaps using some of the material present. The structures are directly adjacent to the 1801 ‘a‘ā lava flow, and are in good condition. With some clearing of *kiawe* and underbrush, this site is accessible to the public via the existing access road. This site could also benefit from some simple reassembly of fallen walls, and interpretive signage detailing the history of ranching in the area. Some photographs of ranching in the area are extant and could be incorporated in interpretive material for this site. Figure 5.8 provides photographs of existing conditions at the site.

Table 5.3 Sites Selected for Visitation and Interpretation

<i>Site No.</i>	<i>Location</i>	<i>Description</i>	<i>Theme</i>	<i>Type of Visitation</i>
1	South End of Kīholo Bay	Complex of walls, including cattle holding pen and driving chute built adjacent to 1801 <i>a'a</i> flow.	Ranching, Changing Economy	Self-guided; set of interpretive panels.
2	Central Kīholo Bay, near end of current access road.	Complex of small shelters and habitation features, centered around a small <i>hōlua</i> .	Kīholo as a chiefly residence; site degradation and rehabilitation.	Self-guided; set of interpretive panels. Would require some restoration work.
3	Undisclosed	Water cave, other large tube system nearby with arch cave.	Lava tube formation; fresh water aquifer/importance in a seemingly arid environment; legendary significance of water caves.	Guided; escorted tours into cave with proper safety management devices in place. Would likely require gating of cave entrance.
4	Northern Kīholo Bay, adjacent to 1859 lava flow between highway and coastline.	<i>Hōlua</i> , high-status residential complex, margin of former fishpond destroyed by lava.	Kīholo as chiefly residence; Kamehameha’s fishpond/destruction by 1859 flow; ranching.	Interpretive walking trail via King’s Trail and foot trails to shoreline. This site would require installation of interpretive waypoints with information provided at multiple stops (variety of delivery means possible). Possible interpretive “gateway” entrance from northern park section from adjacent private developments.
5	Northern park boundary.	Extensive abrader manufacturing area, foot and cart trails, temporary habitation, petroglyphs.	Tool manufacture, trade; transportation, meaning of petroglyphs.	Interpretive walking trail via King’s Highway and foot trails to shoreline. Would require installation of interpretive waypoints with information provided at multiple stops; a variety of delivery means are possible. Possible interpretive “gateway” entrance to northern park section from adjacent private developments (some presently exist at boundary).
6	South end of Kīholo Bay at Lynn Residence.	Salt pan complex.	Salt manufacture exemplifying the change from subsistence to market economy.	Self-guided; set of interpretive panels.
7	Adjacent to Queen Ka’ahumanu Highway (Site 1349)	Complex of four large cave chambers.	Example of caves exemplifying traditional pattern of use and containing cultural deposits.	Guided; escorted tours into cave with proper safety management devices in place. Would likely require gating of cave entrance.

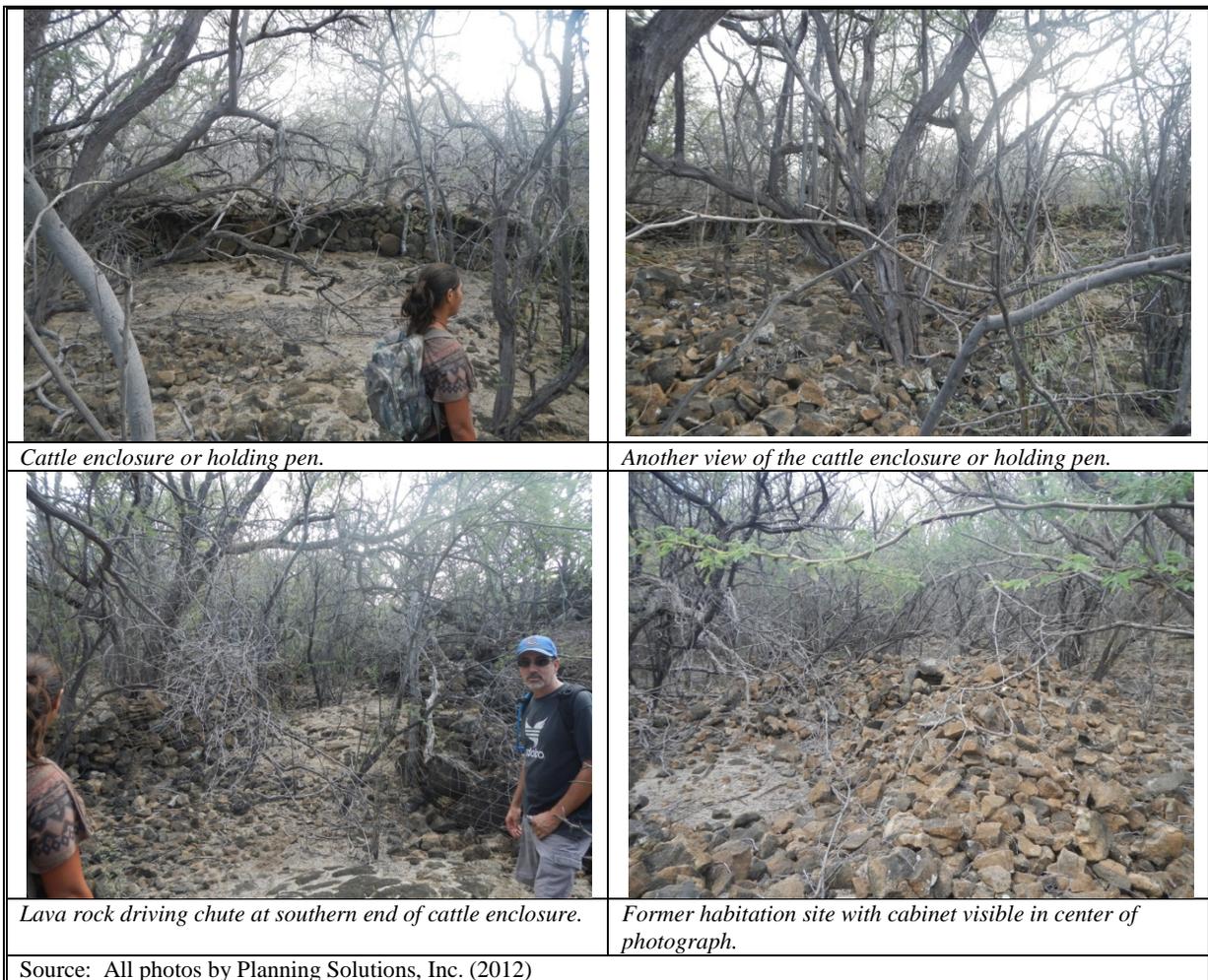
Source: A. Carpenter, DLNR-Division of State Parks (2012)

Figure 5.7 Location of Interpretive Site 1



Source: Planning Solutions, Inc. (2012)

Figure 5.8 Site 1: South Kīholo Bay Cattle Ranching Features



Site No. 2 Residential and Hōlua Complex. This site is located just to the south of the day visitor cul-de-sac and parking areas at the terminus of the existing access road, as shown in Figure 5.9. It is easily accessible either from that access road or from the shoreline, and is along the path many park visitors will take to access Kīholo lagoon. The series of features at Site No. 2 are representative of pre-contact habitation at Kīholo, and include a complex of residential structures, a small *hōlua* sledding concourse terminating near the shoreline, and a post-contact burial crypt at its top. By clearing a short trail and engaging in minor restoration to reassemble some of the lava rock comprising the *hōlua*, the site can be made into a short, self-guided interpretive trail with one or more panels describing pre-contact and early post-contact habitation at Kīholo, the complex Hawaiian sporting culture, and the need for protection and restoration of native archaeological sites. Figure 5.10 provides some views of the site, including the alignment of the *hōlua* course and post-contact burial crypt above it. Because it is near an area where a good deal of camping occurred in the past, trash removal and restoration work will be required. Some additional restoration and preservation work may be necessary to protect the crypt, which has been previously vandalized.

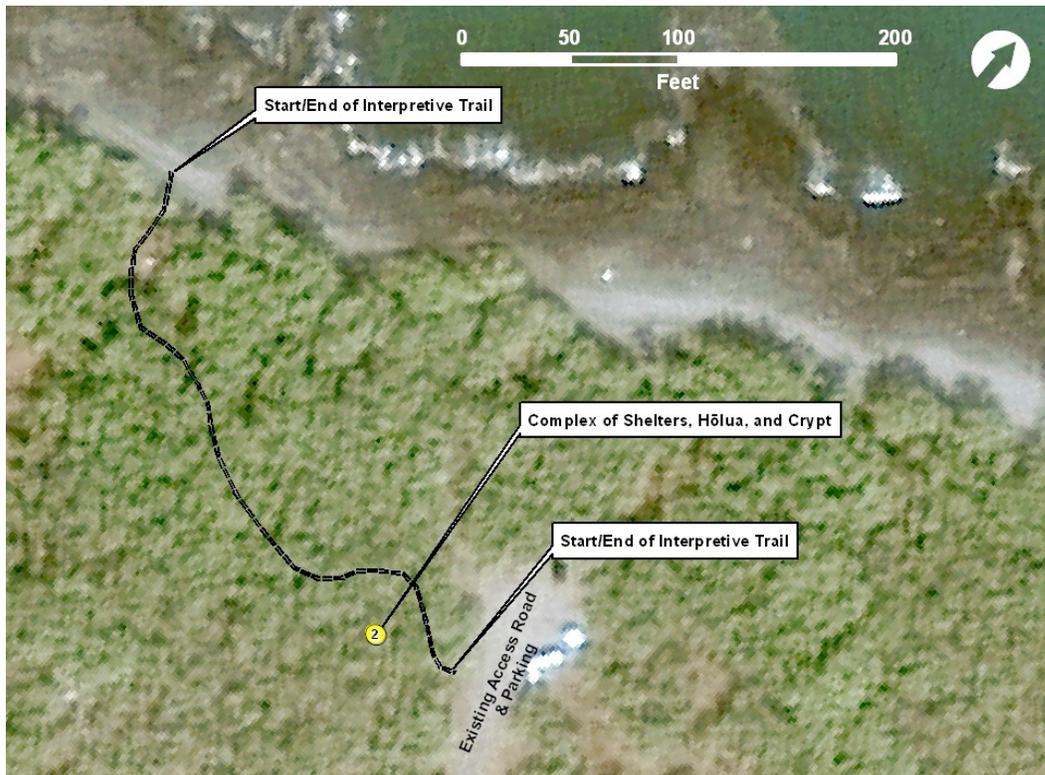
Site No. 3 Water Cave at Kīholo Bay. This site is a large tube system, with fresh water flowing down through subterranean chambers out into the bay. The cave provides visitors with an excellent opportunity to see how lava tubes are formed and how the subterranean fresh water aquifer plays a critical role in the biology and culture of an otherwise arid environment. Also, this cave could serve as an appropriate place to teach park visitors about the legendary significance of water caves in the Pu‘u Anahulu and Pu‘u Wa‘awa‘a ahupua‘a.

Because of safety issues particular to water caves, some additional restrictions on entry may be necessary, including but not limited to restricting entry to a periodic guided tour conducted by State Parks personnel, installing additional safety management devices (such as footholds), and possibly gating the entrance so that it could be entered only when authorized personnel are present.

Site No. 4 Hōlua and Chiefly Residence Interpretive Trail. This interpretive trail would knit together several fascinating sites that chart a path through the history of Kīholo. As shown in Figure 5.11, the trail would extend from Queen Ka‘ahumanu Highway along the adjacent 1859 lava flow, down to the coastline passing several significant archaeological and historical sites in the process. Beginning in the park uplands near the highway, the first feature is a large *hōlua*, with a well-preserved running ramp at the top and a nearby *ahu* and series of lava rock enclosures, with some cultural material still present (see Figure 5.12). Further towards the shore, a large high-status residential and/or *heiau* complex, with intact cupboards and terrace, depicts Kīholo’s historical significance as a place of chiefly residence and home to King Kamehameha I’s fishpond at Wainānālī‘i. Alongside these archaeological features are a series of long cattle enclosures, commemorating the later use of this area for cattle ranching.

Development of this series of sites and the trail serving them would require some significant restoration and protection to prevent friction between interpretive and preservation objectives. In addition, substantial brush clearing would be needed to establish a safe trail down to the shore, as well as periodic maintenance to keep the trail clear. State Parks would create a series of interpretive installations—such as placards or signs—along the trail which could inform park visitors about the sites and their significance. Artwork depicting how the site might have appeared in pre-contact times could also be used.

Figure 5.9 Location of Interpretive Site 2

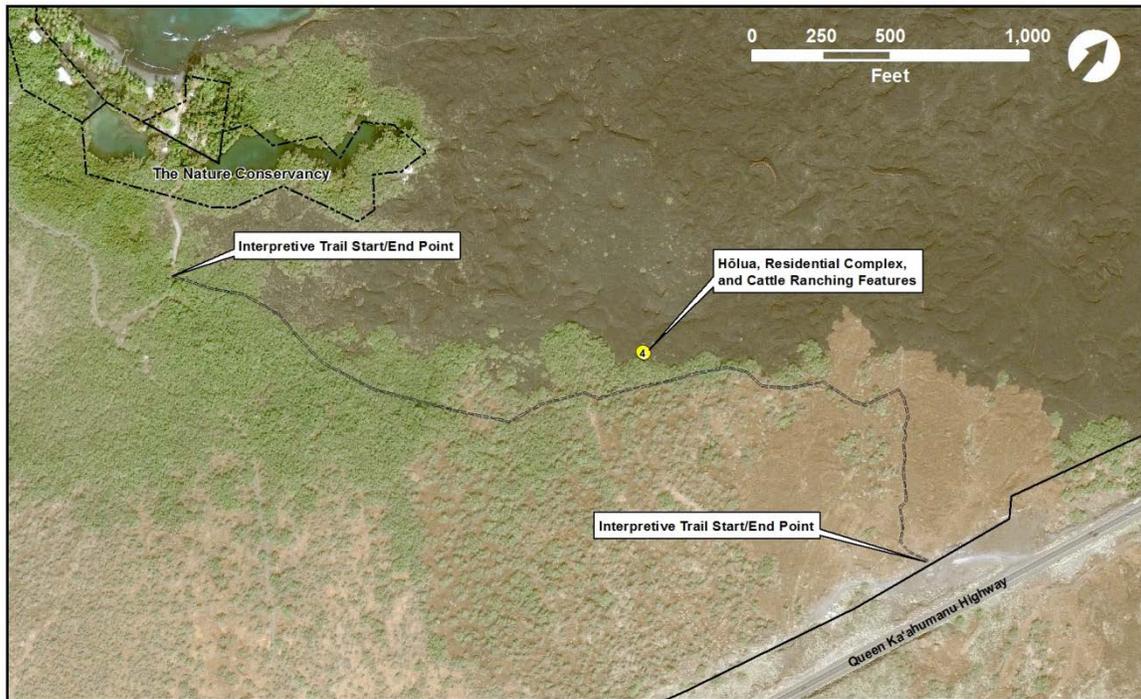


Source: Planning Solutions, Inc. (2012)

Figure 5.10 Site 2: High Status Residence and Hōlua near Central Kīholo Bay

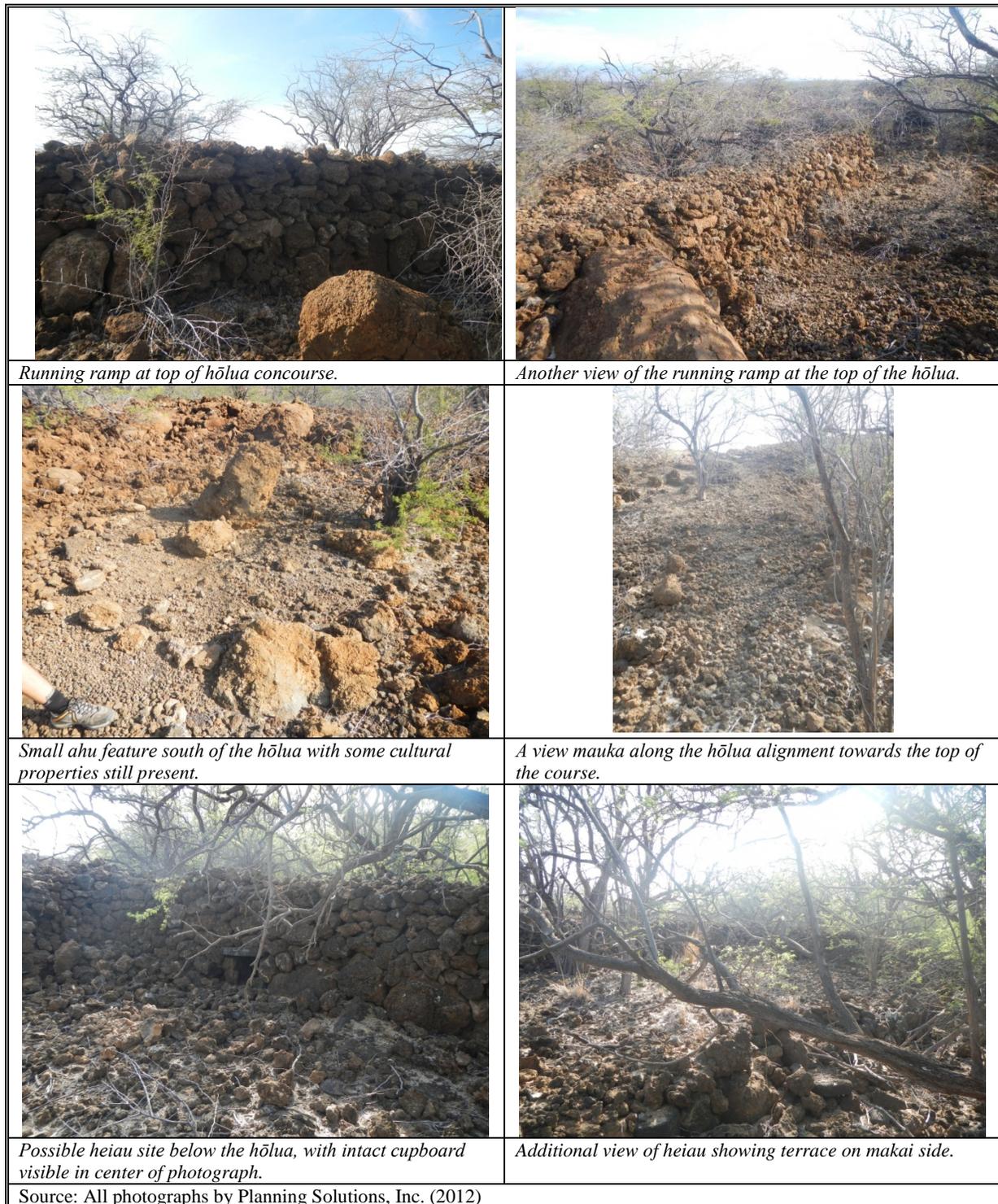


Figure 5.11 Location of Interpretive Site 4



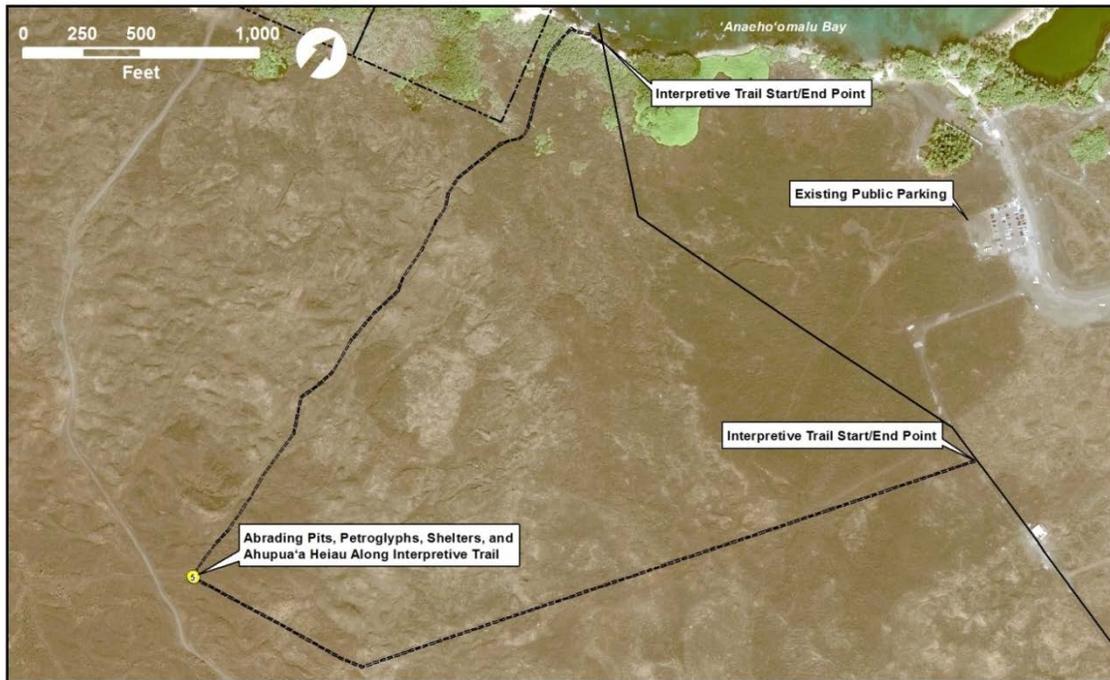
Source: Planning Solutions, Inc.

Figure 5.12 Site 4: Hōlua and High Status Residential Complex



Site No. 5 King’s Trail Interpretive Loop. This interpretive site could consist of one or more concentric loop trails, incorporating a portion of the King’s Trail, the Ala Kahakai, and other existing park trails. Figure 5.13 depicts the possible alignment of one such trail.

Figure 5.13 Location of Interpretive Site 5



Source: Planning Solutions, Inc.

Figure 5.14 Site 5: King’s Trail Petroglyph Field and Abrading Pits

	
<p><i>The King’s Trail, extending off towards the northern boundary of the park at ‘Anaeho‘omalū.</i></p>	<p><i>Abrading pits along the King’s Trail.</i></p>
	
<p><i>Ahupua‘a heiau, marking the boundary between the moku (districts) of North Kona and South Kohala.</i></p>	<p><i>Petroglyph field along the King’s Trail.</i></p>
<p>Source: All photographs by Planning Solutions, Inc. (2012)</p>	

This trail would take advantage of the existing public beach access parking lot at Kona Village, allowing people to enter the park from the north side without having to create a new access point off of Queen Ka‘ahumanu Highway. Heading out across the lava fields on the historic King’s Trail, visitors could view abrading pits, petroglyph fields, and the restored ahupua‘a heiau marking the boundary between North Kona and South Kohala at the northern border of the park. Circling back they could enjoy a portion of the coastal Ala Kahakai trail, passing many *wahi pana*—places of legend—at Kapalaoa and ‘Anaeho‘omalū. Interpretive materials could encompass themes of (i) trade and transportation in the Nāpu‘u region, as embodied in the trails themselves; (ii) tool manufacture at abrading sites; and (iii) the meaning and significance of petroglyphs in Hawaiian culture. Appropriate use of signage and other interpretive media could have the additional effect of gently diverting attention away from more sensitive sites and hazards.

This site would create a linkage between the Ala Kahakai shoreline trail, the King’s Trail, and other existing foot trails and require that the trails be subject to periodic inspection and maintenance. In addition, interpretive waypoints provide information and explicit directions for hikers. Signage should also reflect the relatively rugged and unimproved nature of this portion of the park and remind visitors of basic safety precautions and protocols.

Site No. 6 Salt Pan Complex at Kīholo Bay. Located directly adjacent to the vacant Loretta Lynn structure in the central portion of Kīholo Bay, the cement salt pans were once used to make salt from evaporating sea water. When in use, seawater would be placed in the large, shallow pan and allowed to evaporate in the dry Kona climate. As the seawater evaporated, the salt crystals left behind would be gathered for use, trade, or sale. This well-preserved site exemplifies the gradual shift from pre-

contact subsistence agriculture to a market economy based on the production of saleable goods. Signs or panels at the site could provide park visitors with an ADA accessible interpretive opportunity to learn about the process of salt production and the transformation of economic life in old Hawai‘i. Figure 5.15 depicts the location of this interpretive site and Figure 5.16 provides views of existing conditions at the salt pan.

Site No. 7 Cave Complex. This interpretive site (see Figure 5.17) was inventoried and recorded as part of a highway right-of-way survey conducted in the 1970s; it underwent extensive data recovery excavation at that time. It has also been identified as Site No. 1349 in the Archaeological Inventory Survey conducted by T.S. Dye & Associates. The cave consists of a complex of four chambers formed by the lava as it cooled. This cave complex exemplifies traditional Native Hawaiian patterns of use, and still contains some cultural deposits. It is located between the existing park access road and the Hu‘ehu‘e-Kīholo cattle trail, several hundred feet below Queen Ka‘ahumanu Highway. Development of this site would require the installation of proper safety management devices such as footholds and signage, as well as the creation of interpretive materials which dealt thematically with the prevalence of lava tubes in the geology of the region, the ways in which caves were used by pre- and early post-contact Native Hawaiians, and possibly the significance of cultural deposits present (or revered from) within these caves. Because of the sensitivity of this type of cave (Class B, see Table 5.2), this site may require barring of the entrance, so that access is limited to authorized individuals during periodic tours of the cave system.

Figure 5.15 Location of Interpretive Site 6



Source: Planning Solutions, Inc.

Figure 5.16 Site 6: Salt Pans at South Kīholo Bay

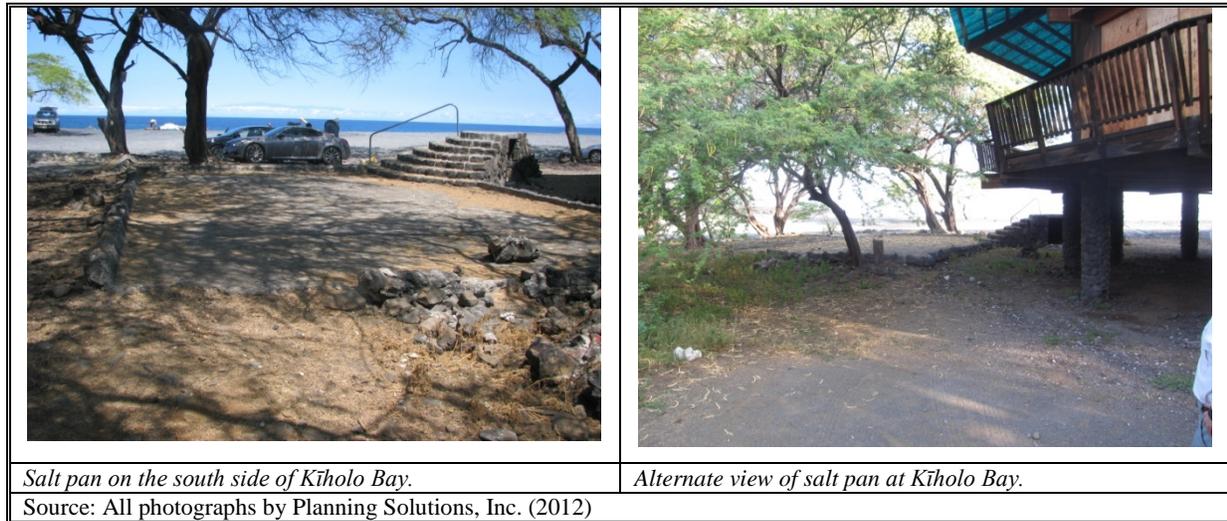
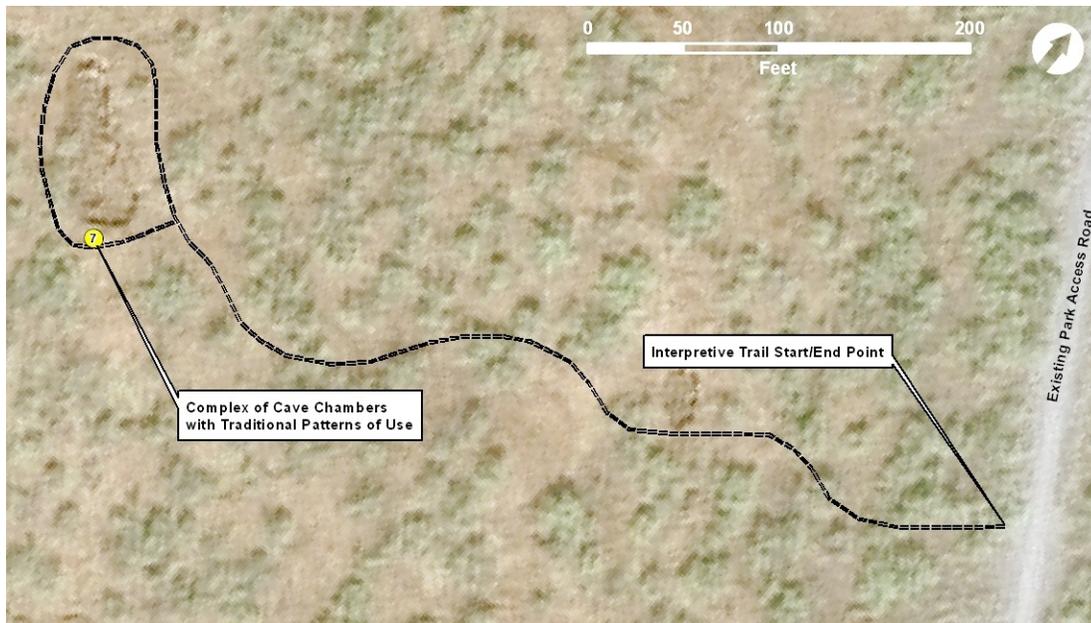


Figure 5.17 Location of Interpretive Site 7



Source: Planning Solutions, Inc.

5.2.9 ENDANGERED SPECIES MANAGEMENT PLAN

A comprehensive threatened and endangered species management plan is beyond the scope of this document; however protections for endangered and threatened species are an integral part of the Master Plan. Signage will inform visitors of endangered species that may be present within park lands and coastal waters, and identify proper protocols for these encounters (e.g., maintaining an appropriate distance). The habitat restoration development module, discussed in Section 6.1.1, would likely play an important role—regardless of which planning alternative is selected—in encouraging the propagation of native and Polynesian-introduced botanical species. Protection and restoration of anchialine ponds (see Section 6.3) which may either contain or serve as loafing and foraging grounds

for threatened and endangered species is another important aspect of a comprehensive management plan.

The presence of park rangers has the potential to play an important role in the execution of such a comprehensive endangered species management plan. When monk seals or sea turtles haul themselves on shore they could demarcate safe distances to ensure that they are not disturbed. They could also help implement protections for any type of fisheries management or fish nursery protections which may be implemented as part of one of the planning alternatives (see Section 6.5), advising fishermen of regulations within the park, propagating best practices, and reporting non-compliance.

5.2.10 COMMERCIAL ACTIVITY MANAGEMENT PLAN

In keeping with the wilderness character of the park, commercial uses and operations within the park are generally prohibited. Exceptions to this rule will require a special action by the Board of Land and Natural Resources.

5.3 ALT-2: MULTI-NODE CAMPING/ACCESS ALTERNATIVE

5.3.1 VISION FOR MULTI-NODE CAMPING/ACCESS ALTERNATIVE

During the planning process, some parties have voiced their view that the eight campsites currently being provided at Kīholo Bay under the Interim Management Plan are insufficient to meet the demand for camping in the area. The belief that additional campsites would be well-used is borne out by the high rate of occupancy at these campsites.

As discussed in Section 5.2.3.2, space for a few additional campsites is available in areas near to the eight existing Kīholo Bay campsites established as part of the State's Interim Management Plan. If the current, and or expanded campsites at Kīholo Bay prove inadequate to meet the demand and State Parks is able to procure sufficient funding for the creation and management of new campsites, additional camping "nodes" could be created elsewhere. A number of sites were closely examined as candidates for additional campgrounds, including areas at Kapalaoa, Akahu Kaimu, and particularly at Kalaemanō. Investigations relating to Kalaemanō included meetings with representatives of the adjacent landowner and the investigation of a possible road route entirely within the boundaries of Kīholo State Park Reserve that avoided known archaeological and historical sites. In the final analysis, difficulties related to providing access to and maintaining public safety at other possible locations led to the conclusion that the most appropriate candidate for an additional camping node would be Keawaiki Bay, provided sufficient resources are available to address access issues there.

In addition to adequate support from State Parks, experience has shown that—while not absolutely necessary—the involvement of the public in the form of a curator group to help monitor and care for a section of the park can be invaluable, particularly in low-density environments such as at Kīholo. Alternative 2 is based on this vision of a public-private partnership, devoted to making more of Kīholo State Park available for visitation and camping. Should a multi-node camping and access alternative become the preferred alternative, other curatorship groups could center on any additional node in much the same way that Hui Aloha Kīholo has focused on Kīholo Bay.

This alternative envisions a park that offers more camping opportunities than are currently available under the Interim Management Plan, or which would be provided under the Focused Camping/Access Alternative discussed in Section 5.2. In addition to the campsites adjacent to Kīholo Bay, the Multi-Node Camping/Access Alternative would introduce additional "permit-only" controlled camping at Keawaiki Bay (see Figure 4.1 for locations of these two campsites within the park). If additional infrastructure (i.e., a new section of internal roadway) was created to allow for it, the additional campground at Keawaiki Bay could be made accessible by vehicle and be ADA compliant. However, providing vehicular access from Queen Ka'ahumanu Highway would be costly and may not be

justified by the number of additional persons served. The increase in campsites would be accompanied by limited improvement to trails in the vicinity of the campsites, and by access roads to the campsites off of existing internal park roadways.

All facets of Alternative 1 could be accommodated under Alternative 2; the primary difference lies in the extent to which Alternative 2 would open up additional areas of the park to higher intensity visitation by providing improved access and camping infrastructure. The basic principles and planning considerations presented under Alternative 1 would be maintained under a multi-node camping scenario. However, provided the required increase in funding and the close involvement of the community living near the expanded area is available, the additional locations would allow State Parks to meet the recreational needs of a greater number of people.

5.3.2 OBJECTIVES OF MULTI-NODE CAMPING/ACCESS ALTERNATIVE

As noted above, the general objectives of the Multi-Node Camping/Access Alternative are similar to those identified under Alternative 1 but with additional family-oriented recreational opportunities. Instead of focusing all camping in one central area at Kīholo Bay, this alternative could include camping at Keawaiki Bay. Providing vehicular access to State-owned land at Keawaiki Bay would be costly; however if a campground at Keawaiki Bay were made road-accessible, it could be made ADA-compliant. The alternative to creating vehicular access at Keawaiki Bay could be limiting access to pedestrian traffic only.⁷⁹

The objectives of Multi-Node Camping/Access Alternative are:

- To create sufficient camping infrastructure to help meet the demand for camping opportunities at Kīholo State Park and along the Kona Coast.
- Create and preserve low-density “shoreline retreat” campsites by providing improved and carefully managed permit-only camping opportunities as described in the Focused Camping/Access Alternative (i.e., Alternative 1).
- Protect park resources—both natural and manmade—by further increasing the level of oversight in the park, so that it is more difficult for individuals to negatively impact park resources or engage in disruptive behavior.
- Limit vehicular traffic in the park to specific camping areas (e.g., Kīholo Bay and Keawaiki Bay) and prohibiting off-road vehicle use on all other parklands, particularly beaches.
- Improve the trail network to accommodate the increased level of park usage anticipated under this alternative, while discouraging off-trail excursions and visitation to sensitive natural and cultural resources.
- To establish a presence at the park to monitor the type and intensity of park use to determine what, if any, additional management or infrastructure is needed in order to maintain or enhance the wilderness experience for park visitors.
- To maintain the existing roads and utilities used by inholders.

5.3.3 PRINCIPAL FEATURES OF MULTI-NODE CAMPING/ACCESS ALTERNATIVE

The Multi-Node Camping Alternative has all of the features that are part of the first alternative (i.e., the Focused Camping/Access Alternative) plus new features that allow it to provide additional recreational opportunities in other areas of the park. The following are among the more important features of this alternative.

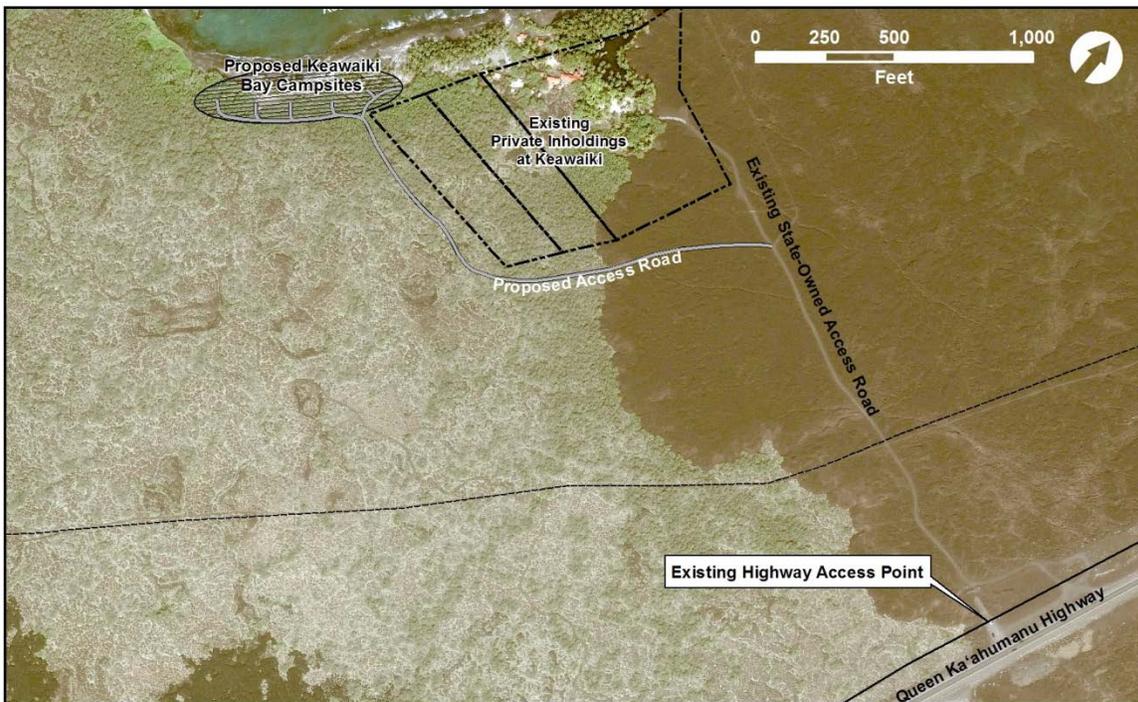
⁷⁹ In view of the parks’ designation as a wilderness, some consideration has been given to the possibility of limiting access to one (or more) campsites to pedestrian traffic only. A drawback to prohibiting vehicular access to a campsite (i.e., Keawaiki Bay) to pedestrian traffic only would be limiting its availability to persons with physical disabilities without reducing the cost of creating road access for service vehicles or the development footprint.

5.3.3.1 Additional Infrastructure Serving Keawaiki Bay

The area in back of Keawaiki Bay has sufficient space to accommodate approximately the same number of campsites as are presently at Kīholo Bay. If this site were selected, as many as eight campsites would be created, each with a cleared area and a fire pit, with access to a nearby trash receptacle and portable toilet. Some signage identifying the campsites and posting regulations would also be required. As noted in Section 5.3.1, if public vehicular access was allowed, this campsite could also be made ADA-compliant.

Access to these campsites would be by the existing State-owned access road, which would need to be extended (see Figure 5.18) to circumvent the private inholdings at Keawaiki Bay. There are significant challenges associated with providing this access. At the very least, vehicular access would need to be provided to accommodate the vehicles that service the portable toilets and solid waste receptacles. This would require construction of a new ~2,000-foot-long gravel road from the existing Keawaiki Bay access to the southern end of the bay as shown in Figure 5.21. Creating such a road solely for service vehicles would not be difficult as that use could be allowed using the existing Queen Ka‘ahumanu Highway connection. However, for reasons outlined below, allowing park visitors use this roadway to drive their private vehicles to the campsites raises issues that may be difficult to overcome.

Figure 5.18 Conceptual Layout of Keawaiki Bay Campsite and Access Road



Source: Planning Solutions, Inc.

If the access road connection with Queen Ka‘ahumanu Highway were to be marked with signage and remain un-gated, it is likely that many drivers (in addition to those traveling to and from campsites) would choose to drive on it. In order to meet AASHTO highway safety standards and avoid the liability that would exist if an accident were to occur at an under-designed intersection, extensive and costly intersection improvements would probably be needed. The cost of these improvements could easily exceed \$500,000, an amount difficult to justify for the limited use that the campsites are likely to receive. Opening Keawaiki to day-use visitors would increase the public service that it would

provide, but it would ensure that major highway requirements would be required and require State Parks to stretch its already-thin resources to oversee an additional remote area.

One way to minimize the expense of modifying the highway access point would be to coordinate the work with the long-planned Queen Ka‘ahumanu Highway widening project, which will expand that highway from two lanes to four in each direction. If State Parks can coordinate the Keawaiki access modifications with this planned work, the aggregate cost of the roadway work could be shared among agencies, possibly making the necessary modifications to the highway affordable.

Another possible means of addressing the access issue could be for the access road to be gated near the highway, thereby discouraging those not destined for the campgrounds from turning onto it. If this were done the number of vehicles using the access road might be sufficiently small that the Highways Division of the State Department of Transportation would allow it. The success of this approach would require either (i) a way to provide each individual with a valid camping permit, a combination or a key to a locked gate or (ii) users’ willingness to park well away from the highway and carry their camping equipment from there to the campsites.

Figure 5.19 Photographs of Existing Conditions at Keawaiki Bay



Resolving all issues needed to assure the practicality of establishing campsites at Keawaiki was beyond the scope of this Master Plan. However, the potential benefits are such that State Parks should continue to explore ways in which it could make this portion of Kīholo State Park Reserve more usable.

5.3.3.2 Additional (Relative to ALT-1) Operations and Management

5.3.3.2.1 Additional Staffing

State Parks Staff and DLNR Technical Staff. The Multi-Node Camping/Access Alternative would require additional staffing if it is to be done well. An Interpretive Park Technician would have to visit the campsites to monitor camping permits, educate park visitors, and monitor compliance with established park rules. If part-time personnel can be found who live close to the two areas or if much of the oversight can be done under a curatorship agreement with organizations which have a vested interest in their management, these services could place a nominal burden on State Parks. Once established, no additional investment of time would be required by DLNR technical staff such as botanists, biologists, or archaeologists.

5.3.3.2.2 Curatorship and Park ‘Ohana for Additional Areas

In the event that the Multi-Node Camping/Access Alternative is selected, State Parks should take steps to form, or cultivate a partnership with, a curator group, park ‘ohana, or similar volunteer group. As noted in Section 5.2.4.1.3 and 5.2.4.3, Hui Aloha Kīholo’s specific area of focus is Kīholo Bay (i.e., from Kalaemanō to Hou Point) and their vision for the group is centered on the role it can play in that portion of the park. Experience, however, has demonstrated that in addition to the role played by State Parks staff, the involvement of a committed curatorship group or similar volunteer group can be invaluable in providing additional oversight and involvement to create a healthy and functional campground. This is particularly true where the anticipated intensity of usage does not warrant the round-the-clock presence of State Parks staff, as would likely be the case at a Keawaiki Bay camping area. Groups of individuals with a strong sense of connection and responsibility for a place—a *kuleana*—can provide valuable insight and knowledge about the cultural heritage and natural environment in a section of the park and conduct interpretive programs, lead educational events, or organize community based clean-ups.

5.3.3.2.3 Park Safety and Security in Additional Campsites

Park Rangers. As at Kīholo Bay, the frequent presence of park rangers has the effect of reducing vandalism and encouraging safe behavior compliant with park regulations. While no full-time ranger presence would be required for an additional campground at Keawaiki Bay, State Parks would need to ensure that there was sufficient enforcement presence to ensure the safety and security of park visitors. The additional campsite at Keawaiki Bay provided in Alternative 2 would be made accessible to service vehicles, which would allow park rangers and/or police officers to access the sites relatively quickly. By ensuring that park rangers were present at some point within the park during regular park hours (7:00 a.m to 7:00 p.m.) and clearly posting contact numbers near the new campsites, visitors would be able to contact park rangers in the event of an emergency.

Gates. At either potential additional campground, the access drive would be controlled by a robust gate, limiting use to normal park hours. The gate would be opened and closed by park rangers, or by arrangement with park curators, to ensure that it was opened and closed in a punctual manner. A gate for a camping area at Keawaiki Bay would need to be just outside of the highway right-of-way. All other requirements for a gate are similar to those elsewhere in the park: strong, lockable structures with adequate signage stating hours of operation, park regulations, and the mobile phone number for park rangers. State Parks would need to coordinate with Hawai‘i County Police Department, Hawai‘i County Fire Department, and emergency medical services so that they could access these campsites in the event of an emergency or natural disaster.

Telecommunications and Utilities. As with all other portions of the park, no telephones, electricity, or fresh water utilities would be created or provided to park visitors under the Multi-Node Camping/Access Alternative. Park rangers and other personnel would use mobile telephones to contact each other and to provide a point of contact for park visitors.

5.3.3.2.4 Natural Hazards at the Additional Campsites

All hazards present in other portions of the park and all management and emergency response strategies intended to mitigate them are described in detail in Section 5.2.4.7. The only salient

difference would be that the scope of operations in the event of a fire, tsunami, earthquake, or other natural hazard would need to be expanded to include the new campsite at Keawaiki Bay.

5.3.3.3 Park Maintenance Activities Not Included in ALT-1

Aside from upkeep of the extension road required to serve the additional campsites, very little additional infrastructure or maintenance is envisioned under the Multi-Node Camping/Access Alternative. Solid waste receptacles and portable toilets would be provided adjacent to the new access road and campsites for ease of service. By making at least a portion of the portable toilets wheelchair accessible, State Parks could make one or more of the campsites ADA-compliant, as wheelchair campers could drive to the site and rely on the availability of suitable restroom facilities. Regular visitation by park rangers would allow them to identify maintenance issues and their presence would act as a deterrent to vandalism.

5.3.3.4 Trail Management Not Included in ALT-1

The only additional trail management envisioned under Alternative 2 which is not included under Alternative 1 would be small trails interconnecting the new campsites with the parking areas, portable toilets, and trash receptacles.

5.4 ALT-3: PARK RESERVE ALTERNATIVE

The previous alternatives all assume a level of expenditure and management control that is greater than at present. It is possible that budgetary constraints, a decision that at least one shoreline recreational area in the region should be left largely unmanaged, or simply a lack of consensus, could lead to a continuation of the existing status for the foreseeable future. In and of itself, this is not a “plan”, but it is a possible alternative and would be considered in the environmental impact documents for the park.

This alternative envisions the State leaving Kīholo as a State Park “Reserve”, delaying or foregoing efforts to turn it into a fully managed State Park. Measures needed to protect the natural and cultural resources of the area could still be undertaken, but the planning, funding, and implementation of any such efforts would need to be authorized separately.

If the State were to leave the existing access road open, individuals, families, and groups might continue to make day visits to the area and/or engage in illegal camping. However, should the State elect to pursue this option it will need to accept or contend with liability issues related to knowing encouragement or allowance of the continued use of a sub-standard access point on a high-speed highway.

It is important to note that this alternative is not the same as the Interim Management Plan which is currently governing operations at Kīholo State Park Reserve. Under Alternative 3, camping permits would not be issued, and the park would revert to the conditions which were present prior to its introduction.

CHAPTER 6 – MANAGEMENT PROGRAM MODULES

As indicated in the previous chapter, there are a number of steps that can be taken to maintain and improve the quality of the resources at Kīholo State Park that are independent of the specific park layout alternative that is implemented. For the purpose of this report we have referred to these as “modules”. The term is meant to emphasize two things. The first is the fact that they can be implemented independently of one another (though many benefit from being undertaken with efforts that are part of other “modules”). The second is that the previously described park alternatives are not completely dependent upon the implementation of all of the modules (though the user experience would certainly be superior if they are implemented).

The modules discussed in the remainder of this chapter include the following:

- Section 6.1 discusses vegetation management and ungulate control measures that would stabilize and/or restore key aspects of the ecosystem.
- Section 6.2 outlines measures related to archaeological, historical, and cultural interpretive programs that could be undertaken using the resources available within Kīholo State Park Reserve.
- Section 6.3 briefly discusses opportunities related to the restoration of anchialine pond resources along the shoreline.
- Section 6.4 reviews opportunities related to the possible renovation of the former Loretta Lynn residence.
- Section 6.5 describes measures related to the management of the fisheries resources at Kīholo.
- Section 6.6 discusses the opportunity to create a Starlight Reserve at Kīholo State Park.

6.1 VEGETATION MANAGEMENT AND UNGULATE CONTROL

6.1.1 VEGETATION RESTORATION AND MANAGEMENT

The vegetation that now dominates Kīholo is unlike that which existed prior to western contact. Instead, it is dominated by exotic species that have been introduced to the area over the past 200 years. Restoring the native and Polynesian-introduced vegetation which once characterized these lands is impossible so long as the feral goat population remains at its present high level. However, if a relatively high degree of ungulate control can be established through measures discussed below in Section 6.1.2 and there are areas in the park which are goat-free, the planting of native and Polynesian-introduced vegetation could begin.

Once goat-free areas are established, State Parks and/or outside organizations with an interest in ecosystem restoration and management can:

- Work with biologists, landscape architects, and other interested parties to identify and enclose one or more areas appropriate for the establishment of native plantscapes. These areas could be created in tandem with interpretive trails, restored anchialine ponds, or cultural features.
- Remove alien plant species from these selected areas and then replant and nurture appropriate native species in their place.
- Expand the restoration efforts to additional and larger areas as methods and procedures are demonstrated to be effective.

In addition to efforts on State lands, The Nature Conservancy and Hui Aloha Kīholo have both expressed interest in creating native Hawaiian planting projects on the Nature Conservancy’s abutting private inholding (which it took control of in 2011 as a result of a donation from Angus Mitchell). The Nature Conservancy has expressed interest in working with the State to ensure that its management of the ponds is supportive of the preservation goals of the park.

6.1.2 FERAL UNGULATE CONTROL

As noted in the previous section, if the park lands are to be restored to a state more closely resembling its pre-contact appearance and ecosystem functioning (which all agree is desirable), the feral goat herds that now roam the area must be eliminated. At one time, subsistence hunting of goats provided a degree of control of the goat population. As the region has changed from a ranching economy to one that is tourism-based, the number of hunters has declined and the potential for adverse interactions (i.e., danger) from hunting has increased. Regular hunting on State Parks land is not allowed, and hunters are sparse to absent from the land immediately above Queen Ka‘ahumanu Highway as well. If native and Polynesian-introduced plants are to be successfully re-established on parklands, the pressure which feral ungulates exert on these species must first be reduced using means other than recreational and subsistence hunting.

Table 6.1 identifies the features that the Hawai‘i Conservation Alliance has identified as essential for any successful ungulate control program. Table 6.2 summarizes the effectiveness of various techniques that can be used to remove animals from fenced areas as estimated by the same organization. Applying this guidance to Kīholo suggests that a combination of professional trapper/shooters and the use of “Judas” animals (i.e., trained goats can that lead hunters to the feral goats) can be used to remove goats from areas once they are fenced to prevent animals from outside the control area from re-populating the herds and negating the effectiveness of the effort.

Hui Aloha Kīholo has already identified several relatively small areas (a few acres each) for this kind of treatment. If the fencing is installed by a commercial contractor, the cost could run in the \$15-\$30 per lineal-foot range. At that rate, installing a small square enclosure fence around 4 acres would cost approximately \$25,000 to \$50,000. In the case of such a small enclosure, the cost of removing ungulates from the control area would be negligible, as the mere presence of the people stringing the fence-line would be sufficient to move goats out of the immediate area.

Table 6.1 Requirements for Successful Ungulate Population Control

(1) Ungulate barriers to isolate populations usually consist of fences, sometimes abutting against barren, inaccessible habitat (the sea, cliff faces, or expansive open lava) to form management units. Currently 4-foot high hog-wire with no gaps at the ground is used to deal with goats, cattle, domestic sheep, and pigs.
(2) Animals must be taken in greater number than their annual reproduction and influx from surrounding uncontrolled areas. This typically requires taking more than a third of the remaining goat (or deer or sheep) population each year.
(3) Barriers must be inspected and repaired on an ongoing basis. Failure to mend fences and to remove the annual increment of animals or those that leaked through negates much or all previous labor, costs, and ecosystem recovery gains. Monitoring both barrier fences and animal populations are integral to controlling ungulate populations.
(4) A system must be established and maintained for monitoring and removing any animals that bypass the barrier and enter the protected area if an area is to be kept ungulate free. A tiny goat population, left undetected, can recover up to 90 percent of its former levels in only four years. Most monitoring involves such things as regular helicopter transect inspections, ground transect analyses to detect ‘sign’ or browsing, and the use of Judas goat searches.
Source: Attachment 1 in <i>Controlling Ungulate Populations in Native Ecosystems in Hawai‘i</i> , Position Paper, Hawai‘i Conservation Alliance

Table 6.2 Summary of Animal Removal Techniques from Fenced or Isolated Population

Technique	Effectiveness	Comment
Live Capture	Fails to remove needed % of population (low density animals are very trap wary).	Good for Public Relations only; does not have long-term effectiveness.
Public Hunting	Fails to remove needed % of population.	Good for Public Relations only. Helps only with initial reduction, in very accessible areas.
Volunteer Hunters	By itself, fails to remove needed % of population.	Can be effective (if with selective recruitment and direct supervision for organized drives), with initial population reduction.
Professional Trapper/Shooters	Capable of removing needed % of population.	Current effective method in Hawai‘i.
‘Judas’ Animal	Highly effective w/ goats, especially for remnant populations.	Greatly simplifies goat control for mop up by professional shooters.
Professional Aerial Shooting	Very effective method along steep cliff faces.	Very high risk
Neck Snares	Highly effective w/ goats if left untended.	Low public acceptance (in part because it works so well, and since snare zones are closed to public hunters)
Poison	Very Effective in New Zealand.	Not acceptable for use in Hawai‘i.
Contraception/Sterilization	Ineffective / impossible	Cannot remove all ungulates in a population.
Biological Control	Not been used. There are no specific agents.	Effect not contained within barrier area and will kill desirable farm animals nearby.

Source: Attachment 3 in *Controlling Ungulate Populations in Native Ecosystems in Hawai‘i*, Position Paper, Hawai‘i Conservation Alliance

Protecting larger areas with ungulate-proof fencing would be considerably more costly. The exact amount would depend upon the specific fence alignment and the extent to which continued road and trail access through the enclosure fence requires special treatment. However, it is likely that the cost of the fencing and ungulate removal from the protected area would be at least \$500,000.⁸⁰ Good fence maintenance and removal of the animals that will inevitably breach the fence from time to time, which is essential to the success of an enclosure, will probably cost on the order of \$15,000 - \$30,000 per year.

6.2 ARCHAEOLOGICAL AND CULTURAL INTERPRETATION

The Kīholo State Park encompasses nearly 2,000 known archaeological and historic properties. Many of these are very sensitive and must be protected. However, others can be made accessible to the visiting public through both passive and active interpretive programs. Among the cultural heritage at Kīholo are petroglyphs, abrading pits, *hōlua*, anchialine ponds, and lava tubes containing cultural deposits. Not all of these sites are appropriate for interpretive efforts, and frequently the interest of park visitors is at odds with the need to respect and preserve these important resources.

Developing detailed interpretive programs that could take advantage of all the archaeological and historic properties at the park was beyond the scope of this master planning effort. Moreover,

⁸⁰ Very close attention will be required to locations where roadways and/or trails pass through fenced areas and where the fencing terminates at the shoreline as it is difficult to prevent goats from circumventing the fence in such areas.

creating and operating such programs would require a level of staffing and financial support not likely to be available to State Parks for the foreseeable future.

State Parks should balance these interests by defining a set of attractive sites for interpretive signage and other programs, and gently steer visitors away from sensitive sites which could be damaged or undermined by indiscriminate use. Thus, the final Master Plan should:

- Establish appropriate protection and preservation efforts for sensitive cultural properties such as burials and caves housing cultural artifacts, barring uncontrolled access where necessary.
- Identify some subset of the cultural properties and sites in the park which are appropriate for visitation and which could be used for interpretive efforts.
- Integrate these cultural sites into the park with signage, trails, smartphone apps or other portable electronic media, to educate park visitors to the *mo'olelo*, history and significance of these places.

6.3 POND RESTORATION

6.3.1 ANCHIALINE PONDS

The Kona coast, and in particular Kīholo State Park, hosts many anchialine ponds which are in varying states of neglect. These anchialine ponds represent a nexus of cultural and ecological significance, acting as sources of fresh water, *wahi pana* or storied places, and as habitat for rare native species. A number of individuals and organizations that have been involved in the park planning process have expressed the hope that an anchialine pond restoration program consisting of a combination of vegetation management, trash removal, the elimination of invasive aquatic species, such as tilapia and mosquito fish, and possible reintroduction of native anchialine species, could preserve and protect this resource for future generations of park visitors to appreciate. Hui Aloha Kīholo, in their curatorship role at the park, has undertaken substantial cleanups of several of the anchialine pools such as Waiaelepī and Wainānāli'i, hopeful that this could serve as an overture to a programmatic restoration of anchialine pools within the park.

Dr. Richard Brock, who evaluated the anchialine pond resources of all of Kīholo State Park as part of the master planning effort, concluded that while the sorts of efforts that these groups are pursuing will undoubtedly improve the appearance of the ponds and restore some of their ecosystem function, there is little likelihood of removing the alien fishes that have decimated the native fauna that once dominated the anchialine ponds. While it does not appear prudent for State Parks to devote substantial portions of its limited resources to attempt to rid the ponds of invasive fish species, the ponds are sufficiently important from an historical and visual perspective that they do warrant protection so that their story can be woven into the overall interpretive program for Kīholo. Consequently, State Parks should be open to partnerships with other organizations that are interested in restoring specific ponds.

The few ponds which continue to harbor the assemblage of biota that make them unique do so largely because they are unknown and unvisited. They cannot be called out in educational and other public information without exposing them to the harm that could result from increased visitation, a risk that exceeds the benefit that the public would gain from being able to visit them in person.

6.3.2 FISH PONDS

In 2011, The Nature Conservancy (TNC) was given title to a 7-acre private inholding within the Kīholo State Park that incorporates major portions of the historic *ka loko o Kīholo* fishpond. TNC has worked in cooperation with State Parks, Hui Aloha Kīholo, Ala Kahakai National Historic Trail, and Conservation International to develop a conservation action plan which identifies (among other objectives) restoration of the fish ponds on their property as the top priority. Restoration activities

may include invasive vegetation removal, ungulate removal and creation of ungulate exclosures, native vegetation plantings, sediment removal, and reconstruction of fish ponds walls.

State Parks should pursue additional opportunities for cooperative action with TNC, as the fishponds on TNC property are connected to the surrounding park and anchialine pools via the groundwater resources which sustain them. TNC and State Parks can partner to develop mutually beneficial programs which enhance management of the fish ponds while integrating these resources with the surrounding park lands. In addition, the pools could be incorporated as points along interpretive trails, with signs detailing the ecology and history of these important resources, or form the core of a vegetation restoration area with protective fencing and native plantings.

6.4 LORETTA LYNN HOUSE RENOVATION

Built in the late 1980s, the former home of Loretta Lynn is located on beachfront near central Kīholo Bay (TMK No. 7-1-002:002) accessible via the main access road off of Queen Ka‘ahumanu Highway. While the house has been vacant for more than two decades, the octagonal structure remains a focal point in this portion of the park, and visitors to Kīholo Bay often use the open areas adjacent to the structure and access road to park their vehicles. The State of Hawai‘i took ownership of the house and parcel when Kīholo was classified as a State Park Reserve. The site has no existing electricity, water, or drainage system.

Because of its location along the coastal Ala Kahakai National Historic Trail, in 2009 the National Park Service and the State’s Department of Land and Natural Resources commissioned Mason Architects, Inc. to produce a scoping report and evaluation of the house. The intent of this process was to evaluate the possibility of converting the facility into a trail office, visitor information, and interpretive center. At the same time, the Division of State Parks considered two additional options with respect to incorporating the structure into park operations; one option is to convert the structure into a concession; the other option is to create an interpretive center for visitors. Further analysis of these possibilities have shown that the cost of repurposing the structure, making it ADA compliant, and creating the necessary infrastructure to establish utilities like water and electricity was too great, and the plan was shelved.

Hui Aloha Kīholo, and the community members that it represents, believe that the Loretta Lynn House is an asset to the park. They view it as a potential base for park management, with a records repository on the upper floor and an interpretive education center. Significant features retrieved from points within the park could be developed there as interpretive exhibits displayed on the open ground-floor level, and the salt pans on the Waialepī side of the house could serve as an interpretive resource (see Section 5.2.8).

Currently, Hui Aloha Kīholo (mid-2013) is in the process of planning renovations to make the house useable, safe, and accessible. Their plans call for the addition of a wheelchair accessible ramp, a replacement door, and repairs/modifications to the structures windows, deck railing, and cabinetry. Finally, they will install a variety of interpretive displays. They have consulted on several occasions with State Parks regarding the types of permits which may be required in order to pursue these proposed improvements. More recently, Hui Aloha Kīholo has sought and obtained grant money that would allow it to use the structure as an interpretive center. Under Hui Aloha Kīholo’s vision for the Loretta Lynn House, a repurposed Loretta Lynn structure could be part of any of the proposed Master Plan alternatives.

The uses for the structure that Hui Aloha Kīholo have identified and is pursuing are supportive of the educational/interpretive work that is at the heart of its mission and are consistent with State Parks overall plan for Kīholo. The resources that the organization has helped to bring to bear have allowed far more to happen within Kīholo State Park Reserve than would otherwise have been possible, and so long as it continues to provide financial and other support needed to operate the house as an

interpretive center, State Parks has concluded that the house should remain. If that support should eventually cease, the Division will have three basic options:

- Assume responsibility for staffing and maintaining the interpretive center and for continuing the programs that it serves;
- Find another partner willing to assume responsibility for staffing and maintaining the interpretive center and for operating programs within it that are relevant to park visitors; or
- Demolish the structure.

6.5 FISHERIES MANAGEMENT

As noted in 2.4.1.2, Kīholo Bay has been listed by the Division of Aquatic Resources as a Marine Fisheries Management Area, which makes it unlawful for any person to possess gillnets within the waters between Hou Point in the north and Nāwaikulia Point in the south. One aspect of this module might include increased restrictions on fishing within all or part of Kīholo Bay. This precedent of a special regulatory framework at Kīholo could also be expanded to encompass further protections and programs intended to enhance the fisheries present along the park's coastline and educate fishermen and the general public about the ecological value and traditional fishing practices native to Kīholo.

An enhanced fisheries management regime at Kīholo Bay could encompass a combination of public and private initiatives and offers the potential to enhance the ecological, cultural, and recreational value of the park. Two examples of programs which could be included in a fisheries management planning module are:

- Hui Aloha Kīholo is currently in the first of a four year program of creel surveys, conducting a series of 6 or 7 surveys annually. The program is funded by Conservation International, with the objective of developing a moon calendar specific to Kīholo, which could be used to guide fishing regulations within Kīholo Bay. The information created through this initiative will be passed on to DLNR-DAR's West Hawai'i Fisheries Council for their use in drafting additional regulations on fishing at the park.
- Hui 'Ākoakoa has begun work on a planned fish station at Kīholo Bay, where fishermen could measure, weigh, record, and clean their catch, share information, and read posted regulations.

6.6 STARLIGHT RESERVE

The Administrator of the Division of State Parks has directed all park planning efforts to examine the potential for instituting "Starlight Reserves", i.e., places which have been committed to the preservation and enhancement of the quality and accessibility of the night sky, at parks throughout the state. This effort takes on special emphasis in Hawai'i, with the Hawaiian culture's long tradition of celestial navigation, agriculture, and mythology. Because of the substantial size and absence of urban development in and around Kīholo State Park, Kīholo is a prime candidate for such designation.

Starlight reserves were first called for as part of the *Declaration in Defense of the Night Sky and the Right to Starlight*, issued by the United Nations Educational, Scientific and Cultural Organization (UNESCO), World Heritage Center, in La Palma, Canary Islands in April, 2004. Subsequently, in 2007, the Working Meeting *Starlight Reserve Concept*, held at UNESCO headquarters in Paris, France articulated a definition, content, and action plan for the establishment of starlight reserves around the world. A Starlight Reserve was defined as:

"...a site where a commitment to defend the night sky quality and the access to starlight has been established. Its main function will be to preserve the quality of the night sky and its associate values, whether they are cultural, scientific, astronomical, natural, or landscape-related."

A Starlight Reserve will have a core or dark zone. This is an unpolluted area where natural night sky conditions are kept intact. This core zone will be protected by a buffer or protection zone, there may be an external zone where criteria for intelligent and responsible lighting will be enforced, along with protection of the night sky from other harmful factors such as light pollution.

Each Starlight Reserve’s requirements will be specified based on the characteristics, unique features, and functions of the site. These should be related to the preservation of the quality of astronomical observations, wildlife conservation, nighttime landscapes, or the cultural heritage.”

UNESCO has established the six types of starlight reserves listed in Table 6.3. Kīholo State Park could qualify for three of these: (i) Starlight Natural Site, (ii) Starlight Landscape, or (iii) Mixed Starlight Site. Of these, the park area probably best fits into the “Starlight Natural Site” category.

Table 6.3 Starlight Reserve Categories

<i>Category</i>	<i>Definition</i>
Starlight Heritage Site	Archaeological and cultural sites or monuments created by man as an expression of its relationship with the firmament, which reflect the development of astronomy and its manifestation in the arts and traditions.
Starlight Astronomy Site	Exceptional observation sites for optical, infrared, and/or radio astronomy, including potential future sites.
Starlight Natural Site	Natural areas where the integrity of natural conditions, including the quality of the night sky, are preserved.
Starlight Landscapes	Places where aesthetic manifestations of the night sky can be observed, as well as natural and cultural landscapes related to starlight where natural manifestations or human works beautifully blend with the view of the firmament.
Starlight Oases	Populated areas relatively free from the negative effects which impeded star viewing and which decrease the quality of the night sky.
Mixed Starlight Sites	Sites that combine two or more of the previously described categories.
Source: UNESCO World Heritage Center, <i>Starlight Reserve Concept</i> (2009)	

All categories of starlight reserves must have a “core zone” where the natural night sky conditions are kept intact, and where sources of artificial light are excluded. Conceptually, an unlit core zone at Kīholo State Park would serve as a window to the sky for nighttime visitors to the park. Because no artificial lighting is contemplated as part of any of the proposed planning alternatives and because light-producing urban development is present (and then only in limited amounts) only along the widely separated northern and southern edges of the park, maintaining a level of illumination at or below the full moon criterion of (<0.27 lux) is achievable within most parts of the park regardless of which alternative is selected.⁸¹

- This core zone would stretch from the shoreline to within 500 feet of the park boundaries. Artificial sources of light other than low-intensity camp lights would be prohibited within this zone.⁸²

⁸¹ The lux is the standard unit of illuminance measuring luminous flux per unit area. It is equal to one lumen per square meter. A level of 0.27 lux is approximately equivalent to a full moon on a clear night.

⁸² State Parks does not have the power to prevent in-holders from using lights on their property. However, these people generally work hard to avoid undue lighting and their activities do not make it impossible to achieve the desired goals.

- It would be surrounded by a several hundred-foot-wide “buffer zone” or protective area, insulating the core zone from the effects of artificial lighting on adjacent properties.
- Finally an “external zone” would encompass the area immediately adjacent to Queen Ka‘ahumanu Highway (where vehicular lighting) and the adjacent properties (where low-level structural and vehicular lights might be present).

Protecting the quality of the night sky would benefit the park and its visitors in several ways. I would:

- Allow them to see the night sky in a relatively pristine state;
- Create opportunities to educate park visitors regarding the park’s scientific and cultural heritage, including native Hawaiian celestial navigation and astronomy; and
- Preserve sensitive habitat from the effects of light pollution and fugitive light, which can disrupt the behavior of native species, including *honu* (green sea turtles).

An additional opportunity exists to create a larger “mountain to the sea” starlight reserve which would incorporate the relatively undeveloped upland portions of Pu‘u Anahulu and Pu‘u Wa‘awa‘a, *mauka* of Queen Ka‘ahumanu Highway. By partnering with the Pu‘u Wa‘awa‘a Advisory Council and other interested parties, State Parks could look at ways to use Kīhōlo State Park as the nucleus of a larger opportunity to preserve the night skies over West Hawai‘i. The lights on vehicles using Queen Ka‘ahumanu Highway will always make it impossible to completely darken the area, but these represent a relatively small interruption in the overall darkness of the area.

Ultimately, each starlight reserve must develop specific guidelines based on its unique characteristics, functions, and features which are incorporated into an action plan. This action plan must deal with critical areas of importance such as wildlife conservation, nighttime landscapes, cultural heritage, and the quality of astronomical observations. The action plan would then be submitted to UNESCO’s World Heritage Center and once all review criteria are met, the park could be given international starlight reserve status recognition.

The International Dark-Sky Association (IDSA) has a program specifically oriented towards parks. Its purpose is to identify and recognize protected public lands with exceptional commitment the ideals of dark sky preservation. However, Kīhōlo State Park did not appear to meet all of the criteria for eligibility for this program.

CHAPTER 7 – PARK MANAGEMENT AND BUDGET

Implementation of the park Master Plan will entail both up-front capital improvements for the required facilities and interpretive program development and ongoing operating expenditures. These are outlined below. Because the costs are related to the way the park is staffed and managed, the recommended staffing concept is discussed as well. The discussion is divided into the following main parts:

- Section 7.1 describes the capital improvements needed for each of the alternatives.
- Section 7.2 outlines the operational considerations and costs associated with each alternative.
- Section 7.3 notes that the present plan calls for the park to be free of commercial uses.

7.1 CAPITAL IMPROVEMENTS

The “wilderness” nature of the proposed park means that the capital investment that is required is smaller than that is needed for development of parks of a comparable size where more intensive use is envisioned. The estimated costs of basic capital improvements needed at Kīholo State Park are shown in Table 7.1.

Table 7.1 Capital Improvement Cost Estimates

<i>Item</i>	<i>Estimated Cost (in \$)</i>	
	<i>Alternative 1</i>	<i>Alternative 2</i>
Relocate Queen Ka‘ahumanu Hwy. Entrance to Kīholo	650,000	650,000
Repairs to Existing Kīholo Bay Access Road	40,000	40,000
Add/Upgrade Existing Kīholo parking	15,000	15,000
Extend Service Road to Keawaiki Bay		225,000
Construct Additional Campsites and Picnic Areas	14,000	32,000
Construct Stations for Portable Toilets/Dumpsters	24,000	36,000
Plan and Establish Interpretive Trails	50,000	50,000
Improve Loretta Lynn House	100,000	100,000
<i>Program Development:</i>		
Prepare Plans for Interpretive Media and Signs	35,000	38,000
Develop Ungulate Control Program Plan	10,000	10,000
Develop Vegetation Restoration Program Plan	12,000	12,000
Develop Anchialine Pond Program Plan	15,000	15,000
Develop Archaeological/Cultural Interpretive Program Plan	20,000	20,000
Develop Fisheries Management Plan	5,000	5,000
Develop Detailed Cave Management Program Plan	25,000	25,000
<i>Program Capital Expenditures:</i>		
Create Media/Fabricate and Erect Signs	35,000	45,000
Implement Ungulate Control Program	50,000	50,000
Implement Vegetation Restoration Program	48,000	48,000
Implement Anchialine Pond Measures	65,000	65,000
Restore Selected Archaeological/Cultural Interpretive Sites	48,000	48,000
Establish Enhanced Fisheries Controls	5,000	5,000
Construct Cave Protection/Access Control Facilities	180,000	180,000
Stabilize King’s Trail	100,000	100,000
TOTAL	\$1,546,000	\$1,814,000
Source: Compiled by Planning Solutions, Inc. (2013)		

7.2 PARK OPERATIONS AND COSTS

7.2.1 STAFFING

Additional personnel will be needed in order to operate the facilities and programs that have been identified as worthwhile for Kīholo State Park. Two different approaches could be used to meet this need. The first would attempt to staff nearly all park maintenance and operations using civil service employees. The second would rely much more on contractors/volunteers/grant-based efforts.

7.2.1.1 State Parks Staffing

Additional personnel will be needed in order to operate the facilities and programs that have been identified as worthwhile. The magnitude of the increase is highly dependent upon the way responsibilities for the programs that are envisioned are assigned. If most program responsibilities are carried out by State Parks staff, the positions shown in Table 7.2 must be approved and filled in order to carry out the Master Plan recommendations. If, on the other hand, some of these responsibilities are carried out by others under a curatorship agreement, then the number of additional State Parks staff positions would be substantially less.

Table 7.2 Operating Cost Budget: Personnel

<i>Position</i>	<i>Number People</i>	<i>Annual Salary</i>	<i>Annual Cost</i>
Park Manager/Interpretive Coordinator	1	\$58,000	\$58,000
Park Ranger/Interpretive Technician	2	\$42,000	\$84,000
Construction and Maintenance Worker	1	\$40,000	\$40,000
Resource Management Technician	1	\$55,000	\$55,000
TOTAL			\$237,000
Source: Estimated by Planning Solutions, Inc. based on historical information.			

7.2.1.2 DLNR Technical Staff

DLNR technical and professional staff, including archaeologists, botanists, and biologists, will be asked to assist in developing and implementing the various resource management programs and policies of the park. In fact, because of the wilderness nature of the area, the Division of State Parks envisions its Kīholo lands as a rich natural resource that other Divisions within the Department (and partner organizations such as the Institute for Pacific Island Forestry) may wish to contribute their expertise to, and use as the basis for some of their programs. To the extent that this is the case, they would contribute the resources of their technical staffs, as well as funds for program operations, to carry out activities at Kīholo State Park. The cost of this technical staff is not allocated to the operating cost estimates in this plan.

7.2.1.3 Curator Program Staff, Docents, and Volunteers

The present curator, Hui Aloha Kīholo, contributes substantial resources to the operations at Kīholo. The funding and in-kind contributions that it and its members provide supports the maintenance of the campsites, restroom facilities, and other facilities that are located there; they also pay for the part-time-ranger and are essential to the continuation of many of the other initiatives that are so evident. It is impossible to put a precise dollar value to this, but there is no doubt that trying to replace the manpower with paid personnel would add tens of thousands of dollars per year to the cost of operating Kīholo State Park.

7.2.2 PARK SAFETY AND SECURITY

7.2.2.1 Gates

Gates at the entrance to Kīholo allow State Parks to manage the flow of people into and out of the park, and are essential to its continuing safe and efficient operation. The steel gates that are now in place are fabricated of heavy duty steel with strong foundations. Gates such as these are needed to resist the kinds of vehicles that are often used to breach fence lines and gates.

The master plan calls for the principal gate at Kīholo to be relocated to a place immediately adjacent to the new access road connection with Queen Ka‘ahumanu Highway. The existing access point is to be blocked with large stones so that vehicles can no longer enter the park at that location. Alternately, the existing gate, which is situated several hundred feet *makai* of the highway, could be relocated to a point immediately outside the highway right-of-way. That would allow it to be opened in an emergency, but would ensure that vehicles wishing to enter the park did not accidentally attempt to do so using the wrong entrance road.

7.2.2.2 Natural Hazard Warning and Fire Plan

As indicated earlier in this report, currently there are no Civil Defense warning sirens within audible range of most of the areas within Kīholo State Park.⁸³ It is possible for park users to sign up for Civil Defense and Hawai‘i County Police Department voice, email, and text message alerts. This service is provided by the Hawai‘i County Civil Defense Agency’s mass emergency notification system (City Watch), which allows for County agencies to easily notify the public in the event of emergencies. City Watch is an electronic notification system that can notify residents about evacuations or other emergency measures via phone or email. The system once activated sends residents registered on the system a brief voice and email message.

The absence of a water system at Kīholo means that fire control must consist entirely of measures designed to keep fires from starting rather than fire control measures that are taken once it is established. The principal means of effecting this will be to limit campfires to specific areas within each campsite, remove dead vegetation that could fuel a fire in the event one were started, and to actively enforce rules against beach bonfires.

7.2.2.3 Emergency Telecommunications

No land-wire telephone service is available at Kīholo Bay and no new facilities of this sort are included in recommended master plan improvements. Cellular telephone service is available in most areas, however, and for those park users who have cellular service, it provides a means of calling for assistance in an emergency.

7.2.3 PARK MAINTENANCE

7.2.3.1 Restroom Facilities

No permanent restrooms are recommended at Kīholo. Instead, the Master Plan relies on modular portable toilets. These can be relocated, removed, and supplemented on an “as-needed” basis. Because the work is done by contractors with available backup units, the breakdown of a restroom does not mean that park users must do without. Instead, replacement units can be put in place immediately.

7.2.3.2 Solid Waste Storage, Collection, and Disposal

For the most part campsite users (who generate the largest volumes of solid waste) are expected to pack out material that they bring in. A limited number of small waste receptacles would be provided

⁸³ There are warning sirens at the Waikoloa Beach Resort (‘Anaeho‘omalū Bay) to the north and at the Hualālai Resort to the south that may be audible in portions of the park closest to them. However, these are away from the most heavily used portions of the park.

adjacent to the beach access paths, and State Parks would arrange for trash pickups to be made from these on a regular schedule.

7.2.3.3 Annual Park Maintenance and Replacement Costs

In addition to the ongoing staffing costs discussed above, normal wear and tear means on the capital improvement will require repair and replacement over time. The amount that will be required for this cannot be precisely estimated at the present time, but experience has long shown that it is unwise to make improvements without first committing to this ongoing expense. For the purpose of this Master Plan, these are conservatively estimated at 10 percent of the original capital cost shown in Table 7.1.

Management of park use permits, including camping, fishing, hunting, hiking, resource gathering, and commercial uses should be consolidated within a single organizational entity. Permit rates should be adjusted to capture reasonable costs of maintaining the impacted resource. For example, resource gathering permits might be issued for particular plant materials at varying rates depending on scarcity and the costs of monitoring, propagating, and out-planting the resource.

In practice, permit fees do not comprise a significant source of revenue for the parks. They do serve a more important function in regulating and monitoring use of park resources. Currently, estimated annual revenue from permit fees is approximately \$5,000.

7.3 COMMERCIAL USES

No commercial uses are envisioned for Kīholo State Park. Exceptions to this rule will require action by the Board of Land and Natural Resources.

CHAPTER 8 – ENVIRONMENTAL ASSESSMENT

8.1 BACKGROUND SUMMARY

The expenditure of funds and the use of State lands to implement any of the planning alternatives presented in Chapter 7 constitutes an agency action subject to the requirements of HRS Chapter 343-5(a)(1), which stipulates that:

Except as otherwise provided, an environmental assessment shall be required for actions that:

- (1) *Propose the use of state or county lands or the use of state or county funds, other than funds to be used for feasibility or planning studies for possible future programs or projects that the agency has not approved, adopted, or funded, or funds to be used for the acquisition of unimproved real property; provided that the agency shall consider environmental factors and available alternatives in its feasibility or planning studies; provided further that an environmental assessment for proposed uses under section 205-2(d)(11) or 205-4.5(a)(13) shall only be required pursuant to section 205-5(b);*

This Environmental Assessment (EA) was prepared in accordance with the requirements of State of Hawai‘i environmental impact assessment regulations. The applicable State of Hawai‘i requirements are contained in Chapter 343, Hawai‘i Revised Statutes and Hawai‘i Administrative Rules, Title 11, Chapter 200. This EA also addresses other laws, regulations, plans, and guidelines promulgated to protect and enhance environmental quality.

As discussed in Section 1.3 of this document, State Parks has made the determination to develop Kīholo State Park Reserve as a Wilderness Park, which is defined as: “*Areas possessing a natural, primitive character without human habitation and offering passive wildland recreation, such as hiking and primitive camping. Wilderness parks should be of a large size so as to provide solitude in a natural setting and a sense of unconfined space. Wilderness parks tend to be remote with limited access and minimal park facilities for public health and safety, such as self-composting toilets.*”

Both of the action alternatives it is considering are consistent with this directive, calling for the minimum infrastructure development within the park required to provide for the health, safety, and intended uses of the park. The impacts of both action alternatives are described below, in both their construction and operational phases. The “No Action” Alternative—in which park would revert to the conditions present prior to the introduction of the Interim Management Plan in November, 2011, would also result in impacts to park resources which are discussed in this chapter.

8.2 TOPOGRAPHY, GEOLOGY, AND SOILS

8.2.1 CONSTRUCTION PERIOD IMPACTS

Because they involve very limited new construction, all of the alternatives will have minimal impact on the topography, geology, and soils within the park. Most of the effects on these resources that would occur would stem from roadway construction, with only slight disturbances needed for the campsites that are part of both plans.

Both Alternative 1 and 2 call for rerouting the *mauka* portion of the Kīholo Bay access road in order to create access through the improved intersection that the State Department of Transportation has constructed at the nearby scenic lookout with adequate turning lanes (see Section 5.2.3.1). By taking advantage of this recent improvement, the plan limits construction to the grading of a new, 2,000-foot long/18-foot wide road bed along the alignment shown in Figure 5.2. Only small amounts of cut and fill would be needed for this, and the grading would not substantially alter the terrain, affect any

important geological feature (e.g., lava tube), or adversely affect soils that are suitable for agricultural use

In addition to this, Alternative 2 would also entail development of a new campground at Keawaiki, which would require construction of a connecting road from the existing Keawaiki access road southward around the private inholding to the campground site. As with the new Kīholo connecting segment, Only small amounts of cut and fill would be needed for this, and the grading would not substantially alter the terrain, affect any important geological feature (e.g., lava tube), or adversely affect soils that are suitable for agricultural use. The change to the existing surface would affect a minute portion of the park land and would be similar to many other such disturbances that are already present.

In both cases, the new roadway would be constructed by crushing and compacting the native lava rock to create a base course for a strong and stable roadway using heavy, diesel-powered construction equipment such as bulldozers and backhoes. A gravel topping would be placed over this to level and clearly demarcate the roadway, as is done currently on the existing access road off of Queen Ka‘ahumanu Highway. The potential for short-term erosion as a result of the creation of these new sections of roadway is limited by the relatively low levels of rainfall in the region. However, the implementation of all dust- and erosion-control measures required by the County of Hawai‘i will reduce the potential for impact to a practicable minimum.

8.2.2 OPERATIONAL IMPACTS

Once constructed, only limited and occasional maintenance work would be needed, and none of the activities associated with this have the potential to further impact the area’s topography, geology, or soils.

8.3 CLIMATE AND MICRO-CLIMATE

With one possible exception, none of the construction and maintenance activities anticipated under any of the planning alternatives described in Chapter 5, have the potential to affect climate or the regional micro-climate in any substantial way. The possible exception is the improvement in ungulate control that could result from construction and maintenance of an ungulate-proof fence in order to foster the re-growth of native vegetation. If this were to substantially increase the vegetated area, small changes in the microclimate could occur (e.g., decreased air temperature/increased atmospheric moisture).

8.4 HYDROLOGY

8.4.1 IMPACTS ON SURFACE WATER FEATURES

There are no lakes, rivers, or streams present within Kīholo State Park Reserve, thus none of the proposed improvements described in Chapter 5 have the potential to affect, or negatively impact, surface water features except for the potential effects on anchialine pools that are discussed in Section 8.7.3.

8.4.2 IMPACTS TO GROUNDWATER

Despite the desert conditions present above ground, there are substantial groundwater resources present within the park (see Section 2.2.3.2), though the groundwater is generally non-potable and is not tapped by any existing wells. None of the alternatives under consideration involve activities (whether in construction or in operation) which involve groundwater withdrawals. Neither do they include work that would diminish groundwater recharge or alter the quality of the recharge. Hence, they do not have the potential to affect groundwater resources in any measurable way.

8.5 AIR QUALITY

8.5.1 CONSTRUCTION PERIOD IMPACTS

None of the alternatives being considered involve substantial amounts of new construction. Heavy construction equipment (e.g., bulldozers, diesel powered trucks, etc.) will be used to construct the short road extensions needed at Kīholo (and in the case of Alternative 2, at Keawaiki as well) will be powered by internal combustion engines that emit a variety of air pollutants. Construction equipment emissions could result from the following sources: (i) construction equipment engine exhaust; (ii) motor vehicle exhaust, brake, and tire wear; (iii) entrained dust from material or equipment delivery trucks; (iv) entrained dust from the roadways themselves; (v) entrained dust from construction worker vehicles transiting to and from the work site; (vi) fugitive dust from vegetation removal, grubbing, and grading, and from the movement of roadway material; (vii) fugitive dust from wind erosion of disturbed areas. However, the area that would be worked on is small (approximately one acre in the case of Alternative 1 and two acres in the case of Alternative 2), the amount of soil present on the disturbed lava so limited, and the construction period so short (1 to 3 months) that neither these nor airborne dust from the grading will be significant. All work will conform to the air pollution control standards contained in HAR, Title 11, Chapters 59, “Ambient Air Quality Standards,” and Chapter 60, “Air Pollution Control”.

8.5.2 OPERATION AND MAINTENANCE PERIOD IMPACTS

Once constructed, the only sources of airborne emissions which would be present within the park under any of the planning alternatives are the result of vehicular traffic along the access roads and the small cooking fires used by campers on the weekends, both of which are already present in the park at the present time. Neither of these sources of emissions is meaningful in comparison with emissions from vehicles traveling on Queen Ka‘ahumanu Highway, and it is even more inconsequential relative to emissions from the volcanic activity on the island. Consequently, State Parks does not anticipate any significant impacts to air quality as a result of any of the three planning alternatives described in Chapter 5.

8.6 TERRESTRIAL AND AVIAN BIOTA

8.6.1 PROBABLE IMPACTS TO BOTANICAL RESOURCES

As discussed elsewhere in this report, 43 different plant species were recorded during the botanical survey that was conducted during preparation of the Master Plan. Of these, a little more than one-third are moderately common endemic and indigenous plants, and several early Polynesian introductions (*niu*, *noni*, *milo*, and *kamani*) are present as well. The most environmentally sensitive plant assemblages are the coastal strand and the coastal pond/anchialine pond environments. These two plant assemblages are easily damaged by high human traffic, off-road vehicles, and invasive species.

No plants currently proposed or listed as threatened or endangered species have been identified. Thus continued use and/or improvements to the park are not expected to result in deleterious impacts to any plant currently proposed, or listed under either the federal or State of Hawai‘i endangered species statutes. This is true regardless of the type of park improvements and/or activities that are undertaken. Similarly, as there is no federally delineated Critical Habitat present within the Kīholo State Park Reserve, none of the alternatives have the potential to affect federally designated Critical Habitat.

Vegetation can change over time, and additional species are added to the lists of protected plants. There is little likelihood that this will occur in the area where the Kīholo Bay access road might be realigned. It is more conceivable that changes could occur in and around the coastal areas that would

be more affected by additional campsite and access road development near Keawaiki. Because of this, a re-survey of this area may be called for if Alternative 2 is selected.

Finally, should State Parks eventually determine that it wishes to create a more “original” appearance and ecosystem in dune and back beach areas and commit to limited *kiawe* removal and replacement effort, the vegetation on portions of the strand might change from a situation where *kiawe* is dominant to one where native and Polynesian introductions, such as *naupaka kahakai* and *niu*, and the non-native beach heliotrope, are more dominant than *kiawe*. Removal of *kiawe* may encourage natural recruitment of the strand vegetation if foot and vehicle traffic are minimal.

8.6.2 PROBABLE IMPACTS TO AVIAN AND MAMMALIAN RESOURCES

While no candidate, threatened, or endangered avian species protected by federal or state statutes have been observed in Kīholo State Park, it is likely that several species threatened or endangered birds do overfly the area. In addition, several species of birds protected by the Migratory Bird Treaty Act are known to be present in the park. The principal threats to these birds are posed by: (i) collisions with tall artificial structures such as utility poles and lines; (ii) disorienting artificial light sources leading to “fallout”; and (iii) predation by invasive alien mammals, particularly dogs, cats, and rats. None of the planning alternatives described in Chapter 5 involve the construction of structures which birds could collide with, or the addition of artificial lighting which could distract or disorient birds.

As noted in Section 2.3.3.2, the only terrestrial mammals present within the park are invasive and disruptive species, including feral goats, pigs, dogs, cats, rats, and mice. None of the planning alternatives identified in Chapter 5 would have significant impacts, however desirable, on the populations of these mammals. Some marginal reduction in populations of dogs, cats, rats, and mice may be achieved through the more careful management and removal of solid waste called for under Alternatives 1 and 2, but the effect is likely to be small.

The most substantial effect that implementation of the park Master Plan could have on mammals is related to the ungulate control measures discussed in Section 6.1. Other things being equal, the reduction in hunting that will occur when it designated a park will allow the goat population to continue to expand unchecked.⁸⁴ This, in turn, will lead to continuing (and perhaps accelerated) damage to both native and Polynesian-introduced plants. If native and Polynesian-introduced plants are to be successfully re-established on parklands, the pressure which feral ungulates exert on these species must first be reduced.

One means of preventing this is to allow and/or foster special public hunts and/or staff control in the area below Queen Ka‘ahumanu Highway. Assuming an existing population of even 500 goats are within Kīholo Park Reserve (there could be more), maintaining the population would probably require the shooting of 100-200 goats per year. The use of hunting as a goat control mechanism would necessitate that the park be closed to the public while the shooting is underway. If large public hunts (such as were undertaken during the ranching era) could be organized, the period of closure might be brief (measured in a day or two). If the number of hunters is too small to make this practical, the required closure time would be greater, possibly on the order of several weeks. Regardless of the method or scale of the hunting, the hunts would need to be repeated every few years so long as the goat population within the park can be replenished by goats migrating downward from land above Queen Ka‘ahumanu Highway.

The only means of avoiding the need for recurrent large-scale hunting in an area is to erect ungulate-proof fences around areas to be protected, to eradicate goats within the fenced area using a

⁸⁴ Feral goats have a relatively high reproductive rate. Gestation is 150 days, goats reach sexual maturity at 6 months of age, multiple births are common, and females may give birth twice a year. These reproductive traits allow feral goats to respond to population reductions with increased birth rates (Keegan, et al. 1994).

combination of professional trapper/shooters and “Judas” animals, and to actively inspect and maintain the fence thereafter. The cost of this is dependent entirely upon the size and shape of the enclosure.

It is difficult, verging on the impractical, to assure the integrity of fences where they cross vehicular roadways and tracks. Because of this, only areas of the park removed from roadways have the potential to be surrounded by large-scale enclosures, and such fencing is not being proposed as part of the park Master Plan.

Enclosure fencing is more practical if it is limited to small areas (up to several acres). Rather than seeking to control the overall goat population, this approach simply excludes them from certain limited areas. While denying goats’ access to food sources within the enclosures it would theoretically limit their numbers to less than what they might have been able to achieve without the fencing. The small areas that are involved mean that this would not have a measureable effect on the total goat population of the area. Hence, the impact of such fences on the overall goat population would be minimal.

8.6.3 PROBABLE IMPACTS TO INVERTEBRATE RESOURCES

While one species which is candidate for federal protection, the Orangeblack Hawaiian Damsselfly (*Megalagrion xanthomelas*), is believed to occur in the region, no invertebrate listed as threatened or endangered under either federal or state statutes was observed during the survey described in Section 2.3.4. Several common invasive species of invertebrates which have been observed in the park are paper wasps (*Polistes exclamans*) and honey bees (*Apis spp.*) could be temporarily disturbed by vegetation clearing and other construction activities; these effects would be only momentary in nature but these species may pose a serious risk to some individuals. Should park managers elect to seal all or most caves, as discussed in Section 5.2.6, certain ongoing impacts to cave nesting species of invertebrates can be avoided.

8.7 AQUATIC RESOURCES

8.7.1 PROBABLE IMPACTS TO THE NEARSHORE AND MARINE ENVIRONMENT

As discussed in Section 2.4.2, the waters off of Kīholo State Park are generally pristine at the present time. None of the alternatives presented in this document involve significant construction or other development which could affect the levels of suspended sediment, temperature, salinity, dissolved oxygen, or acidity, or otherwise impact water quality metrics.

8.7.2 PROBABLE IMPACTS TO NEARSHORE AND MARINE BIOTA

So long as increased oversight accompanies increased park use, no impacts to any protected marine species, such as whales, green sea turtles, or Hawaiian monk seals are anticipated as a result of any of the planning alternatives or modules provided for in this Master Plan. The regulation of human use of the area and the regulatory oversight which this plan calls for could reduce the burden on nearshore and marine biota even as park usage increases over time.

Should the implementation of this Master Plan result in an increase in access to the southern portion of the park through the development of a campground at Keawaiki Bay, there is concern regarding the effect this increased usage could have on the nearshore environment and biota. While none of the measures identified as part of any of the proposed planning alternatives would have a direct deleterious effect on the nearshore environment, an increase in fishing (and other resource withdrawals) in the area could be an indirect result. However, it is important to note that there is no regulation of fishing in this portion of the nearshore environment presently, and the increase in access to the park caused by creating public access at Keawaiki Bay could be accompanied by an off-setting increase in oversight and enforcement of existing laws.

A detailed examination of all fisheries management issues at Keawaiki Bay (and elsewhere in the park) that might be affected by the implementation of the park Master Plan is beyond the scope of this document. However, it is clear that focusing park development around Kīhōlo (where camping and regular visitation by the outside public is already a fact of life) will make fisheries management simpler than alternatives which make additional areas more accessible as well. As discussed in Section 6.5, additional fisheries management protocols could be introduced to areas of the park (such as at Keawaiki Bay or the inner lagoon of Kīhōlo Bay) and are compatible with any of the planning alternatives discussed in this document. Should the creation of access at Keawaiki Bay create additional pressure on fisheries, and if park managers and the community feel that it is warranted, steps could be taken to extend the Ka'ūpūlehu-Uluweuweu Bay Marine Reserve to encompass the nearshore environment there or to create an additional fisheries management area.

There is clear evidence that the creation of Fisheries Management Areas can have a beneficial impact on the nearshore environment over time (Tissot, 2003). Currently, there are several Fisheries Management Areas along the West Hawai'i coastline, including at Ka'ūpūlehu-Uluweuweu Bay and at Kīhōlo Bay (see Section 2.4.1.2). In these areas the collection of aquarium fish and the laying of nets are prohibited activities. In addition, the Ka'ūpūlehu Marine Life Advisory Committee has been working with the West Hawai'i Fisheries Council to designate the Ka'ūpūlehu Fisheries Management Area as a marine reserve, where most forms of fishing and resource collection would be prohibited for a period of 10 years.

8.7.3 PROBABLE IMPACTS TO ANCHIALINE PONDS

As discussed in Section 2.4.5, most of the surface-exposed anchialine habitat in Kīhōlo State Park has been biologically degraded by the introduction of alien species, debris, and pollutants. However, since introduction of the Interim Management Plan and curatorship agreement, several developments have improved the situation: (i) Hui Aloha Kīhōlo has undertaken substantial cleanups of Waia'elepi and other anchialine ponds near Kīhōlo Bay; (ii) State Parks has removed the population of long-term campers who were living in the park and disposing of waste in and near the anchialine ponds; and (iii) The Nature Conservancy has begun work to restore ponds on their property in close cooperation with DLNR.

Because of the difficulty in ridding the ponds of the alien fish species that have invaded the great majority of them, the biologist who supported the master planning effort did not recommend making an extensive (and expensive) effort to rid the ponds of the invasive species that have infested most of them. Should park managers opt to pursue the anchialine pond restoration activities identified in Section 6.3.1 these resources could still be upgraded in ways that, while not restoring them to a pristine condition, could improve their cultural and biological resource value. Activities involving the creation of exclosures around surface-exposed anchialine ponds, within which invasive vegetation would be removed and native Hawaiian vegetation established in its place could create important interpretive points in the park where the public could be educated about the anchialine habitat, their cultural-historic importance in the Nāpu'u region, and ongoing conservation efforts devoted to the protection and restoration of these environments.

In addition to restoration of the surface anchialine ponds, there are many subterranean anchialine ponds throughout the park. In part because of the inaccessibility of these anchialine ponds, they generally are in better biological condition than their surface counterparts. The Cave Management Plan outlined in Section 5.2.6 calls for these "water caves" to be sealed from public entry, with unmarked entrances, thereby preserving the remaining viable anchialine habitat in the park. Any anchialine ponds with a remaining suite of native aquatic species would be protected by park regulations, physical barriers, and enforcement personnel. Establishing and maintaining controls such as these could only have positive impacts on anchialine resources at Kīhōlo State Park.

8.8 SCENIC RESOURCES

Consistent with State Parks determination that Kīholo should be developed as a wilderness park, none of the planning alternatives identified in this report call for substantial new construction that has the potential to impact scenic resources. However, some elements have the potential to impact scenic resources in and near Kīholo State Park. They are:

- Creation of a new park entrance and section of access road at the location of the existing scenic viewpoint north of the existing entrance to improve vehicular access and safety at the park's interface with Queen Ka'ahumanu Highway (see Section 5.2.3.1).
- Construction of a new campground (whether at expanded sites at Kīholo Bay or at Keawaiki Bay) equipped with facilities such as signage, trash enclosures and receptacles, portable toilets, and fire pits very similar to those installed at the existing Kīholo Bay campsites (see Section 5.3.3.1).
- Construction of additional sections of access road, and roadside parking, for the additional campground located at Keawaiki Bay (also in Section 5.3.3.1).
- The clearing of (generally short) sections of paths for use as cultural-historic interpretive trails (see Section 5.2.8).

While construction activity related to these additions will be visible from nearby areas, particularly those close to the highway and park access road, the period of activity will be short. These activities will involve the creation of work-related dust and the presence of construction vehicles, equipment and material; their presence will be limited to relatively brief periods of time as combustion-powered equipment clears, grubs, and grades new road and trail alignments.

Once constructed, the planned park improvements will represent new visual elements where currently there is none. In particular, the creation of a new park entrance off of the exiting scenic viewpoint above Kīholo Bay—while intended to improve park safety and accessibility—could impact some viewer's experience there, as the increase in traffic and the presence of a road where none was previously will be noticeable.

The visual impact of a new campground, and access road leading to it, in terms of type, would generally be similar whether it was located in additional areas at Kīholo Bay or at Keawaiki Bay. However, the Keawaiki Bay campsite would require a significant extension of the existing park roadway there, thus the scale of the impact could be somewhat greater than expanded campsites at Kīholo Bay, where the access road is already extant. Such a roadway would be constructed from crushed lava rock native to the area, consistent with roads elsewhere within the project.

8.9 EXISTING INFRASTRUCTURE

8.9.1 PROBABLE IMPACTS TO EXISTING ROADWAYS

The goal of the Master Plan is to improve the park experience while protecting park resources through proper management. While this may increase its attractiveness for some visitors, it is unlikely that traffic within the park will reach the peak it saw prior to implementation of the Interim Management Plan. To the extent that the park is made more attractive for day users, traffic from that source is likely to increase. Much of this increase could be realized in the form of group visitation, such as school groups, taking buses and vans into the park, but the number of individual and small-group visitors is likely to increase as well.

While no precise record of vehicular traffic on the park access road exists, it is very low at the present time, not greater than 20 vehicles per hour. None of the improvements called for under any of the planning alternatives involve intensive use, thus while it seems likely that the transformation of Kīholo into a full-fledge wilderness park will increase visitation somewhat, based on the information presently available the increase is unlikely a few tens of vehicles per hour. This level of traffic is well

within the capacity of area roadways, the park entrance, and the park access road. Finally, access to the park will be limited through the use of locking gates, posted operating hours, and designated parking areas.

8.9.2 PROBABLE IMPACTS TO EXISTING TRAILS

As discussed in Section 2.6.1.2, there are a variety of trails, all or part of which occupy park lands. Some of these trails are recent, however some of the trails such as the Kīholo-Puakō Trail, the Hu‘ehu‘e-Kīholo Trail, and the Ala Kahakai National Historic Trail are themselves cultural-historic properties. The planning alternatives presented in Chapter 5 of this document are all intended to preserve the complex network of modern and ancient trails within Kīholo State Park. In some cases preservation is passive, as with many of the minor foot trails accessing remote sections of the coastline. In others, such as with the Ala Kahakai, State Parks is actively coordinating with the National Park Service, the state Division of Forestry and Wildlife, and other agencies to actively preserve and promote the trail as a cultural-historic and recreational resource.

The only trails which will be impacted by implementation of any of the Master Plan alternatives are those existing and new trails incorporated into the cultural historic interpretive plan described in Section 5.2.8 and the additional new infrastructure described under the Multi-Node Camping/Access Alternative, described in Section 5.3.3.1. Impacts to interpretive trails will include:

- The clearing of sections of the pathway of invasive vegetation with hand-tools or gas-powered equipment, so that the trail alignment is clearly visible and unobstructed.
- The posting of signage or other interpretive media which identifies specific point of interest pertaining to natural history or cultural-historic interpretation.
- Additional signage identifying natural hazards, such as rockfall, flash floods, etc. or park regulations.
- Additional foot traffic on interpretive trails as a result of improved access and clearly identified points of interest.

By focusing hiking on trails which have been determined to be appropriate for visitation and are kept in safe, clearly marked condition, some other trails may see a decline in traffic as park visitors are channeled towards a smaller subset of park trails. Insofar as this keeps individuals from points of cultural sensitivity or natural hazards, this is a positive impact which is consistent with park objectives of recreational value and cultural-historic preservation.

The new campsite trails will be short sections of trail leading from access road parking areas to the campsites. They will require the clearing of some vegetation, similar to the interpretive trails described above, and be demarcated by native lava rock. Signage will be placed at appropriate points near these campsite trails identifying applicable regulations and any hazards present in the area.

8.9.3 PROBABLE IMPACTS TO EXISTING STRUCTURES

The only existing structure within the park which could be impacted by implementation of one of the planning alternatives presented in this Master Plan is the old Loretta Lynn home at Kīholo Bay. As outlined in Section 6.4, several groups including the National Park Service and Hui Aloha Kīholo have expressed interest in repurposing this structure to serve as an activity or interpretive center. Either of these possibilities would have some impact on this structure, but given that the home has been unoccupied for many years, maintenance and use of the structure would be an improvement over its present state of neglect and would not constitute an adverse impact. The use of the structure, and the revenue which it could generate, could be applied to its maintenance and improvement over time.

8.9.4 PROBABLE IMPACTS TO ELECTRICAL AND COMMUNICATIONS FACILITIES

The proposed Master Plan alternatives do not involve the creation of electrical or communications infrastructure, and there is none present in the park at the present time. Thus, there is no way in

which implementation of any of the planning alternatives could impact this type of facility. Park rangers and other park staff will continue to use cellular telephones for communications.

8.9.5 PROBABLE IMPACTS TO OTHER PUBLIC INFRASTRUCTURE

There is no existing municipal water supply or wastewater disposal system within Kīholo State Park, thus the plans proposed in this document do not have the potential to affect these types of public infrastructure. Zero-discharge portable chemical toilets will continue to be used at the park, owned and operated by private contractors. Park visitors will continue to produce some solid waste which will be picked up by State Parks maintenance personnel and deposited in area collection points, including the nearby Pu‘u Anahulu landfill.

8.10 HISTORICAL AND ARCHAEOLOGICAL IMPACTS

Hawai‘i Revised Statutes (HRS) Chapter 6E and its implementing regulation, Hawai‘i Administrative Rules (HAR) §13-13-275 establish the State’s policy to preserve, restore, and maintain historic properties for future generations. The discussion in this section is limited to the potential physical impacts which implementation of the proposed Master Plan would have on archaeological sites within Kīholo State Park. There is also a strong connection between the living Hawaiian civilization and the archaeological remnants of times past; for a complete assessment of impacts to cultural practices, resources, and features see the following Section 8.10.

In general, the physical improvements to the park called for under all of the planning alternatives are relatively modest, with a similarly modest potential to impact archaeological properties. For a discussion of the aspects of the Master Plan that do have the potential to impact archaeological sites, see Section 8.10.1, below. In general, these physical improvements will result in relatively limited and predictable physical impacts.

The park’s transition from a reserve to a wilderness park is likely to have the additional effect of increasing the volume of visitation to the park. While this change would not in and of itself necessarily harm historic and archaeological resources, this increase in visitation levels has the potential to cause harm if it is not effectively managed. This type of potential effect, and the measures that can be taken to avoid and minimize it, are discussed in Section 8.10.2.

8.10.1 IMPROVEMENTS WITH POTENTIAL TO IMPACT ARCHAEOLOGY AND MITIGATION

8.10.1.1 Queen Ka‘ahumanu Highway Kīholo Bay Access Road Modifications

As described in Section 5.2.3.1, the existing park entrance to Kīholo from Queen Ka‘ahumanu Highway does not meet current State Department of Transportation design standards. In consultation with the State Department of Transportation, State Parks is proposing to address this by re-routing the *mauka* portion of the existing Kīholo access road so that it reaches the highway at the recently constructed scenic lookout north of the existing access road intersection. This improvement, in turn, will necessitate the construction of a new section of access road—approximately 1,900 feet in length and 20 feet wide—which would connect a combined scenic lookout and park entrance to the existing Kīholo Bay access road in the vicinity of the upper parking area, as depicted in Figure 5.2.

The proposed new access road would be built of crushed lava rock and gravel using heavy diesel-powered construction equipment. A preliminary field inspection of the route, and comparison with the results of the Archaeological Reconnaissance Survey conducted by Tom Dye & Colleagues, Archaeologists, Inc. (see Section 3.2.4.5), indicates that the proposed route would not affect any identified historic or archaeological features, and would not pass over any important lava tubes that might contain undiscovered archaeological resources. Prior to final design of the access improvements off Queen Ka‘ahumanu Highway, a detailed survey by qualified archaeologists would allow for re-routing should any previously unknown site be found.

8.10.1.2 Keawaiki Bay Access Road

In the discussion of a Multi-Node Camping Alternative, the need for a new section of access road and parking serving additional campsites at Keawaiki Bay is described (see Section 5.3.3.1). Currently, access to Keawaiki Bay is either by foot (for park visitors) or (for inholders) by an existing access road across land that is part of Kīholo State Park Reserve. The concept for an improved access road calls for a new section of road to be built which would extend the existing access road south and around the private inholdings at Keawaiki Bay to a new campground and parking area at the south end of the bay (see Figure 5.18).

If developed, this new access road would be approximately 2,000 feet long, 20 feet wide, and constructed of gravel and the crushed lava rock native to the area using heavy diesel-powered machinery. As with the proposed highway access improvements to Kīholo Bay described in Section 8.10.1.1 above, the preliminary alignment of the road extension has been evaluated against the results of the Archaeological Reconnaissance Survey conducted in the preparation of this Master Plan and found to avoid known archaeological, historical, and cultural remains. During the final design of the road, a qualified archaeologist would make a detailed inspection of the alignment to determine the presence of any features or remains and engineers would revise the road alignment as necessary to avoid them.

Also note that currently uncontrolled and unlawful access to Keawaiki Bay by four-wheel drive vehicles is ongoing and likely to result in damage to archaeological properties. By focusing vehicular access along an alignment where no such resources are present, the potential exists to reduce cumulative impacts to the area's archaeology. Consequently, provision of this access is not expected to cause any direct effects on archaeological or historical resources. The information that is presently available indicates that such an intersection could be provided in this location without adversely affecting historical and archaeological sites. This tentative conclusion would need to be confirmed if and when the widening/required intersection improvements are being planned.

8.10.1.3 Proposed New Campsites

The planning alternatives outlined in Sections 5.2.3.2 and 5.3.3.1 call for possible additional campsites to be created in three areas: (i) an additional 4 to 6 campsites at Kīholo Bay, south of the old Loretta Lynn Home; (ii) 2 to 4 new campsites north of the existing turnaround at Kīholo Bay, and (iii) between 6 and 8 new campsites on the southern end of Keawaiki Bay. These new campsites would all be very similar to the ones which are presently operated by DLNR-State Parks for permitted, weekend-only camping at Kīholo Bay, based on the same prototypical design shown in Figure 5.3. This includes a cleared area large enough to accommodate up to 10 campers each, with a fire pit, picnic table, and adjacent refuse container and portable toilet.

In order to create these new campsites, some minor clearing of brush and rocks would be needed in some areas, using hand tools and light machinery. Very limited work by heavy equipment would be required in several locations immediately adjacent to the roadways in order to provide vehicular parking for campers. Prior to commencement of this brush-clearing and minor grading, a qualified archaeologist would conduct a final inspection of the potential sites and they would either be relocated or foregone so that no previously unidentified archaeological property would be damaged in the process of campsite construction.

8.10.2 INCREASED VISITOR PRESENCE

Under the Interim Management Plan now in place, only a small number of campgrounds are available, State Parks makes no specific efforts to make key sites known to visitors, connecting trails are not marked on the ground, and the entrance to the park is unmarked along the highway. As Kīholo transitions from a park reserve into a full-fledged wilderness park, this will change. Signage alone is likely to attract many day-visitors who presently drive past it unaware of its presence. Experience elsewhere has shown that this increase in visitation levels has the potential to cause harm if it is not effectively managed.

This Master Plan approaches the need for effective management of archaeological sites in several ways: (i) by identifying the most sensitive archaeological sites and, to the extent possible, withholding information about and preventing or limiting public access to them; (ii) by focusing public attention on a second set of attractive and appropriate archaeological features which will be subject to interpretive programming; (iii) leaving other archaeological properties unmarked and relatively inaccessible as a way of limiting public interest and traffic; and (iv) calling for a greater management presence at the park via park rangers intended to create an atmosphere of regulatory oversight.

The Master Plan recommends that interpretive activities and materials prepared for the park focus on archaeological and historical resources which subject area specialists, planners, and members of the Kīholo community felt were most appropriate for presentation to park visitors and could be visited and interpreted without causing significant harm to the resource. In general, these sites were selected because they: (i) do not contain culturally sensitive properties such as pre-contact burials; (ii) are relatively close to existing or planned park infrastructure; (iii) provide information and insight into the park's history; and (iv) are innately interesting and attractive points of visitation.

In general, the sites that Chapter 5 identifies as being most appropriate for the interpretive program would be cleared of vegetation, connected by trails, and provided with interpretive signage or other interpretive media. In some cases, limited site restoration work (e.g., replacing rocks along a *hōlua* alignment) could also be conducted. All of these sites have been selected by state archaeologists and all work in and around these areas would be done under their direction. As a consequence, this work is unlikely to have a significant adverse effect on the resource.

The presence of park rangers, the work that will be done to create particularly attractive sites, and the efforts that will be made to close off the most sensitive sites, appear likely to deter, but not eliminate damage done by vandals and thieves. Hence, the possibility of deleterious impacts to some sites will always remain. However, State Parks expects to avoid the potential for significant adverse effect by adapting management of the Cultural Resources Interpretive Plan to circumstances within the park over time. Both the plan, and its application, would be subject to review and adaptation by park rangers, State Parks archaeologists, area specialists, and Kīholo community members. Where sites are being negatively impacted, aspects of the plan can be changed or removed, and priority will always be given to site preservation over incorporation in the interpretive work at Kīholo State Park.

8.11 CULTURAL IMPACT ASSESSMENT

8.11.1 REGULATORY FRAMEWORK

In accordance with the provisions of Chapter 343, Hawai'i Revised Statutes (HRS) and its implementing regulations, Hawai'i Administrative Rules (HAR) §11-200, this section of the report presents a detailed analysis of the effects that implementation of the proposed Master Plan (see Chapter 5) could have on cultural practices, resources, and features. The disclosure of this information is intended to promote transparent and responsible decisions-making in accordance with Articles IX and XII of the Constitution of the State of Hawai'i, other state laws, and the courts of the state, all of which mandate government agencies to endeavor to promote and preserve the cultural practices and resources of Native Hawaiians and other ethnicities.

Specifically, HRS §343-2 defines Environmental Impacts Statements as follows:

“Environmental impact statement” or “statement” means an informational document prepared in compliance with the rules adopted under §343-6 and which discloses the environmental effects of a proposed action, effects of a proposed action on the economic and welfare, social welfare, and cultural practices of the community and the State, effects of the economic activities arising out of the proposed action, measures

proposed to minimize adverse effects, and alternatives to the action and their environmental effects.

“Significant effect” means the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the State’s environmental policies or long-term environmental goals as established by law, or adversely affect the economic or welfare, social welfare, or cultural practices of the community and State.”

In addition to the content requirements of Chapter 343 and HAR §11-200, on November 19, 1997 the State of Hawai‘i Council on Environmental Quality Control issued specific *Guidelines for Assessing Cultural Impacts*.⁸⁵ The purpose of that guidance is to provide a methodological and content protocol for projects that may have the potential to significantly affect cultural resources.

The guidelines stipulate specific matters that should be addressed in the portion of a Chapter 343 environmental impact document addressing cultural impacts, i.e., in Cultural Impact Assessments (CIA) such as the one in this chapter (see Table 8.1).

The remainder of this chapter summarizes the findings of State Parks and its consultants with respect to each of the required topics. Each information requirement identified in the above table is discussed in its own subsection, with a summary of findings and conclusions and, where appropriate, related the requirement to another section of the document.

8.11.2 SUMMARY OF PREVIOUS RESEARCH

The CIA is based on a series of archaeological and cultural studies which have been conducted relating to the lands of Kīholo State Park. For a complete discussion of the archaeology and cultural history of the makai lands of Pu‘u Wa‘awa‘a and Pu‘u Anahulu, see Chapter 3.

8.11.2.1 Archaeological Research

The earliest archaeological study conducted in the lands now encompassed by Kīholo State Park was by J.F.G. Stokes (1910) who traveled the lands of Pu‘u Wa‘awa‘a and Pu‘u Anahulu along the *ala loa* and *ala aupuni* trailways, recording and reporting on the extensive petroglyph fields he found there. In 1930, J. Reinecke on behalf of the Bishop Museum, conducted the first systematic survey of Hawaiian archaeological sites in West Hawai‘i, producing a manuscript survey of sites of various functions ranging from the ceremonial to the residential. Reinecke also conducted interviews among the small remnant population of native residents he encountered. Nearly 70 years later, Rechtman and Wolforth (1999) conducted an archaeological reconnaissance survey for 9 acres at Kīholo Bay, where State Parks conducted a land swap for previously privately-owned lands within the park.

While all of the above studies and surveys identified above were important contributions to the archaeology of Pu‘u Wa‘awa‘a and Pu‘u Anahulu, they were done in piecemeal fashion over a 90-year period. State Parks recognized the need for a comprehensive survey of the park lands which would aid them in effective conservation and management of these important resources, including the formulation of this park Master Plan. The Division of State Parks commissioned T.S. Dye and Colleagues, Archaeologists, Inc. to conduct a reconnaissance-level survey to identify surface sites and lava tube openings with Kīholo State Park. The work was carried out from March to June, 2011 and resulted in the creation of an electronic database of surface features, cave openings, and cave contents to a distance of 30 meters. The specific datasets resulting from the survey are listed in Table 3.3.

⁸⁵ Available on the Office of Environmental Quality Control website at:

<http://oeqc.doh.hawaii.gov/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fShared%20Documents%2fPreparation%20of%20Hawaii%20Environmental%20Policy%20Act%20Documents%2fGuidance%20on%20Cultural%20Impact&View={C0C5C897-3066-4821-864E-36FB3D77F5D5}>

Table 8.1 Guidelines for Assessing Cultural Impacts

<i>Number</i>	<i>Requirement</i>	<i>Discussion</i>
1	A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.	§8.11.3
2	Descriptions of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.	§8.11.4
3	Ethnographic and oral history interview procedures, including the circumstances which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.	§8.11.5
4	Biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.	§8.11.6
5	A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations, or biases.	§8.11.7
6	A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.	§8.11.9
7	A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project.	§8.11.9
8	A discussion of confidential information that has been withheld from public disclosure in the assessment.	§8.11.8
9	A discussion concerning any conflicting information in regard to identified cultural resources, practices, and beliefs.	§8.11.3
10	An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.	§8.11.9
11	A bibliography of references, and attached records of interviews which were allowed to be disclosed.	§8.11.10
Source: State of Hawai'i Environmental Council, Guidelines for Assessing Cultural Impacts (1997)		

8.11.2.3 Cultural and Historical Research

In 2006, Kumu Pono Associates LLC (“Kumu Pono”) produced the two-volume *He Wahi Mo’olelo No Pu’u Wa’awa’a A Me Nāpu’u O Nā Kona — A Collection of Cultural and Historical Accounts of Pu’u Wa’awa’a and the Nāpu’u Region, District of Kona, on the Island of Hawai’i*. This study of historical and cultural resources in the combined Nāpu’u lands was conducted at the request of the U.S. Department of Agriculture’s Institute of Pacific Islands Forestry as it dedicated a portion of the Pu’u Wa’awa’a dryland forest as part of the Hawai’i Experimental Tropical Forest (HETF) program (see Section 1.1.3).

Following that, Kumu Pono conducted an ethnographic study as part of the cultural impact assessment process for the Master Plan and EA for Kīholo State Wilderness Park. This effort resulted in *He Mo’olelo ‘Āina No Nāpu’u — Traditions of Pu’u Wa’awa’a and Pu’u Anahulu Lands of Kīholo State Wilderness Park, District of Kona, Island of Hawai’i*. The study covered all the *makai* lands of the *ahupua’a* of Pu’u Wa’awa’a and Pu’u Anahulu, which comprise the 4,357 acres of Kīholo State Park. The findings of this cultural-historic research are presented at length in Chapter 3 of this report.

8.11.3 CONSULTATION METHODOLOGY

In addition to the important archaeological and cultural-historic documentary research carried out in preparation for the Master Plan and EA, Kumu Pono consulted with and conducted oral history interviews with many individuals familiar with the lands encompassed by Kīholo State Park Reserve. Because the experiences conveyed through interviews are personal, the narratives are richer and more animated than those that may be found in archival or academic reports. Through the process of conducting oral history interviews, information is preserved which could be overlooked or lost through other forms of documentation. The interviews demonstrate how traditional knowledge is passed down through time, from generation to generation. It also shows how, with the passage of time, knowledge and personal recollections change; sometimes, information which was once vitally important becomes forgotten, or assigned lesser importance. Today, when individuals—particularly when they come from a culture different than the one which originally assigned cultural values to places and traditional practices—evaluate things such as cultural sites, resources, practices, and history, their significance is often misunderstood or diminished. Thus, oral historical narratives provide present and future generations with an opportunity to understand the cultural attachment or relationship shared between people and their natural and cultural environment.⁸⁶

The because of the subjective nature of cultural-historic interviews, the level of documentation is incomplete. In the process of conducting oral history interviews, it is impossible to record all the knowledge or information that the interviewees possess. Thus, the record provides only a glimpse into the stories being told and the lives and experiences of the interview participants. The interviewer made every effort to accurately record and relay the recollections, thoughts, and recommendations expressed by the people who shared their personal history in the study. However, as one might expect, participants in oral history interviews sometimes have different recollections of places, people, and events. There are a number of reasons for these discrepancies:

- Recollections result from varying values assigned to an area or occurrences during an interviewee’s formative years.
- They reflect localized, or familial interpretations, of the particular history being conveyed.
- With the passage of time, sometimes that which was heard from elders in childhood 70 or more years before may transform into that which the interviewee recalls having actually experienced.
- In some cases, differences can arise as a result of the inadvertent grafting of more recent information onto traditional concepts or practices.

⁸⁶ Cultural attachment embodies the tangible and intangible value of a culture. It is how people identify with and personify the environment, both natural and manmade, around them.

- Some aspects of an interviewee's recollections can be shaped by a broader world view. In the face of continual change to one's cultural and natural landscapes, there can emerge a sense of urgency in caring for what has been.

In general, the discrepancies between historical recollections as cited in the oral history interviews are minor. If anything, the differences help to direct new lines of questioning which may be answered through additional research; in some cases they pose questions which may never be answered but which add texture to the record of times past. Diversity in the stories told should be seen as something that will enhance interpretation, preservation, and long-term management for the lands of Kīholo State Park.

8.11.4 INTERVIEW SELECTION PROCESS

An integral part of an assessment of cultural impacts involves gathering information about cultural and historical features and practices that may be affected by actions subject to HRS Chapter 343, and promotes responsible decision making. Most of the participants in the oral history interviews which were conducted in preparation for this CIA and EA are descendants of native families granted homestead lands at Pu'u Anahulu as part of the Land Act of 1895. Most of these Native Hawaiian homestead applicants were themselves descendants of people who had lived in the lands of Nāpu'u or adjacent *ahupua'a* for generations prior to the establishment of the homestead program. Other interviewees who were not descendants of the native and traditional residents of Nāpu'u were either: (i) descendants of the founders of Pu'u Wa'awa'a Ranch (the Robert Hind and Eben Low families); or (ii) individuals who had personally worked the ranch lands and who were known to be very knowledgeable about the culture and history of Nāpu'u. Where large families were involved, the eldest surviving members of the native families of the Nāpu'u-Kīholo area were asked to participate in the interviews.

8.11.5 ETHNOGRAPHIC-ORAL HISTORY METHODOLOGY

The oral history interviews carried out in preparation for this CIA were conducted in a manner consistent with federal and state guidelines for such studies. Kumu Pono principal Kepā Maly worked with Ku'ulei Keakealani (representing members of families which have resided for generations in Nāpu'u and neighboring *ahupua'a* of Ka'ūpūlehu), Aunty Jenny Hind Mitchell (with members of families native to this region and partners in Hui Aloha Kīholo, and Perry J. White of Planning Solutions, Inc. (authors of this document) to formulate a general approach and specific questions to help direct these oral history interviews. During the interviews, several historic maps were referenced, and when appropriate, the approximate locations of sites discussed were marked on one or more of the maps. Depending on the location being discussed, and the nature of the resources or features being described, maps dating from 1876 to 1948 were referenced, and locational information was recorded on them. Figure 8.1 provides a sample of the general question outline which guided the oral history interview process.

Figure 8.1 General Question Outline for Oral History Interviews

<p>General Question Outline for Oral History Interviews Kīhōlo - Pu'u Wa'awa'a (Nāpu'u Region), Kona, Island of Hawai'i</p> <p>The following questions are meant to set a basic foundation for discussion during the oral history interview. Your personal knowledge and experiences will provide direction for the formulation of other detailed questions; determine the need for site visits, and/or other forms of documentation which may be necessary.</p> <p><u>Interviewee-Family Background:</u></p> <p>Name: _____ Phone #: _____</p> <p>Address: _____</p> <p>Interview Date: _____ Time: _____ to _____ Location: _____</p> <p>When were you born? _____ Where were you born? _____</p> <p>Parents? (father) _____ (mother) _____</p> <p>Grew up where? _____ Also lived at? _____</p> <p>Raised by? _____</p> <ul style="list-style-type: none"> • Additional family background pertinent to the Kīhōlo study area — Such as generations of family residency in area... (time period)? • Kinds of information learned/activities participated in, and how learned...? • Naming of the ahupua'a or sections of the land that are of particular significance in the history of the land and to native practices...? • Knowledge of heiau (or other ceremonial sites), other cultural resources (for example — kī'u'ula, ilina...), and families or practices associated with those sites? <ul style="list-style-type: none"> Knowledge of land based ko'a (cross ahupua'a) — ocean based ko'a; kilo ūa (fish spotting stations) locations and types of fish? Names of heiau and ko'a etc.? Burial sites, practices, beliefs, and areas or sites of concern (ancient unmarked, historic marked / unmarked, family)...? Representing who and when interred...? • Villages or house sites; church; stores; community activities. Names of native- and resident- families and where did they lived? 	<ul style="list-style-type: none"> • Fishing — describe practices (i.e., where occurred/occurring, types of fish; names of fishermen; and what protocols were observed...? (such as: permission granted, practices and methods of collection...?) • Who were/are the other families that came and/or come to collect area resources, and protocol? • Gathering practices (who and what)? Salt making. Shore line and mauka-makai trail accesses? • Personal family histories of travel upon the trail ...? • Historic Land Use: Agricultural and Ranching Activities...? (relationship with other ranches; shipping from shore; routes traveled...) • Ranch management of land resources (for example — fencing; planting activities; hunting and other practices...)? • Can you share some of the events of your youth that stand out in your memory? • Do you have any early photographs of the area? <p>Recommendations on caring for Kīhōlo and vicinity:</p> <ul style="list-style-type: none"> • Recommendations on how best to care for the natural and cultural resources in the Kīhōlo vicinity...? • Are there particular sites or locations (such as traditional sites, family homesteads, and ilina etc.) that are of cultural-historical significance or concern to you? • Do you have recommendations — such as cultural resource- and site-protection needs in the Kīhōlo vicinity, that can help guide development of the state park programs...? <p style="text-align: right;">Describe sites and define boundaries of those sites/locations and of the area of access via the trail/road ...</p>
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Source: Kumu Pono Associates LLC (2011)

Because many of the interviewees were known to the interviewer, and had participated in previous oral history programs with their own elders (many of whom have now passed away), much of the background information and many traditions had been previously recorded (see Kumu Pono, 2006). Thus, an additional layer of questions directly pertaining to the Kīhōlo State Park Master Plan and EA were also asked in an effort to direct the discussion toward the future management of the park. These questions, integrated into the general question outline, included but were not limited to:

- (1) What resources within the park are important to preserve or restore? Why?
- (2) What is important to teach visitors to the park? Why?
- (3) What would you plan for protecting, restoring, or teaching about the park lands? Why?
- (4) What would you change in how the Kīhōlo park lands have been or are managed? How should the changes be made?
- (5) What is good, or what do you like about the Kīhōlo curatorship program?
- (6) How would you like to be kept informed about management and developments within Kīhōlo State Park?

8.11.6 BIOGRAPHICAL INFORMATION OF INTERVIEWEES

For detailed biographical information regarding the interview participants, please see *He Mo'olelo 'Āina No Nāpu'u—Traditions of Pu'u Wa'awa'a and Pu'u Anahulu Lands of Kīholo State Wilderness Park, District of Kona, Island of Hawai'i* (Kumu Pono, 2011). The primary participants in the 2011 oral-history interviews are provided in in alphabetical order in Table 8.2 below.

Table 8.2 September 6 and 7, 2011 Oral History Interviewees and Attendees

<i>Primary Participants</i>		
<i>Number</i>	<i>Name</i>	<i>Relationship</i>
1	Tracy-Mae U'ilani Ha'o	Nāpu'u 'Ohana
2	Mike Hind	Hui Aloha Kīholo
3	Jenny Hind-Mitchell	Hui Aloha Kīholo
4	Ku'ulei Keākealani	Nāpu'u 'Ohana and Hui Aloha Kīholo
5	Robert Kamuela Sonny Keākealani	Nāpu'u 'Ohana
6	Leina'ala Keākealani Lightner	Nāpu'u 'Ohana
7	Shirley-Ann Kau'ilani Keākealani Wilcox	Nāpu'u 'Ohana
8	Robert Liwai Mitchell	Nāpu'u 'Ohana
9	Kamehanamauloa Tachera	Nāpu'u 'Ohana
10	Ku'unahenani Tachera	Nāpu'u 'Ohana
<i>Additional 2011 Interview Program Attendees</i>		
1	Luisa Castro	State Parks
2	Casey Cho	Community Member
3	Randy Clarke	Hui Aloha Kīholo
4	Mike Donoho	Hui Aloha Kīholo
5	Shinji Inaba	Hui Aloha Kīholo
6	Kamanawa Mitchell	Hui Aloha Kīholo
<i>Previous Oral-History Interview Participants</i>		
1	Raymond Keawe Alapa'i	
2	Gordon Alapa'i	
3	Howard Alapa'i	
4	Lois Alapa'i-Akao	
5	Nancy Alapa'i-	
6	Geo. Kinoulu Kahananui, Sr.	
7	Miki Kato	
8	Caroline Kiniha'a Keākealani-Pereira	
9	Luika Kauhane (Keākealani)	
10	Charles Mitchell	
11	Edith Kau'ihelwaleokeawaiki Kailihiwa	
12	William "Billy" Hāwawaikaleoonāmanuonākanahale Paris, Jr.	
13	Robert Ka'iwa Punihaole, Sr.	
14	Elizabeth "Tita" K. Ruddle-Spielman	
15	Coco Vredenburg Hind	
Source: Kumu Pono Associates LLC (2011)		

8.11.7 HISTORICAL AND ARCHIVAL RESEARCH

Primary research references cited in the Kumu Pono (2011) study which forms the basis for this CIA include—but are not limited to—land use records, including an extensive review of Hawaiian Land Commission Award (LCA) records from the *Māhele ʻĀina* (Land Division) of 1848; Boundary Commission testimonies and survey records of the Kingdom and Territory of Hawaiʻi, American Board of Commissioners for Foreign Missions (ABCFM) mission station records, and historical texts authored or compiled by—D. Malo (1951); J.P. Iʻi (1959), S.M. Kamakau (1961, 1964, 1976, and 1991); Wm. Ellis (1963); Chas. Wilkes (1845); A. Fornander (1916-1919 and 1996); G. Bowser (1880); and Handy and Handy with Pukui (1972). The study also includes several native accounts from Hawaiian language newspapers (compiled and translated from Hawaiian to English by Kepā Maly), and historical records authored by nineteenth century visitors, and residents of the region. The records also include important oral testimonies of elder *kama ʻāina* of the lands which make up, and surround, the Puʻu Anahulu and Puʻu Waʻawaʻa region.

Historical and archival resources were located in the collections of the Hawaiʻi State Archives, Land Management Division, Survey Division, Natural Area Reserves office, and the Bureau of Conveyances; Hawaiian Historical Society; University of Hawaiʻi-Hilo Moʻokini Library; the Houghton Library at Harvard; private family collections; and in the collection of Kumu Pono Associates LLC. This information is generally cited in categories by chronological order of the period depicted in the narratives.

8.11.8 CONFIDENTIAL INFORMATION

Information shared by interview participants and their families is intended to support wise use, community-based stewardship, and protection of the cultural and natural resources of the Kīholo-Nāpuʻu region. The narratives provide readers with lessons from the past, knowledge of place, and can help present and future parties develop a sustainable and culturally responsible system of land and resource management. The oral history accounts are not to be used to support research or assumptions which are inconsistent with traditional and customary Hawaiian cultural values.

At the time of the release of the interviews, the interview participants stipulated that the resulting narratives are not to be cited out of context, or used to justify actions that are detrimental to the land or culture of the people. Readers of the Master Plan, EA, CIA, or the ethnographical material produced by Kumu Pono Associates LLC should not assume that resources or sites—whether historical or cultural—are not valued because they are not described in detail. The consensus between families of these lands, agencies, researchers, and resource managers is that sensitive properties or resources shall not be specifically identified or otherwise made vulnerable to misuse. The oral history interviews upon which this CIA is based may not be incorporated as block-quote texts in other studies without permission from the interviewees and Kumu Pono Associates LLC.

8.11.9 ANALYSIS OF IMPACTS

The interviews of the participants revealed several areas of common interest. They included, but were not limited to, the following categories:

- The cultural-geographic landscape—cultural and natural resources are viewed as one and the same in the Hawaiian mind.
- Sites associated with native Hawaiian religious and ceremonial practices are not limited to a single locale, but instead extend from the shore into uplands forests.
- *Ala loa* and *ala hele* (regional and intra-*ahupuaʻa* trail systems) and other trails, including the Alanui Kui (across the Puʻu Waʻawaʻa-Puʻu Anahulu forest lands between Kona and Kohala), the Kīholo-Puʻu Waʻawaʻa Trail, the Puʻu Waʻawaʻa-Kīleo-Keauhou Trail, and numerous other trails in the Nāpuʻu region.

- Sites associated with temporary and long-term native habitation (shelters, modified caves, and burials), and with homesteads.
- Coastal and near shore fisheries, marine resources collection areas, and *kāheka* and *loko pa‘akai* (natural and modified salt making ponds).
- Land division and paddock markers.
- Features and practices associated with ranching activities—including descriptions of historic and contemporary management practices—and the decline of the land under the latter management scheme.

The interview participants also expressed several areas of common concern and recommendations for long-term protection and management of the cultural and natural heritage of the Kīholo-Nāpu‘u region. A general summary of these comments and recommendations include:

- Protection of the natural and cultural features of the Kīholo-Nāpu‘u region. Among these are the sacred sites of the landscape, including ceremonial sites, *ilina* (burials), and places which are documented in the traditions of the area.
- Support for the curatorship program conducted by Hui Aloha Kīholo in establishing a center which would serve as a repository for artifacts, historic documents, land or resource management studies, and oral history collections, where the history of the land and people who have lived upon and worked it can be taught, researched, and recorded. Such a facility will help protect the history of the land and be an invaluable resource for management decisions for future activities in Kīholo State Park and throughout Pu‘u Wa‘awa‘a and Pu‘u Anahulu.
- Programs offered at a curatorship center should seek to interpret the cultural and natural resources and ranching history of Nāpu‘u and help encourage respectful use of the land and informed visitation to the area.
- Provide input and guidance to state agencies regarding preservation and management of cultural and natural resources at Kīholo State Park and the larger Pu‘u Wa‘awa‘a and Pu‘u Anahulu *ahupua‘a*.
- Hui Aloha Kīholo and Nāpu‘u ‘ohana members seek to help facilitate programs that will foster protection of resources in the area. Resources and subsistence activities of concern to native families of the land include: (i) management of salt works; (ii) protection of *ko‘a* (i.e., dedicated nearshore and offshore fishing grounds); and (iii) establishing a dynamic plan for sustainable resource development, building the carrying capacity of the land and ocean for use.
- Respect *ilina*, *kahua hale* (residential features), *ala hele* (trails), *kaha pōhaku* (petroglyphs), and other sites within the region.
- Work with families who are descended from *po‘e kahiko* (ancient people) of Nāpu‘u in determining and maintaining proper treatment of burials and other cultural sites and resources.
- Encourage cultural and natural resource stewardship and “wise use” on behalf of all who touch the lands of the Kīholo-Nāpu‘u region.
- Support the Hui Aloha Kīholo and Nāpu‘u ‘ohana in the work of ensuring the park and *ahupua‘a* resources will be cared for and passed down to future generation intact.

State Parks plan for Kīholo State Park is intended to protect the resources and promote the causes of concern to the native people of Pu‘u Wa‘awa‘a and Pu‘u Anahulu, thereby minimizing adverse impacts to the cultural history, resources, and practices which are part of the park’s heritage. This CIA has been prepared in accordance with the guidelines set forth by the State of Hawai‘i Environmental Council for the completion of Cultural Impact Assessments and the requirements of HRS Chapter 343 and HAR §11-200. Based on the criteria contained in the guidelines, the Division

has concluded that no cultural resources or practices will be negatively impacted as a result of instituting the proposed Master Plan.

8.11.10 REFERENCES CITED

A complete list of references cited and other source materials is included at the end of the Kumu Pono ethnographic report upon which this CIA is based (see pp. 396-399). Interview descriptions and transcripts are provided from page 147 onward.

CHAPTER 9 – RELATIONSHIP TO EXISTING PLANS, POLICIES, AND CONTROLS

In accordance with the requirements of HAR §11-200-17(h), this chapter discusses the relationship of the proposed Master Plan for Kīholo State Wilderness Park with existing land use plans, policies, and controls for the area. State Parks has evaluated all alternatives identified in this report for consistency with these regulations. It has also identified the extent to which the proposed Master Plan alternatives would conform or conflict with objectives and specific terms of approved or proposed land use plans, policies, and controls. The discussion is organized first by jurisdiction (federal, state, or county) and then by specific ordinance, regulations, or law. This is followed by a listing of the required permits or approvals.

9.1 FEDERAL LAW

9.1.1 AMERICANS WITH DISABILITIES ACT OF 1990

Title II of the Americans with Disabilities Act of 1990 requires that state and local government not discriminate against disabled persons in the provision of government services. It is the policy of the Department of Land and Natural Services' Division of State Parks to pursue all reasonable efforts to ensure that its facilities, programs, and services are accessible to persons with disabilities. State Parks intends, to the maximum feasible extent, to provide access to archaeological and cultural sites, historic properties, and wilderness areas while preserving each site's significant features. Where direct access is not provided, an alternative method of experience will be made available.

9.1.2 DISCUSSION

The Division of State Parks is currently implementing a plan, under the Americans with Disabilities Act (ADA), to make Hawai'i's state parks accessible to persons with disabilities, under the direction of the state ADA Coordinator. Due to the wilderness nature of Kīholo State Park, not all portions of the park can be made accessible to persons with limited mobility. However, as noted in Section 5.3.3.1, all of the camping/access alternatives discussed in Chapter 5 of this document can incorporate design elements which would allow for access and enjoyment by disabled park visitors. These include:

- Roadway access to existing and/or proposed campsites at Kīholo Bay, Kalaemanō, or Keawaiki Bay.
- Level campsite access trails which could allow for wheelchair access to/from campsite parking to the campsites themselves.
- At least some of the campsites are, or can be, provided with wheelchair-accessible portable toilets.
- Wheelchair-accessible picnic tables

If the cost of making all campsites accessible to persons with limited mobility is too great to allow for all campsites to be so equipped, State Parks may choose to equip a subset of campsites closest to parking and level access trails with wheelchair accessible toilets and tables. Then, disabled campers could be given preference for these ADA-compliant campsites.

9.2 STATE OF HAWAI'I

9.2.1 HAWAI'I STATE PLAN

The objective of the *Hawai'i State Plan* (HRS §226) is to achieve: "A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people." It establishes objectives and policies related to:

- Land Based, Shoreline, and Marine Resources (226-11);
- Scenic, Natural Beauty, and Historic Resources (226-12);
- Land, Air, and Water Quality (226-13); and
- Socio-Cultural Advancement—Leisure and Culture (226-23).

Discussion. State Parks, through the development of this Master Plan and EA, is pursuing a vision of Kīhōlo State Park as a public wilderness which conforms to the objectives of the *Hawai‘i State Plan*. By setting the land aside as a wilderness park, State Parks is creating the regulatory framework for the preservation and protection of the physical environment, including shoreline and marine resources, and the physical beauty these resources represent. This protected natural environment will in turn provide the people of Hawai‘i with a relatively untouched space for cultural practices, leisure activities, and learn about the history and natural history of this unique place.

In addition to an exhaustive analysis of previous research conducted at Kīhōlo over the past century, State Parks also commissioned an archaeological reconnaissance survey, biological surveys, and an ethnographic study which collected the documentary and oral history of the park lands. These additional studies were conducted to create a clear understanding of the present state, and to inform future adaptive management of, the park’s natural and cultural resources.

The planning alternatives and modules presented in Chapters 5 and 6 of the Master Plan are all intended to reduce potential impacts on the natural and cultural environment to a practicable minimum, preserving and protecting these resources for the enrichment of future generations of residents and visitors; protection, and where possible enhancement, of these resources have guided the design of the Master Plan through all phases of its development. The alternatives strike a careful balance between the goals of conservation and prudent use for recreational activities. The few new facilities which are incorporated into this plan take these goals into account and are compatible with the existing natural environment, calling for a minimal development footprint and protecting the untouched natural beauty for which the park is known.

9.2.2 STATE FUNCTIONAL PLANS

Part II of the *Hawai‘i State Plan* establishes a statewide planning system to coordinate and guide all major state and county activities and to implement the overall theme, goals, objectives, policies, and priority guidelines. The system implements the State Plan through the development of functional plans and county general plans. Functional plans, general plans, and the formulation, administration, and implementation of state programs must be in conformance with the state plan (HRS § 226-59). Table 9.1 lists the objectives, policies, and actions that are most relevant to Kīhōlo State Park.

Discussion. The Functional Plans, excerpts of which are provided above, were intended to create a vision and goals for the State of Hawai‘i’s priority areas, including conservation, recreation, and tourism. The objectives and policies which they establish were created by advisory committees comprised of government regulators and private citizens; as such they summarize the voice of the people describing a desirable future for the State. The planning alternatives which have been developed for Kīhōlo State Park are intended to reflect the values and objectives expressed in the functional plan.

By designating the Kīhōlo State Park as a public wilderness, State Parks is setting aside these approximately 4,362 acres of conservation land as a place where wild coastland can be maintained and enhanced as a biological preserve and recreational resource. Generations of Hawai‘i residents and visitors to come will be able to come to Kīhōlo State Park to hike carefully preserved trails, camp at clean and well-maintained campsites, observe coastal habitat, and learn about the natural and cultural history of this unique place.

Table 9.1 Relevant Objectives, Policies, and Actions in State Functional Plans

<p><u>State Conservation Lands Functional Plan</u></p> <p><i>Objective IIC: Enhancement of natural resources.</i></p> <p><i>Policy IIC(2): Expand and enhance outdoor recreation opportunities and other resource uses.</i></p> <p><i>Action IIC(2)a: Upgrade and enhance the State’s outdoor recreational infrastructure of roads, trails, and shelters.</i></p> <p><i>Action IIC(2)e: Provide and improve public access to the shoreline and to mauka areas as condition on leases, executive orders, easements, and other encumbrances on lands with recreational and/or educational potential.</i></p> <p><i>Policy IID(1): Develop and expand resources to protect natural shorelines and wilderness recreation areas.</i></p> <p><i>Policy IID(3): Develop recreational and archaeological resources on the shoreline and mauka areas.</i></p> <p><i>Action IID(3)a: Acquire and/or develop areas for historic preservation.</i></p> <p><i>Action IID(3)b: Establish a State-wide trails and access system.</i></p> <p><i>Objective IIIA: Expansion and promotion of a public conservation ethic through education.</i></p> <p><i>Action IIIA(1)b: Develop and implement ongoing interpretive program to promote an appreciation and understanding of unique natural and cultural resources.</i></p>
<p><u>State Recreation Functional Plan</u></p> <p><i>Policy I-A(1): Acquire additional beach parkland and rights-of-way to remaining undeveloped shorelines to provide increased capacity for future public recreational use.</i></p> <p><i>Policy II-A(3): Proceed with planning, acquisition, and development of trails.</i></p> <p><i>Policy III-D(3): Effectively manage and maintain existing public access ways.</i></p> <p><i>Policy IV-B(2): Protect, preserve, restore, and enhance recreational fishery resources.</i></p> <p><i>Policy V-C(3): Explore innovative ways to manage and maintain recreational resources.</i></p> <p><i>Policy V-C(3)b: Expand “adopt-a-park”, “adopt-a-beach”, and “adopt-a-trail” programs to get the public involved in caring for public recreation facilities.</i></p> <p><i>Objective VI-A and Policy VI-A: Increase recreational access and opportunities in Hawai‘i’s wetlands. Identify existing wetlands with the potential for recreational development without significantly affecting wetland resources, with an emphasis on passive recreation and education.</i></p> <p><i>Policy VI-C(1): Assure the protection of the most valuable wetlands in the state through fee acquisition, land banking, cooperative agreements, conservation easements, cooperation with private landowners, public education, and/or other strategies.</i></p>
<p><u>State Historic Preservation Functional Plan</u></p> <p><i>Objective C: Management and treatment of historic properties.</i></p> <p><i>Policy C.2: Encourage the preservation and maintenance of historic properties through economic incentives and support.</i></p> <p><i>Action C.2.d: Encourage the State and County agencies to maintain and preserve historic buildings under their administration.</i></p>
<p><u>State Tourism Functional Plan (1991)</u></p> <p><i>Policy II.A.7: Improve the quality of existing parks and recreational areas, and ensure that sufficient recreational areas—including scenic byways and corridors—are available for the future.</i></p> <p><i>Action II.A.7.c: Acquire beaches for expansion of existing beach parks, and development of future beach parks.</i></p> <p><i>Objective III.A: Enhancement of respect and regard for the fragile resources which comprise Hawai‘i’s natural and cultural environment. Increase preservation and maintenance efforts.</i></p> <p><i>Policy III.A.2: Assist in preserving, perpetuating, and interpreting cultural, historic, and archaeological resources.</i></p>

The planning alternatives and modules, together with the robust curatorship presence which this plan promotes, create a framework where State Parks can partner with concerned citizens to enhance park resources, cooperating to protect the unique natural resources present within the park. Specifically, the Master Plan will promote the objectives and policies of the State Functional Plans by:

- Preserving natural and cultural resources throughout the park by creating a framework of responsible use and oversight.
- Offering enhanced recreational and educational opportunities through camping, interpretive programs, and expanded access to selected sites and trails.
- Providing interpretive programs which promote appreciation, understanding, and involvement with the cultural and natural history of the park.
- Improving protections for cave, anchialine, archaeological, marine, and other natural and cultural resources.
- Improving and maintaining facilities for enjoyment of coastal and ocean recreation activities while keeping new development within the park to a minimum.

9.2.3 HAWAI‘I 2050 SUSTAINABILITY PLAN

The *Hawai‘i 2050 Sustainability Plan* does not replace the Hawai‘i State Plan. However, as time has passed since adoption of the Hawai‘i State Plan in 1978, and the development of the *State Functional Plans* in the late 1980s and early 1990s, and the Sustainability Plan is intended to augment and complement those documents with up to date goals as the state transitions towards a sustainable future. The goal of the Sustainability Plan is to define a vision for the State’s future which is sustainable over the long term, where the lifestyle and values which we associate with a Hawaiian way of life can be passed on to future generations, balancing social, economic, and environmental priorities. The plan has the goal of sustainability in five categories: (i) a sustainable way of life; (ii) a diversified and globally competitive economy; (iii) responsible and respectful use and stewardship of natural resources; (iv) a strong and vibrant community ethic; and (v) perpetuation of *Kanaka Maoli* culture and island values. A sixth objective of education is considered integral to all five other goals. The provisions of the *Sustainability Plan* most relevant to the Kīholo State Park Master Plan are listed in (see Table 9.2).

Discussion. Sustainable management of park resources is a guiding principle of this Master Plan and permeates the recommendations regarding infrastructure and oversight. Prior to the introduction of the Interim Management Plan, conditions in certain portions of the park had reached a “crisis point” of over use, abuse, and neglect. In acknowledgement of this, State Parks has moved to plan for and implement improvements within the park which are prudent and sustainable over the long term to protect and enhance park resources. This begins with State Parks decision to move the park from a “reserve park” to a “wilderness park” designation, with development of a Master Plan and additional investment in the park’s staffing and infrastructure with the objective of more actively and effectively manage the park than has been the case in the past.

A critical aspect of creating a sustainable recreational experience is creating a framework which balances leisure activities with protection and preservation of the natural environment that makes Kīholo State Park unique and amazing place. By gathering together past research on the natural environment at Kīholo, together with the new studies which have been commissioned to survey the existing biota within the park during the development of the Master Plan, State Parks has created a baseline of data about the natural environment which can serve as a starting point for future scientific research within the park. This increasing body of knowledge can be used to adapt park management and regulation as conditions there continue to evolve and applied to native habitat restoration.

Table 9.2 Relevant Provisions of the Sustainability Plan

<p>Goal Two: The Economy—Strategic Action 4 Identify, prioritize and fund infrastructure “crisis points” that need fixing.</p> <p><i>Public infrastructure is key to building a strong economy, protecting our environment and a better quality of life. Great strides have been made since statehood, yet for a sustainable future, we must ensure that our public infrastructure is intact and enables our citizens, business and communities to function properly. Roads, highways, dams, bridges, harbors, airports, water supply and wastewater systems are key functions of sustainable communities. It is essential that we identify and prioritize our infrastructure needs to adequately allocate resources to maintain and improve them.</i></p>
<p>Goal Three: Environment and Natural Resources—Strategic Action 4 Provide greater protection for air, and land-, fresh water, and ocean-based habitats.</p> <p><i>We are home to the most rare and sensitive ecosystems in the world, from upland rainforests to coral reefs. They form the foundation of our society from a biological and cultural perspective. It’s important to understand that our most pristine areas will not stay as they are if we just leave them alone. Because of invasive species, we need conservation officers on the ground, in the forests and marine habitats, monitoring these places and making sure that their biological integrity is preserved. The greatest threat to the health of our most biologically rich ecosystems is not just development—it is weeds. By protecting our habitat, we protect our native species. By protecting both, we ensure biological sustainability.</i></p> <ul style="list-style-type: none"> • <i>Strengthen enforcement of habitat management..</i> • <i>Fund public and private conservation education.</i> • <i>Improve management of protected watershed areas.</i> • <i>Incorporate the values and philosophy of the ahupua‘a resource management system as appropriate.</i> • <i>Establish funding for invasive species control and native ecosystems protection.</i>
<p>Goal Four: Community and Social Wellbeing—Strategic Action 4 Provide access to diverse recreational facilities and opportunities.</p> <p><i>Parks, recreational and leisure activities enhance our quality of life by providing facilities, services and programs that meet the emotional, social and physical needs of communities. This is especially critical given the inclinations that many young people have towards handheld devices and video games. In a sustainable Hawaii, our young people will still continue to play sports, surf, paddle, dance hula, hike, and sing and not become a culture singularly obsessed with iPods and the latest gadgets. Providing access to recreational facilities and activities to meet the varied needs of differing communities (e.g., rural, urban, large and small communities) are important aspects of healthy quality of life.</i></p>
<p>Goal Five: Kanaka Maoli Culture and Island Values—Strategic Action 1 Honor Kanaka Maoli culture and heritage.</p> <p><i>Kanaka Maoli (i.e., Native Hawaiian) culture is the foundation for living culture in Hawai‘i. We must ensure that the Kanaka Maoli people are supported, and that culture is perpetuated. The success of this endeavor will ensure the way of the Kanaka Maoli will guide our actions and behaviors in the years ahead.</i></p> <ul style="list-style-type: none"> • <i>Sponsor cross-sector dialogue on Kanaka Maoli culture and island values.</i> • <i>Protect Kanaka Maoli intellectual property and related traditional knowledge.</i> • <i>Provide Kanaka Maoli cultural education for residents, visitors and the general public.</i>

Along with close attention to the natural environment comes the need for careful stewardship of the cultural heritage of Kīhōlo, protecting and enhancing the archaeological and historic legacy of the coastal lands of Pu‘u Wa‘awa‘a and Pu‘u Anahulu. Park planners have worked with archaeologists, park curators, and park ‘ohana, and concerned members of the public to explore ways to interpret and educate appropriate cultural sites for park visitors so that people can learn about and develop a connection with these sensitive properties while preserving them for the enrichment of future generations.

9.2.4 COASTAL ZONE MANAGEMENT (CZM) PROGRAM

The objectives of the Hawai‘i Coastal Zone Management (CZM) Program are set forth in Hawai‘i Revised Statutes, Chapter 205A. The program is intended to promote the protection and maintenance of valuable coastal resources; all lands in the State of Hawai‘i are classified as valuable coastal lands. The State Office of Planning administers Hawai‘i’s CZM program. A discussion of the relevant objectives and policies of Hawai‘i’s CZM program follows.

9.2.4.1 Recreational Resources

Objective: *Provide coastal recreational opportunities accessible to the public.*

Policies:

1. *Improve coordination and funding of coastal recreational planning and management; and*
2. *Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:*
 - a. *Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;*
 - b. *Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fish ponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable.*
 - c. *Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;*
 - d. *Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;*
 - e. *Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources.*
 - f. *Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;*
 - g. *Developing new shoreline recreation opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and*
 - h. *Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of Section 46-6.*

9.2.4.2 Historic Resources

Objective: *Protect, preserve, and where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.*

Policies:

1. *Identify and analyze significant archaeological resources;*
2. *Maximize information retention through preservation of remains and artifacts or salvage operations; and*
3. *Support state goals for protection, restoration, interpretation, and display of historic resources.*

9.2.4.3 Scenic and Open Space Resources

Objective: *Protect, preserve, and where desirable restore or improve the quality of coastal scenic and open space resources.*

Policies:

1. *Identify valued scenic resources in the coastal zone management area;*
2. *Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;*
3. *Preserve, maintain, and where desirable, improve and restore shoreline open space and scenic resources; and*
4. *Encourage those developments that are not coastal dependent to locate in inland areas.*

9.2.4.4 Coastal Ecosystems

Objective: *Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.*

Policies:

1. *Exercise overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;*
2. *Improve technical basis for natural resource management;*
3. *Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;*
4. *Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and*
5. *Promote water quantity and quality planning and management practices that reflect the tolerance of fresh water and marine ecosystems and maintain and enhance water quality through the development and implementation of point and nonpoint source water pollution control measures.*

9.2.4.5 Economic Uses

Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

1. Concentrate coastal dependent development in appropriate areas;
2. Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor industry facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and
3. Direct the location and expansion of coastal dependent development to areas presently designated for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
 - a. Use of presently designated areas is not feasible;
 - b. Adverse environmental effects are minimized; and
 - c. The development is important to the State's economy.

9.2.4.6 Coastal Hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence, and pollution.

Policies:

1. Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards;
2. Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint source pollution.
3. Ensure that developments comply with requirements of the Federal Flood Insurance Program; and
4. Prevent coastal flooding from inland projects.

9.2.4.7 Managing Development

Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

1. Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;
2. Facilitate timely processing applications for development permits and resolve overlapping or conflicting permit requirements; and
3. Communicate the potential short and long-term impacts of proposed significant coastal development early in their life cycle and in terms understandable to the public and informed decision making to the responsible parties.

9.2.4.8 Public Participation

Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

1. Promote public involvement in coastal zone management processes;

2. *Disseminate information on coastal management issues by means of education materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal issues, developments, and government activities; and*
3. *Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.*

9.2.4.9 Beach Protection

Objective: *Protect beaches for public use and recreation.*

Policies:

1. *Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;*
2. *Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and*
3. *Minimize the construction of public erosion-protection structures seaward of the shoreline.*

9.2.4.10 Marine Resources

Objective: *Promote protection, use, and development of marine and coastal resources to assure their sustainability.*

Policies:

1. *Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*
2. *Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;*
3. *Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United State exclusive economic zone;*
4. *Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and*
5. *Encourage research and development of new and innovative technologies for exploring, using, or protecting marine and coastal resources.*

9.2.4.11 Kīholo State Park Master Plan Consistency with CZM Program

Both of the action alternatives described in Chapter 5 are intended to improve and enhance coastal recreational resources at Kīholo State Park by offering permitted camping, interpretive trails, shoreline access and other recreational opportunities. The only construction activities which would be visible within the park would be new sections of access road and the proposed new campground, either at Kīholo Bay or at Keawaiki Bay, and possible some portion of interpretive trails, signage, and installations. Construction of these proposed facilities would not interrupt ongoing use of the park or access to the shoreline.

By creating a formal cultural-historic interpretive program at the park which will channel public visitation towards sites which have been identified as appropriate and adequately prepared, sensitive archaeological and historic sites can be managed and protected more effectively than has been the case in the past. As part of the planning process, an archaeological reconnaissance survey of the park has been conducted and provided to the State Archaeologist and SHPD. In addition, the Master Plan calls for the presence of interpretive park technicians—park rangers—to provide additional oversight

and enforcement of applicable regulations and laws. SHPD will also be provided a copy of this Master Plan to review and provide comment.

No coastal open space, coastal ecosystems, beaches, or marine resources would be affected by implementation of this Master Plan, which seeks to protect and preserve the park lands and shoreline environment as a public wilderness. Towards this end, the Master Plan also calls for no private commercial activity, or any permanent structures near the shoreline (or elsewhere) which could be threatened by natural hazards such as fire, earthquake, tsunami, or hurricane. This will limit the possibility of injury, loss of life, or development which could lead to the release of pollutants into the coastal environment.

This Master Plan has been developed in coordination with federal and state agencies, and in consultation with stakeholder organizations and interested members of the public. Public meetings, staff contact, workshops, and other forms of dialogue have all been incorporated into this document so that it can best represent the public interest.

9.2.5 HAWAI‘I REVISED STATUTES CHAPTER 205 STATE LAND USE LAW

HRS Chapter 205 establishes the State Land Use Commission (SLUC) and gives this body the authority to designate all lands in the state as either: Urban, Rural, Agricultural, or Conservation District lands. The Counties then make all land use decisions within the Urban district in accordance with their respective County general plans, development plans, and zoning ordinances. The counties also regulate land use in the state Rural and Agricultural Districts, but within the limits imposed by Chapter 205. However, the State retains regulatory authority over conservation lands. All of Kīholo State Park is located in the Conservation District, with the exception of the northwest corner of the park which is located in the Agriculture District, where no development is contemplated under this Master Plan.

9.2.5.1 §205-2 Districting and Classification of Lands

Hawai‘i Revised Statutes §205-2(e) establishes allowable uses within the Conservation District as:

Conservation districts shall include areas necessary for protecting watersheds and water sources; preserving scenic and historic areas; providing park lands, wilderness, beach reserves; conserving indigenous or endemic plants, fish, and wildlife, including those which are threatened or endangered; preventing floods and soil erosion; forestry; open space areas whose existing openness, natural condition, or present state of use, if retained, would enhance the present or potential value of abutting or surrounding communities, or would maintain or enhance the conservation of natural or scenic resources; areas of value for recreational purposes; other related activities; and other permitted uses not detrimental to a multiple use conservation concept.

In addition HRS §183C-6(a & d) further states that:

(a) The department shall regulate land use in the conservation district by the issuance of permits.

(d) The department shall regulate the construction, reconstruction, demolition, or alteration of any structure, building, or facility by the issuance of site plan approvals.

Discussion. The project is consistent with the objectives of the Conservation District, Resource Subzone. The purpose of the Resource Subzone is to develop, with proper management, areas to ensure sustainable use of the natural resources in those areas. The proposed action is consistent with this objective, providing a framework for proper management that can be sustained over the long term by minimizing the size, cost, and footprint of development and calling for a consistent regulatory presence in the form of park rangers. By creating an improved and regulated access to Kīholo State Park, with a fulltime management presence, will further the objectives of the Resource Subzone by

allowing for expanded use of the park under conditions established by the state and enforced by rangers.

Because all of the new facilities which are suggested under the action alternatives in Chapter 5 would be constructed in the Conservation District, Resource Subzone, they would require a Conservation District Use Permit (CDUP) subject to the approval of the Department of Land and Natural Resources. In addition, this Master Plan and EA will be subject to the approval of the Board of Land and Natural Resources; in the course of their review and approval of the final Master Plan and EA, they could take the additional step of directly approving the construction of these new park facilities.

Finally, while no final construction plans have been developed for the new facilities recommended under the planning alternatives described in Chapter 5, it is likely that they would involve disturbance to more than one acre of land. Consequently, this new construction would require coverage under the State of Hawai'i NPDES General Permit program (HAR §11-55, Appendix C).

9.3 HAWAI'I COUNTY

9.3.1 COUNTY OF HAWAI'I GENERAL PLAN

The purpose of the County of Hawai'i's *General Plan* is to provide a comprehensive, long range document which guides development on the island of Hawai'i.⁸⁷ The entirety of Kīholo State Park is designated as Open Space; this designation is appropriate for park lands and natural, undeveloped areas. Section 12.5.7.2 of the General Plan sets several relevant goals for North Kona District, within which Kīholo State Park is located:

- “(f) Acquire, and/or encourage the development of additional public shoreline recreation areas.*
- (g) Establish public access to and the development of shoreline regions along the North Kona Coast in areas such as Keawaiki, Kīholo Bay, Ka ‘ūpūlehu...*
- (k) Encourage the development of historic trails.”*

In addition to specifically calling for the development of recreational capacity and access at points within Kīholo State Park, the plan sets out many general objectives; the planning goals most relevant to this Master Plan are listed in Table 9.3.

Discussion. Consistent with the *Hawai'i County General Plan*, the transition from a reserve to wilderness park designation will ensure that Kīholo State Park remains an open, natural area for public recreation and education. The hook-shaped inner lagoon of Kīholo Bay, among other sites, is widely recognized and appreciated for its natural beauty and is the focal point of the Department of Transportation's scenic viewpoint along Queen Ka'ahumanu Highway. Sensitivity towards the beauty of the park lands, and the desire to minimize the impacts of further development has been incorporated into the very limited call for new or improved infrastructure. The plan seeks to gently focus visitor access to specific areas of the park, thereby limiting the impact of human visitation and the need for additional infrastructure.

The archaeological reconnaissance survey conducted by T. S. Dye & Colleagues, Archaeologists, Inc. as part of the park master planning effort has been provided to the State Department of Historic Preservation (SHPD) for its review and approval.

⁸⁷ The State of Hawai'i is not bound by the County General Plan, which is intended specifically to guide County decision-making. Nonetheless, as the preeminent expression of County interests, State Departments normally attempt to give the policies strong consideration in their own decision-making.

Table 9.3 Hawai'i County General Plan Goals and Objectives

<i>Historic Sites</i>	
Goals	Access to significant historic sites, buildings and objects of public interest should be made available.
Policies	Agencies and organizations, either public or private, pursuing knowledge about historic sites should keep the public apprised of projects.
	The County of Hawai'i shall require both public and private developers of land to provide a historical survey to the clearing or development of land when there are indications that the land under consideration has historical significance.
	The County of Hawai'i shall also aid in the development of a program of public education concerning historic sites.
	Signs explaining historic sites, buildings and objects shall be in keeping with the character of the area or the cultural aspects of the feature.
<i>Natural Beauty</i>	
Goals	Protect, preserve and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.
	Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.
Policies	Increase public pedestrian access opportunities to scenic places and vistas.
	Access easement to public or private lands which have natural or scenic value shall be provided or acquired for the public.
<i>Natural Resources and Shoreline</i>	
Goals	Provide opportunities for the public to fulfill recreational, economic, and educational needs without despoiling or endangering natural resources.
	Protect and promote prudent use of Hawai'i's unique, fragile, and significant environmental and natural resources.
Policies	The shoreline of the island of Hawai'i shall be maintained for recreational, educational, and/or scientific uses in a manner that is protective of resources and is of the maximum benefit to the general public.
	The shoreline shall be protected from enhancement of man-made improvements and structures.
	The County shall encourage public and private agencies to manage the natural resources in a manner that avoids or minimizes adverse effects on the environment and depletion of energy and natural resources to the fullest extent.
<i>Recreation</i>	
Policies	Public access to the shoreline shall be provided in accordance with an adopted program of the County of Hawai'i.
	Establish public access to and the development of shoreline regions along the North Kona coast so as to provide recreational opportunities in areas such as Kūki'o and Kakapa Bays, Kua Bay, Kaho'iawa, Makalawena and Mahai'ula.
	Protect 'ōpae'ula ponds as natural areas.
	Encourage the development of historic trails.
<i>Economy</i>	
Policies	The natural beauty of the area should be recognized as a major economic and social asset. This resource should be protected through appropriate review processes when development is proposed.
Source: Hawai'i County General Plan (February 2005)	

It is the general policy of State Parks—to the extent possible—to preserve and protect all cultural and historic properties on its land, and that policy has been incorporated into this Master Plan. Sensitive sites will be either left unmarked and away from new infrastructure to the extent practicable, and where possible (e.g., in caves), sealed off from public access. Sites appropriate for visitation will be incorporated into an interpretive plan which will be used to inform and educate park visitors about the unique and profound cultural history of Kīholo State Park. The Master Plan balances the need to protect the scenic beauty, natural, and cultural resources with the park’s purpose of providing a safe, sanitary wilderness environment for park visitors to enjoy. Improvements to infrastructure, including a new campground at Keawaiki Bay, and the creation of interpretive trails are intended to increase the recreational value of the park while respecting the economic, aesthetic, and cultural value of the park lands.

9.3.2 SPECIAL MANAGEMENT AREA (SMA) HRS §205A-26

The Special Management Area (SMA) boundary follows Queen Ka‘ahumanu Highway, directly *mauka* of Kīholo State Park, and includes all of the park lands within it. The County of Hawai‘i Planning Department and Planning Commission will be provided with the opportunity to review and comment on this Master Plan, according to the County’s rules and guidelines, and State Parks’ policy. The relevant provisions relating to the Special Management Area drawn from HRS §205A-26, are presented in Table 9.4.

Discussion. For reasons outlined below, all of the Master Plan alternatives are consistent with the Special Management Area guidelines.

- The plan provides adequate public access to the natural resources within the park consistent with sound conservation principles.
- It provides for solid and liquid waste treatment, disposition, and management which will minimize adverse effects upon special management area resources.
- It entails minimal alterations to existing land forms and vegetation, and there is minimal construction or other work that could adversely affect water resources or scenic and recreational amenities.

Consistent with both the wilderness concept and the regulations governing activities in the Special Management area, the action alternatives described in Chapter 5 would limit environmental and ecological impacts to the minimum extent practicable while still creating recreational and education opportunities within the park. Liquid and solid waste would be managed through the provision of removable toilets and trash receptacles, partially obstructed from view by enclosures made of material native to the park (e.g., lava rock). The only modification of existing landforms would be as a result of the construction of new sections of park access road, near the park entrance and possibly near a new campground located at Keawaiki Bay.

All of the relatively limited new construction is consistent with other state and county controls, such as the CZM program. The improvements to the park are intended to enhance its recreational and educational value while avoiding impacts to the natural and cultural-historic heritage of the park lands. Any new construction will be built in a manner which avoids creating, either individually or collectively, dangers from flood, landslides, erosion, siltation, or failure in the event of an earthquake or which modifies any beach or other water body. Implementation of the Master Plan would not require dredging, filling, or otherwise altering any bay, estuary, salt marsh, river mouth, slough or lagoon. Neither would it reduce the size of any beach or other area usable for public recreation. It would enhance, rather than restrict, public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management areas and the mean high tide line where there is no beach, and it would not interfere with or detract from the line of sight towards the sea from the state highway nearest the coast. Finally, it would not adversely affect water quality, existing and potential fisheries and fishing grounds, or wildlife habitats.

Table 9.4 HRS §205A-26 Special Management Area Guidelines

- (1) All development in the Special Management Area shall be subject to reasonable terms and conditions set by the authority in order to ensure:*
- (a) Adequate access, by dedication or other means, to publicly owned or used beaches, recreation areas, and natural reserves is provided to the extent consistent with sound conservation principles;*
 - (b) Adequate and properly located public recreation areas and wildlife preserves are reserved;*
 - (c) Provisions are made for solid and liquid waste treatment, disposition, and management which will minimize adverse effects upon special management area resources; and*
 - (d) Alterations to existing land forms and vegetation, except crops, and construction of structures shall cause minimum adverse effect to water resources and scenic and recreational amenities and minimum danger of floods, wind damage, storm surge, landslides, erosion, siltation, or failure in the event of an earthquake.*
- (2) No development shall be approved unless the authority has first found:*
- (a) That the development will not have any substantial adverse environmental or ecological effect, except as such adverse effect is minimized to the extent practicable and clearly outweighed by public health, safety, or compelling public interests. Such adverse effects shall include, but not be limited to, the potential cumulative impact of individual developments, each one of which taken itself might not have a substantial adverse effect, and the elimination of planning options;*
 - (b) That the development is consistent with the objectives, policies, and special management area guidelines of this chapter and any guidelines enacted by the legislature; and*
 - (c) That the development is consistent with the county General Plan and zoning. Such a finding of consistency does not preclude concurrent processing where a general plan or zoning amendment may also be required.*
- (3) The authority shall seek to minimize, where reasonable:*
- (a) Dredging, filling, or otherwise altering any bay, estuary, salt marsh, river mouth, slough or lagoon;*
 - (b) Any development which would reduce the size of any beach or other area usable for public recreation;*
 - (c) Any development which would reduce or impose restrictions upon public access to tidal and submerged lands, beaches, portions of rivers and streams within the special management areas and the mean high tide line where there is no beach;*
 - (d) Any development which would substantially interfere with or detract from the line of sight towards the sea from the state highway nearest the coast; and*
 - (e) Any development which would adversely affect water quality, existing areas of open water free of visible structures, existing and potential fisheries and fishing grounds, wildlife habitats, or potential or existing agricultural uses of land.*

9.5 REQUIRED APPROVALS

The proposed improvements described in Chapter 5 are intended to be consistent with, and support, the intent of the State Conservation District, the County of Hawai‘i General Plan, regulations governing the Coastal Zone Management and Special Management Area programs, and other existing controls. In order to implement any of the action alternatives described in this Master Plan and EA, State Parks is likely to require approvals and permits from various government agencies.

Table 9.5 Required Approvals and Permits for Kīholo State Park Master Plan

<i>Approval or Permit</i>	<i>Approving Authority</i>	<i>Status</i>
Master Plan Approval	Board of Land and Natural Resources	Future
Environmental Assessment (EA)	State of Hawai‘i, Governor	Future
Special Management Area Use Permit	County of Hawai‘i, Planning Department	Future
Conservation District	Department of Land and Natural Resources	Future
Grading Permit	County of Hawai‘i, Planning Department	Future
Grubbing Permit	County of Hawai‘i, Planning Department	Future
Building Permit	County of Hawai‘i, Planning Department	Future
Source: Compiled by Planning Solutions, Inc. (2013)		

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CHAPTER 10 – ANTICIPATED DETERMINATION

10.1 SIGNIFICANCE CRITERIA

Hawai‘i Revised Statutes Chapter 343 and its implementing regulations in Hawai‘i Administrative Rules (HAR) §11-200 establishes procedures for determining if an environmental impact statement (EIS) should be prepared or if a finding of no significant impact is warranted. HAR §11-200-12 provides that:

In most instances, an action shall be determined to have a significant effect on the environment if it:

- 1. Involves an irrevocable commitment to loss or destruction of any natural or cultural resource;*
- 2. Curtails the range of beneficial uses of the environment;*
- 3. Conflicts with the State’s long-term environmental policies or goals as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders;*
- 4. Substantially affects the economic or social welfare of the community or State;*
- 5. Substantially affects public health;*
- 6. Involves substantial secondary impacts, such as population changes or effects on public facilities;*
- 7. Involves a substantial degradation of environmental quality;*
- 8. Is individually limited but cumulatively has considerable effect on the environment or involves a commitment for larger actions;*
- 9. Substantially affects a rare, threatened, or endangered species, or its habitat;*
- 10. Detrimentally affects air or water quality or ambient noise levels;*
- 11. Affects or is likely to suffer damage by being located in an environmentally sensitive area such as a flood plain, tsunami zone, beach, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal waters;*
- 12. Substantially affects scenic vistas and view planes identified in county or state plans or studies; or,*
- 13. Requires substantial energy consumption.*

Actions which do not exceed these thresholds are generally considered not to have a significant effect on the environment.

If, after preparing an environmental assessment, reviewing public and agency comments, and applying these criteria the proposing agency anticipates that the proposed action is not likely to have a significant effect, it issues a notice stating that it anticipates a negative declaration subject to the public review provisions of Section 11-200-9.1. If, on the other hand, it determines that there are likely to be significant adverse effects, it prepares an environmental impact statement.

The remainder of this chapter discusses the Division of State Park’s findings with respect to the potential effects of implementing the Kīholo State Park Master Plan. It concludes that no significant adverse effects are likely to result and states that it anticipates issuance of a Finding of No Significant Impact.

10.2 FINDINGS

The remainder of this section summarizes findings with respect to each criterion. These findings are based on the detailed analysis and discussion presented earlier in the report. Where the term “Master Plan” is used, it is to be understood that the statement is applicable to all of the master planning alternatives outlined in Chapter 5.

10.2.1 IRREVOCABLE LOSS OR DESTRUCTION OF VALUABLE RESOURCE

The Kīholo State Park Master Plan is designed to maintain most of the 8-mile-long/4,300-acre park in an undisturbed state. While the presence of the coastal highway along the *mauka* edge of the property and the presence of a number of residential in-holding properties prevents it from being a “wilderness” in the classical sense, the parklands are largely maintained in their pristine state. Moreover, the intensified management that is proposed as part of the plan will help ensure that some of the things that now adversely affect natural and cultural resources can be better managed. Consequently, its implementation will prevent, rather than lead to, the irrevocable loss or destruction of significant cultural or natural resources.

10.2.2 CURTAILS BENEFICIAL USES

Under the Interim Management Plan that currently governs recreational uses at Kīholo State Park Reserve, uses of the 4,362-acres of State-owned land are substantially curtailed. Moreover, without an approved park Master Plan, there is no ability to make even minor capital investments required to preserve the area’s resources, much less make them available to a larger public. Implementation of the proposed Master Plan for Kīholo State Park would significantly increase both the quantity and quality of beneficial uses of the park.

10.2.3 CONFLICTS WITH LONG-TERM ENVIRONMENTAL POLICIES OR GOALS

As discussed in Chapter 9, the proposed Master Plan for Kīholo State Park is consistent with the relevant environmental policies and goals in the Hawai‘i State Plan, the *County of Hawai‘i General Plan*, the Hawai‘i 2050 Sustainability Plan, Coastal Zone Management (CZM) Program, the State Land Use Law, and with the long-term environmental policies and goals expressed in Chapter 344, Hawai‘i Revised Statutes and elsewhere in state law.

10.2.4 SUBSTANTIALLY AFFECTS ECONOMIC OR SOCIAL WELFARE

The physical, management, and operational improvements called for/facilitated by features of the park Master Plan will improve public access to recreational, historical, cultural, and other resources within Kīholo State Park Reserve. This will add to the social welfare of Hawai‘i residents and visitors.

10.2.5 PUBLIC HEALTH EFFECTS

Aspects of the proposed Master Plan will improve waste management in the area, and the upgrade in the Queen Ka‘ahumanu access will improve the safety of the public as they travel to and from Kīholo. None of the components that are included in any of the Master Plan alternatives would increase pollutant emissions or place users of the area at greater risk. In fact, the intensified management that is called for in the Master Plan will reduce the likelihood of accident and increase the ability to respond immediately to emergencies. Aside from a brief increase in dust during construction of the access road improvements that are called for, implementation of the park plan alternatives do not have the potential to adversely affect air or water quality in ways that could adversely affect public health.

10.2.6 PRODUCE SUBSTANTIAL SECONDARY IMPACTS

None of the alternatives in the Master Plan have the potential to produce significant secondary impacts. The amount of construction is very limited and is of a scale that can be readily handled by the existing businesses and labor force. It is not designed or intended to foster population growth or promote economic development. Instead, it is intended to guide management and development of Kīholo State Park and its sensitive natural and cultural resources.

10.2.7 SUBSTANTIALLY DEGRADE ENVIRONMENTAL QUALITY

As discussed in Chapters 8 and 9, the measures that would be taken in accordance with the Master Plan would not have substantial long-term environmental effects. Construction activities related to some planning alternatives (e.g., the access road to Keawaiki Bay) would temporarily elevate noise levels and generate airborne dust during construction, but these impacts will be localized and of limited duration.

10.2.8 CUMULATIVE EFFECTS OR COMMITMENT TO A LARGER ACTION

Taking the actions called for in the park Master Plan (all alternatives) does not commit the State to a larger action and is not intended to facilitate or stimulate population growth in the region. It is part of State Parks' ongoing efforts to effectively plan for, protect, and manage its park lands as a resource for the public.

10.2.9 EFFECTS ON RARE, THREATENED, OR ENDANGERED SPECIES

As discussed in Section 2.3 of this report, there are no known rare, threatened, or endangered plant species within Kīholo State Park Reserve. However, at least two listed animal species (Green Sea Turtles and Monk Seals) are known to exist within the lagoon and to haul out on the shore. The presence of this wildlife is one of the qualities which make Kīholo State Park an attractive place for education and recreational activities. However, so long as park users adhere to existing laws, regulations, and practice, implementation of the measures called for in the Master Plan for Kīholo State Park will not harm any rare, threatened, or endangered species or negatively impact any of the resources on which they depend. On the contrary, as evidenced by the positive effect that Hui Aloha Kīholo's oversight has had on the behavior of those who use the area, the increased supervision that would be afforded by park rangers has the potential to improve the protection of listed species. For example, when monk seals or sea turtles haul themselves on shore, rangers could demarcate safe distances to ensure that they are not disturbed. Their presence could also promote enhance fisheries management and fish nursery protection, advising fishermen of regulations within the park, propagating best practices, and reporting non-compliance.

10.2.10 AFFECTS AIR OR WATER QUALITY OR AMBIENT NOISE LEVELS

Implementation of the Master Plan for Kīholo State Park will not have a measurable effect on water or air quality (see Sections 8.4 and 8.5). Noise levels will temporarily increase during construction of the improvements but are not anticipated to affect any noise-sensitive uses.

10.2.11 ENVIRONMENTALLY SENSITIVE AREAS

The proposed Master Plan for Kīholo State Park is intended to provide for the effective protection and management of the sensitive natural resources described in Chapter 2. Portions of the park lands are within flood and tsunami hazard zones, however the plan does not call for the construction of any new enclosed habitable structures.

10.2.12 AFFECTS SCENIC VISTAS AND VIEW PLANES

Kīholo State Park is located along a scenic highway corridor. However, the Master Plan calls for no new buildings or other construction which could significantly alter the visual character of the park or significantly change views across it (see Section 8.8).

10.2.13 REQUIRES SUBSTANTIAL ENERGY CONSUMPTION

Construction of the improvements called for in the Master Plan will use some energy; however once in operation these facilities (e.g., access roads, campsites, etc.) will not require any energy to operate and will require only infrequent maintenance.

10.3 DETERMINATION

Based on the analysis described in Section 10.2, the Division of State Parks has concluded that implementation of the measures that are provided for in the Master Plan for Kīholo State Park does not have the potential to cause substantial harm to the environment and is proposing a Finding of No Significant Impact (FONSI).

CHAPTER 11 – AGENCIES AND PARTIES CONSULTED

In the process of identifying key issues which the Master Plan and environmental impact analysis needed to address, direct community input was sought through a series of interviews and public meetings. Information from this consultation is summarized in Section 1.9 of this report. The agencies, organizations, and individuals listed in Table 11.1 are being provided copies of this report and asked to comment on it.

Table 11.1 Agencies, Organizations, and Individuals Being Asked to Comment

<i>Federal Agencies</i>
U.S. Army Corps of Engineers—Pacific Ocean Division
U.S. Department of the Interior—National Park Service (NPS) Pacific Island Support Office
National Park Service – Ala Kahakai National Historic Trail
U.S. Department of the Interior – Fish and Wildlife Service (USFWS)
National Marine Fisheries Service (NMFS)
U.S. Forestry Service – Hawai‘i Experimental Tropical Forest
<i>State Agencies</i>
Office of the Governor, State of Hawai‘i
Department of Agriculture
Department of Accounting and General Services (DAGS)
Department of Business, Economic Development, and Tourism (DEBDT) – Office of the Director
DEBDT – Energy, Resources, and Technology Division
DBEDT – Planning Office
Department of Defense
Department of Education
Department of Land and Natural Resources (DLNR) – 5 Copies
DLNR – State Historic Preservation Division
Department of Health (DOH)
DOH – Environmental Planning Office
DOT – Highways Division
Office of Hawaiian Affairs
<i>County of Hawai‘i</i>
Department of Water Supply
Department of Parks and Recreation
Planning Department
Department of Public Works
<i>Elected Officials</i>
Mayor Billy Kenoi
Senator Josh Green
Senator Malama Solomon
Representative Denny Coffman
Representative Nicole E. Lowen
Representative Cindy Evans
Councilmember Karen Eoff
Councilmember Margaret Wille
<i>Media</i>
Kailua-Kona Public Library
Hilo Public Library
Hawai‘i State Library
West Hawaii Today
<i>Private Organizations and Individuals</i>
Hui Aloha Kiholo
Kamehameha Schools
Ka‘ūpūlehu Interpretive Center at Kalaemanō
Kūki‘o Community Association
Pu‘u Wa‘awa‘a Advisory Council
The Nature Conservancy
Sierra Club, Hawaii Chapter

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APPENDIX A. CURATORSHIP AGREEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF STATE PARKS

CURATORSHIP AGREEMENT

THIS AGREEMENT, executed on the respective dates indicated below, is effective as of December 23, 2009, between the STATE OF HAWAII (hereafter "STATE"), by its Chairperson of the Board of Land and Natural Resources, and through its Department of Land and Natural Resources ("DLNR"), Division of State Parks ("State Parks"), whose address is 1151 Punchbowl Street, Honolulu, Hawai'i 96813, and Hui Aloha Kiholo (also referred to herein as "CURATOR"), by Jennifer Mitchell, Coordinator, whose address is P.O. Box 2003, Kamuela, Hawai'i 96743, for and regarding the Kiholo State Park Reserve, Island of Hawai'i, State of Hawai'i.

INTRODUCTION

This curatorship agreement addresses the maintenance, management, interpretation and documentation of the natural and cultural resources within Kiholo State Park Reserve (SPR), North Kona, Island of Hawai'i (Attachment 1). The park reserve encompasses 4,356 acres between the Queen Ka'ahumanu Highway and the shoreline from the Pu'uwa'awa'a - Ka'upulehu district boundary on the south to the Pu'uuanahulu - 'Anaeho'omalu boundary on the north (TMK: 7-1-02: 02, 08 and 7-1-03: 02, 07). The undeveloped park area is characterized as an 8-mile stretch of wilderness coastline with expansive lava fields and sandy beaches at Kiholo and Keawaiki Bays. The *honu*, green sea turtle, favors Kiholo Bay as a feeding and resting place. Numerous lava tubes, anchialine ponds, and archaeological sites also mark the coastline, including trails, habitation shelters, walled canoe *hālau*, *hōlua* slides, and petroglyphs. All of these natural and cultural resources are fragile and subject to disturbance and damage by the public's use of the area.

The responsibilities of the CURATOR shall focus on Kiholo Bay from the northern end at Hou Point (Kalaehou) to the southern end at Mano Point (Kalaemano) (Attachment 2). With this agreement, special attention is being given to protection of the shoreline resources, including the marine resources of the bay, the archaeological resources on the land surrounding the bay, and the recreational activities occurring along the shoreline.

The STATE is the owner of Kiholo SPR (hereafter "park"). This agreement for assistance with the maintenance, management, interpretation, and documentation of the resources at Kiholo SPR is in the public interest and serves a public purpose. The arrangements made herein

with the CURATOR will help improve and maintain the park area at Kīholo Bay for public use and will provide reasonable and appropriate recognition and gratitude to the CURATOR on account of the significant labor and improvements its members are contributing to reclaim, preserve, and improve this park for the use and benefit of all.

The STATE is represented by the Division of State Parks, hereinafter referred to as State Parks. State Parks has ownership and management jurisdiction over the site. The staff of State Parks shall oversee the operations and activities of the CURATOR in consultation with other divisions of the Department of Land and Natural Resources (DLNR) for compliance with this agreement.

Hui Aloha Kīholo is comprised of 90+ community members from West Hawai'i who joined together in 2007 to help protect, enhance, and perpetuate the Hawaiian culture and natural landscape of the Kīholo area through collaborative management and active caretaking. Many of the individuals have a connection to Kīholo through family history, residence, and recreation. The organization incorporated in 2007 and filed for their 501(c)(3) status in 2008. Hui Aloha Kīholo has demonstrated their concern and dedication by conducting clean-up days, maintaining visitor counts and observations of park use, providing visitor services, and posting signs that promote respect for the resources of Kīholo.

The CURATOR will perform all duties and responsibilities without pay from the State of Hawai'i.

THE AIM OF THE STATE OF HAWAII'S CURATOR PROGRAM

A curator program was initiated by State Parks and the Historic Preservation Division in 1987. The aim of this program is to:

1. Better maintain significant cultural and natural resources and protect them from vandalism, natural factors, and unintentional human actions that will damage these resources.
2. Provide the State's citizens greater access to view and understand the importance of Hawai'i's natural and cultural resources, and their significance to the State's past history and natural environment.

It is the role of the CURATOR to help protect the sites and resources under its jurisdiction and to help provide public access for all the State's citizens. The CURATOR is not the owner of the site and cannot restrict access. The CURATOR shall not disseminate information or install interpretive devices on the site without the prior approval of State Parks. The CURATOR cannot undertake site improvements unless these tasks are covered in the curator agreement or in later amendments to each agreement.

THE CURATOR'S RESPONSIBILITIES

1. The CURATOR will coordinate all actions and activities undertaken in the execution of this Curator Agreement with State Parks.
2. The CURATOR will designate a volunteer supervisor(s) who is subject to approval by State Parks. All participants must submit a completed State Parks' volunteer waiver form (Attachments 3 and 4). The CURATOR may sponsor volunteer projects and educational tours in addition to their regular maintenance responsibilities, but State Parks shall be notified 5 working days in advance of activities involving over 25 individuals.
3. The CURATOR will submit an annual report of its activities and volunteer hours under this agreement to State Parks.
4. The CURATOR will maintain the coastal and public use areas of Kīholo by clearing selected vegetation and removing litter.
 - a. Chainsaws other hand tools may be used. The cut debris will be chipped, composted at a designated park site, or transported off-site. There is to be no burning within the park.
 - b. The removal of vegetation shall be done with minimal ground disturbance to prevent damage to the archaeological sites and any subsurface archaeological deposits.
 - c. The specifics of any expanded vegetation clearing shall be discussed with the State Parks Superintendent and Archaeologist.
 - d. With State Parks approval, an herbicide with dissipation properties such as Round-up, may be used to control weeds and vegetation growth where appropriate.
 - e. Landscaping, watering and planting activities for the purpose of providing ground stabilization and minimizing erosion of the area may be undertaken, contingent upon approval of specific plans by State Parks.
5. The CURATOR is required to assist in coordinating volunteer efforts that may be forthcoming from other organizations or individuals. Such other groups or individuals may participate in curator activities without being required to become a member of the Curator organization.
6. The CURATOR should conduct regularly scheduled workdays and monitor the site on a monthly basis to assess the condition of the park resources in an attempt to prevent vandalism and damage. Should any damage be discovered, the CURATOR will notify State Parks.
7. The CURATOR may prepare and install interpretive devices and distribute park information, contingent upon approval of specific interpretive plans by State Parks.

8. With State Parks approval, the CURATOR may retain the services of a professional archaeologist for the purposes of conducting archaeological work needed to fulfill the objectives of this agreement or to contribute to State Parks meeting the requirements of the historic preservation project review process (§6E-7 and §6E-8, HRS; Chapter 13-275, HAR). The archaeologist shall meet the professional qualifications established by §13-281-3, HAR, and hold a valid permit to conduct archaeological activities in Hawai'i in accordance with §13-282-3, HAR. If any state funds are applied, all applicable state procurement law shall be followed.
9. The CURATOR may propose amendments to this agreement in writing to undertake other tasks. Depending on the scope of the proposed amendments, approval by the BLNR or its designee shall be necessary. Upon signed approval, the amendments will become a part of this agreement.
10. Use of the park by the CURATOR shall be in accordance with all of the Rules and Regulations of the Division of State Parks (Hawai'i Administrative Rules Title 13, Chapter 146), the Conservation District (Hawai'i Administrative Rules Title 13, Chapter 5) and all other applicable rules and regulations of the Department of Land and Natural Resources as well as all other applicable rules, regulations and permit requirements of the County of Hawai'i, State of Hawai'i and Federal Government, including requirements under HRS Chapter 343 concerning environmental and cultural review prior to any actions that would trigger this chapter.
11. All proposed maintenance, management and interpretive plans for cultural and archaeological resources developed under this agreement shall be submitted by State Parks to the Historic Preservation Division for review in accordance with §6E-7 and §6E-8, HRS, and all applicable administrative rules.
12. Restoration work, as needed, may be undertaken by the CURATOR, contingent on approval of specific restoration plans by State Parks and their submittal by State Parks to the Historic Preservation Division for the review and approval in accordance with Chapter 13-277, HAR.
13. Further restoration work as needed may be undertaken by the CURATOR, contingent on approval of specific plans by State Parks.

SPECIAL CONDITIONS

The CURATOR shall not:

1. Conduct or permit commercial activity, including the sale of any items or advertising of commercial products, to be conducted in conjunction with the curation of the site;
2. Undertake or permit fund raising activities at the site;
3. Permit participants to possess, display, use/consume alcoholic beverages or illegal drugs at the site;
4. Permit any temporary or permanent residence to occur at the site.
5. Cause any significant disruption to normal park usage.
6. Undertake site improvements unless these tasks are covered in this agreement or in later amendments to each agreement.
7. Violate any provisions of Chapter 6D, HRS, regarding protection of caves.

RESPONSIBILITIES OF STATE PARKS

1. DLNR, in its sole discretion, will continue to manage and be responsible for the area covered by this agreement and may issue permits, including commercial permits, conduct archaeological research and other investigative activities, install interpretive devices and regulatory signs, and implement management plans. DLNR will consult with the CURATOR on these activities.
2. State Parks agrees to provide the CURATOR with information in its possession relating to the park, including but not limited to archaeological and historical information, surveys conducted of archaeological sites or features which are not of a confidential nature, draft environmental impact assessments and statements, and plans regarding existing or proposed future uses of lands within the park.
3. The assistance of State Parks may be requested by the CURATOR for large clearing and hauling projects and with herbicide use. Such requests should be coordinated between the CURATOR and the State Parks Hawai'i District Superintendent.
4. In accordance with §6E-7 and §6E-8, HRS, and Chapter 13-275, HAR, State Parks shall be responsible for obtaining concurrence from the State Historic Preservation Division to proceed with proposals under this agreement that could have an effect on historic properties in the park and for submitting for review and approval any reports or plans.
5. The CURATOR will be notified and consulted on proposed activities in the park. The CURATOR may be given the opportunity to assist in work at the park done by DLNR or approved by DLNR.

RESTRICTIONS ON THE CURATOR'S ROLE

1. The CURATOR may not undertake tasks, which are not specified in this agreement. The CURATOR may propose amendments to this agreement to undertake other tasks at the park. These proposed amendments must be approved by the Board of Land and Natural Resources or its designee.
2. It must be emphasized that failure to get approval of additional tasks will likely lead to the revoking of this agreement and the potential imposition of civil or criminal penalties under sections 6E-11, 6E-11.5, or 6E-11.6, HRS, if historic properties are damaged or altered without prior approval of the department.
3. It is the role of the CURATOR to help protect the park resources covered by this agreement and to help provide public access for all the park's visitors. The CURATOR is not the owner of the park and cannot restrict access.

CHECKS TO INSURE PROPER CURATION

1. The CURATOR and the STATE, through the Division of State Parks, will agree on a schedule for when volunteer work will be performed. State Parks will monitor the progress of the work and maintain close communication with the CURATOR. The CURATOR will notify State Parks if a schedule change is necessary.
2. State Parks will make a minimum of two (2) field checks per year to see that proper maintenance is being done. If it is determined that proper maintenance is not taking place, State Parks will notify the CURATOR in writing of the problem(s) and will provide suggestions to correct the problem(s). The CURATOR will be allowed a reasonable time to correct the problem and if they fail to correct the problem, the STATE may revoke this agreement.

CHECKS TO INSURE PROPER SAFETY

1. The CURATOR agrees to perform its volunteer services in a safe and reasonable manner. It is the CURATOR's responsibility to become acquainted with the procedures and tools necessary to perform these tasks and to monitor the actions of their group of volunteers.
2. Prior to commencement and periodically throughout the agreement, the CURATOR will conduct safety briefings with their volunteers to ensure that they are aware of any potential safety hazards. The CURATOR will have all volunteers sign liability waivers and instruct all volunteers in the proper method of performing their tasks.

3. The STATE, through the Division of State Parks, is available to assist in safety presentations and proper measures of performing the work. An on-site evaluation can be scheduled prior to the commencement of this agreement.

COORDINATION OF ACTIVITIES

The CURATOR shall designate a person to coordinate with the STATE on the activities under this agreement. The CURATOR shall be responsible for transmitting to the STATE the names of the individuals who will be performing services under this agreement.

INDIVIDUAL MEMBERS AND VOLUNTEERS OF CURATOR

The members and volunteers of Hui Aloha Kīholo who perform the CURATOR's responsibilities under this agreement will be deemed to be volunteers for purposes of Chapter 90, HRS. As such, these persons when acting as volunteers may be entitled to certain immunity from civil liability if acting in good faith and within the scope of the volunteer's official functions solely for the purposes of Chapter 662D, HRS.

TERM & MODIFICATION OF AGREEMENT

The term of this agreement is for five (5) years after its effective date. Either party may terminate this agreement after providing the other party with thirty (30) days written notice. This agreement may be amended only in writing signed by both the STATE and the CURATOR.

PUBLICITY

During the term of this agreement, the STATE may post a sign or signs that recognize the contributions of the CURATOR to the improvement of the park.

COMPLIANCE WITH LAW

The CURATOR shall comply with all applicable federal, state, and county laws, ordinances, codes, rules, and regulations, as the same may be amended from time to time, that in any way affect the CURATOR's performance of this agreement.

PARK RULES

The rules of the Hawaii state park system which are set forth in Hawai'i Administrative Rules, Title 13, Subtitle 6, Chapter 146, shall apply to the fullest possible extent to the implementation of this agreement.

IN VIEW OF THE ABOVE, the parties execute this agreement by their signatures, on the dates below, to be effective as of the date first above written. By signing, the person indicates they have the requisite authority to enter into this agreement on behalf of the organization indicated.

STATE



(Signature)

Approved by the Board of
Land and Natural Resources
At its meeting held on
August 28, 2009.

Laura H. Thielen
(Print Name)

Chairperson
Board of Land & Natural Resources
(Print Title)

12/23/09
(Date)

HUI ALOHA KĪHOLO



(Signature)

Jennifer Mitchell
(Print Name)

President
(Print Title)

12.18.09
(Date)

APPROVED AS TO FORM:



Deputy Attorney General

ACKNOWLEDGMENT

STATE OF Hawaii)

- COUNTY OF Hawaii : SS.

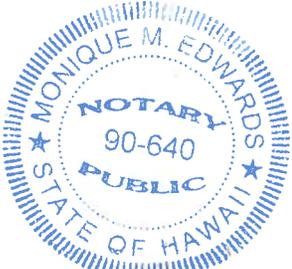
On this _____ day of DEC 18 2009, 20____, before me appeared Jennifer Mitchell, to me known, to be the person described in and, who, being by me duly sworn, did say that ^{she} ~~he~~ is the President of Hui Aloha Kiholo, the CURATOR named in the foregoing instrument, and that ^{she} ~~he~~ is authorized to sign said instrument on behalf of the Hui Aloha Kiholo, and acknowledges that he executed said instrument as the free act and deed of the President.

Monique M. Edwards

(Signature)

MONIQUE M. EDWARDS
NOTARY PUBLIC, STATE OF HAWAII
COMMISSION EXPIRES: 11/4/2010

(Print Name)



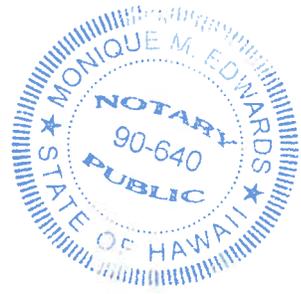
(Notary Seal)

Notary Public, State of _____

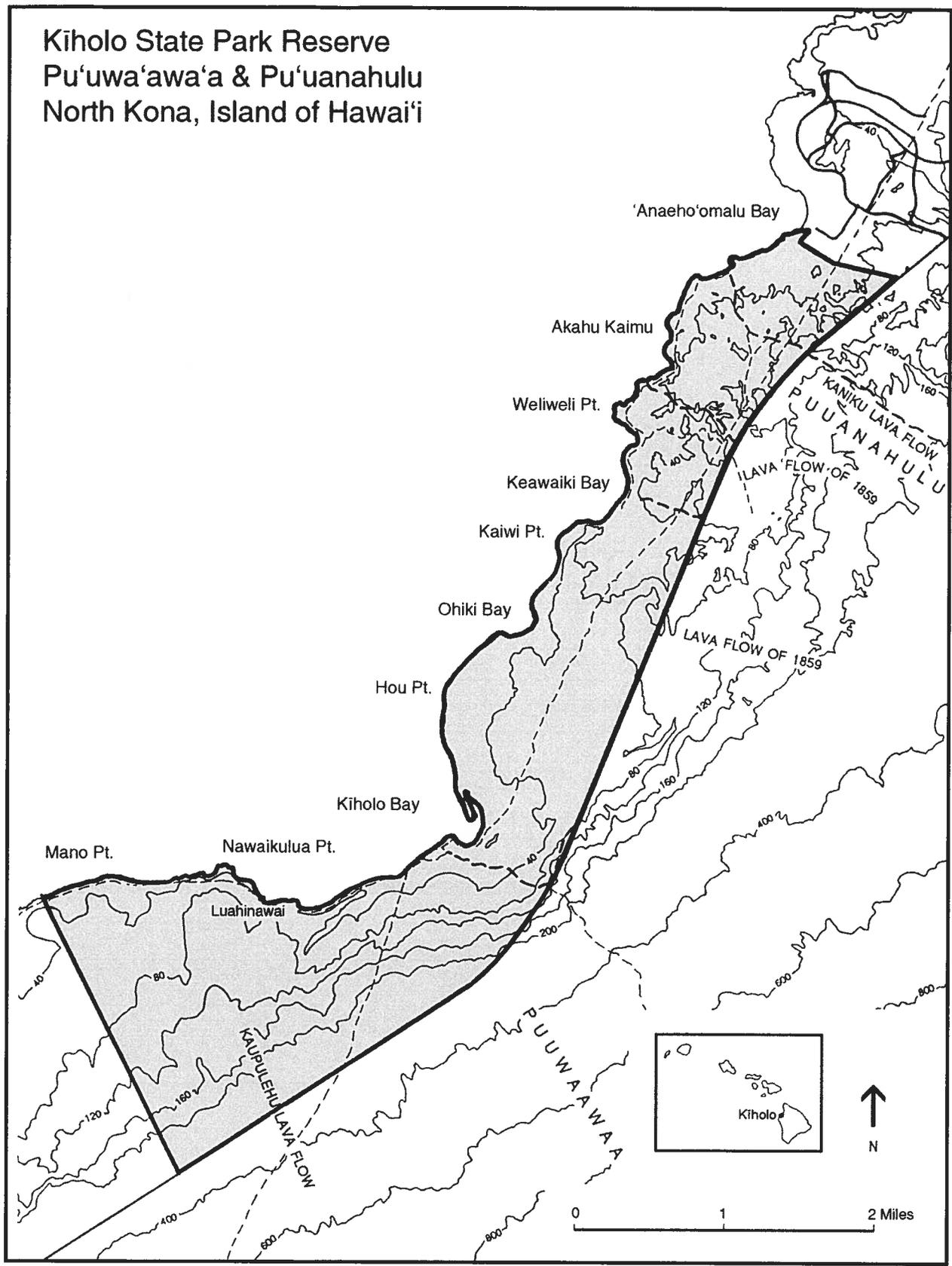
My commission expires: _____

Doc. Date: undated # Pages: 14
Name: Monique M. Edwards 3rd Circuit
Doc. Description: Curator (Stamp or Seal)
Agreement

Monique M. Edwards
Signature Date 12-18-09
NOTARY CERTIFICATION



Kīholo State Park Reserve
Pu'uwa'awa'a & Pu'u'anahulu
North Kona, Island of Hawai'i



ATTACHMENT 1

Boundaries of the Kīholo State Park Reserve, North Kona, Island of Hawai'i.

CURATORSHIP AGREEMENT FACT SHEET & VOLUNTEER WAIVER

Park/Site: _____

Name of Group or Organization: _____

Designated Volunteer Supervisor(s) and their contact numbers:

1. _____

2. _____

If you are a 501(C-3) non-profit, please include your ID number and date of incorporation:

ID No.: _____ Date: _____

Date of Agreement: _____

List members who are regularly involved in curator activity and titles if applicable:

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

Work Schedule:

Emergency Contacts (list names, telephone, pager or cellular numbers, in priority order):

1. _____

2. _____

APPENDIX B. PUBLIC MEETING MATERIALS

**STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
AGREEMENT FOR INDIVIDUAL VOLUNTARY SERVICES**

NAME: _____ PHONE: _____

ADDRESS: _____

DURATION OF AGREEMENT: START: _____ END: _____

I understand that I will not receive any compensation for the above work and that volunteers are NOT considered to be employees of the State of Hawaii for any purpose other than tort claims, and I understand that volunteer service is not creditable for leave accrual or any other employee benefits. I also understand that either the State of Hawaii, or I may cancel this agreement at any time by notifying the other party. I acknowledge that there are inherent risks and dangers associated with this activity and in particular have noted those risks listed below.

I understand that I will be assisting the State of Hawaii/Department of Land and Natural Resources in taking care of Hawaii's natural and cultural resources. I will be responsible for my equipment and supplies. I will be responsible for all aspects of the actual work project, and the safe use and proper care of hand tools including, but not limited to: Machetes, Saws, Hand Axes, Pry bars, Sled Hammers, Gardening and Painting Equipment.

I am in good physical shape, and will be self sufficient while at the work project site. I have informed the State, of any mental, physical and/or medical conditions that may increase the risk of harm to myself or others while engaging in the activities described in this document. I understand I should wear footwear with good traction and should have clothing suitable for work in both rainy, wet, and hot, dry conditions, when working in the field. I understand that the duration of the project may be less than eight hours in length, however, in the even of inclement weather the work day may be either shortened or extended at the discretion of the State. These and other activities will be taking place in potentially remote areas. I am aware that there are inherent risks and dangers associated with field work. They include but are not limited to:

• gusty winds	• paint, fuel and oil fumes
• sharp and or slippery rocks	• thorny plants/potentially dense vegetation
• stinging or biting insects and spiders	• lack of reliable communication
• portable or no bathroom facilities	• no telephones
• steep drop-offs	• work on, in or near water
• no potable (drinking) water	• wet and slippery roads
• rugged terrain	• herbicides
• sharp tools	• work in a hunting area
• lack of medical facilities	• steep and slippery trail and river crossings
• wild animals	• flash floods
• harsh weather conditions, ranging from hot and humid to wet and cold	• diseases caused by water, air, or animal vectors

I agree to hold harmless and indemnify the State of Hawaii, its officers, agents, employees, and other volunteers from any activities as a volunteer or the activities of the State of Hawaii, its officers, agents, employees or other volunteers.

I understand I am also signing on behalf of any minor that is under my care during the duration of the volunteer activity. I further agree that I will be responsible either for personally supervising the minor or for making arrangements for the supervision of the minor by another responsible adult.

I hereby volunteer my services as described above, to assist the State of Hawaii/ Department of Land and Natural Resources in its authorized work.

Signature of Volunteer
(or Minor's guardian)

Date

Minor's Name(s): _____

Based upon the above agreement and understanding, the State of Hawaii agrees, while this arrangement is in effect, to accept your services as a volunteer.

Laura H. Thielen, Chairperson and Member
Board of Land and Natural Resources

ANNOUNCEMENTS

PUBLIC MEETINGS TO DISCUSS FUTURE OF KIHOLO STATE PARK RESERVE TO BE HELD SEPTEMBER 26, 27 IN KONA AND HILO

The Division of State Parks (State Parks), Department of Land and Natural Resources will conduct two public meetings for the Master Plan and EIS for Kiholo State Park Reserve, North Kona, Hawai'i. State Parks, along with its consultants from Planning Solutions, are developing a Master Plan that will preserve the area's natural wildland character and its significant archaeological and cultural features, protect the coastal resources from further degradation, and determine the public's recreational use of the area. An interim camping management plan will be announced in conjunction with the park's closure to vehicular access and clean up beginning October 1, 2011.

Two meetings are scheduled with the first meeting on Monday, September 26, 2011 from 5:00 p.m. to 7:30 p.m. at the Natural Energy Laboratory of Hawai'i Authority (NELHA), Gateway Center, 73-4460 Queen Kaahumanu Highway, Kailua-Kona, HI. After you enter the grounds of NELHA, take the 1st left and then another left turn into the Gateway Center parking lot.

The second meeting will be held in the conference room located in the State Office Building, 75 Aupuni St., Hilo, HI on Tuesday, September 27, 2011 from 5:30 to 7:30 p.m.

We would like the public to attend the meetings to share their thoughts, issues, and concerns about Kiholo State Park Reserve and to get involved with the master planning process. If you have special needs due to disability, please contact the Division of State Parks at 587-0293, at least 4 days prior to the meeting date.

KIHOLO PUBLIC MEETINGS TIMELINE

(For Perry & Reggie)

Monday, September 26, 2011

- **7:31A** – HA118 flight to Kona Airport
 - Curt Cottrell, Dean Takebayashi, Lauren Tanaka, and Alan Carpenter on same flight
- **8:13A** – Arrive at Kona – Reggie to pick up Perry
- **8:30A** – Scout campsites and trails at Kiholo with State Parks team; meet Reggie with possible additional community rep (i.e., Hui Aloha Kiholo) at site;
- **2:00P** – Go to NELHA
 - Pick up key from Georgie Espinueva (#101) – 808-327-9585 Ext. 221 (she leaves @4pm)
 - Right after key pickup, drive to Gateway Center to meet with Guy Toyama for microphone instructions/extension cord
- **2:30P** – Check-in @ King Kamehameha Hotel (808) 329-2911 – Confirmation# 18675SY044791
- **3:27P** – Carl Sholin (808-220-4550) of T. Dye & Associates arrives at KOA (HA348)
- **4:30P** – Set up Facility @ NELHA (Gateway Center)
 - Screen, Laptop & Projector (Dean will bring his projector)
 - Microphone
 - Chairs/tables
 - Agenda (PSI – 50 copies)
 - Sign-in Sheet (Lauren)
- **5:00P** – Pule-Start Meeting
- **7:30P** – Pule-End of Meeting
 - Carl Sholin to ride with Curt Cottrell (if possible) for 8:30P HA397 flight
 - Breakdown
 - Return Key
- **8:00P** - NELHA gate closure

Tuesday, September 27, 2011

- **9:00A-2:00P** – Follow-up meetings with any community members
- **2:00P-4:30P** – Travel time between Kona to Hilo (set up ride share)
- **5:00P** – Set up @ State Office Building
 - Screen, Laptop & Projector
 - Microphone
 - Agenda (PSI – 50 copies)
 - Sign-up Sheet (Lauren)
- **5:30P** – Pule-Start Meeting
- **7:30P** – Pule-End Meeting
- **8:55P** – HA__ flight to Honolulu (catch ride with Lauren or Reggie)

Notes of the Kona Meeting on September 26, 2011 (WS500038)

Lauren Tanaka began the meeting with welcome and introductions. Jenny Mitchell did the opening pule. Approximately 60 people were present. Perry White and Reggie David gave progress reports on the various studies that were conducted for the Master Plan. The botanical survey identified 43 species, 16 which were native or (37%). One species was endemic, the puakala and possibly another endemic, the loulu. Both were found up by the highway, not down by the caves, which was unusual. The findings concluded that there were no endangered species present that would restrict park development. 33 species of invertebrates were id, these are amphipods, snails, insects, and spiders, 18 were native, none are threatened, or endangered. All work was done above ground, there were no surveys of subterranean voids (caves). 17 species of avifauna were identified, 4 of them native to Hawai'i, all indigenous, 3 migratory shorebirds, 1 resident waterbird, the bristle thighed curlew which is rarely seen but we saw from 3 to 10 and lots of auku'u. Avian diversity and density is low, typical of dryland communities. Mammalian survey id rats, mice, mongoose, cats and goats. The anchialine pond survey counted 24 surface exposed anchialine ponds with brackish groundwater, 10 located on private properties, 5 biologically degraded and 2 have native biota, 7 arent very good but we did not look long enough to confirm. Very few surface pools have special habitats, most have been introduced with fish making the habitat irreversible. Those that were undisturbed, had ̄pae'ula.

The archaeological survey identified 2700 features spread out over the entire area, and included enclosures, petroglyphs, mounds, burials. Each feature was gps'd and uploaded to Google Earth.

There will be more public meetings when the various alternatives are developed. All will recommend minimal physical improvements, low budget operations, ongoing expenditures.

Public Comments:

Many want camping to be provided 7 days. There is a great demand for places where people can be outdoors. The State has several places that camping can be provided but because there's not enough money, there isn't enough sites. Kekaha Kai was supposed to have camping and its been 15 years since work was done on that plan. Eight camp sites at Kīholo are not enough. There's lots of places south of the Loretta Lynn house to camp that aren't near archaeological sites.

Many are not opposed to stopping vehicles from driving on the beach, but people wont walk down from the highway to camp for fear of leaving their cars unattended.

Separate camping zones rather than have them clustered, will give more of the wilderness experience. Its better to have a limit on the number of people rather than number of campsites. Some people go camping by themselves and don't need a permit for up to 10 people.

Clarify pathways.

We need to have water quality monitoring of the ponds on a regular basis, say once a week.

Is there going to be a full-time Ranger? If you increase permit fees, you can pay for a Ranger. Enforcement is critical to orderly conduct. Have you thought about an entrance fee? Taxes don't provide the resources to maintain Kīholo; people create funding. Adequate fees for camping should be implemented, don't sell it cheap. What about a day use fee?

You cant keep people out, 8 sites is not enough. Having a locked gate, you'll have a lot of angry people. For the State, short term can end up being years. The question is about having the resources to expand camping opportunities, finding a balance is the issue.

Is Kīholo a critical habitat for the turtles?

It will be another 12-18 months before we have a final Master Plan.

NOTES FROM SEPTEMBER 27, 2011 HILO PUBLIC MEETING ON KĪHOLO

The following is a list of comments/topics that I jotted down on my flight home from the Hilo version of the public meeting on the Kīholo master plan. The listing is not necessarily complete because I was focused on the presentation. However, it should complement the notes that others took.

1. Please do not limit camping so much. Provide more days (preferably 7 days per week, but at least more than weekends) and more camp sites (i.e., greater number than 8).
2. Need to do more with caves. Cavers have a lot of information and they would do more work as volunteers.
3. NOAA's proposed plan to restock the main Hawaiian Islands with Monk Seals will make the beaches on the Big Island unusable.
4. State ought to buy the private parcel within which Luahinewai is located. The activities there are harming the pond. People are using the pond for recreation.
5. State should charge more for use of the camp sites so that it has more money to maintain and secure them. It is not OK to say there is not enough money. Most people will pay higher camping fees if it can be guaranteed that the funds will be used to help maintain the park.
6. All archaeological sites are degraded by people who have entered them and stolen everything of value. When Queen Kaahumanu Highway was built, the cave looters used it to dig up the cultural deposits and take everything of value. There is nothing left in most of the caves.
7. If you are going to restrict camping at Kīholo, the State needs to create more camping opportunities at the other State parks. The demand is huge and the State is not doing what it needs to do to satisfy the demand. Other areas where the State can provide camping are at Hāpuna, Kekaha Kai, Mahai'ula, Awake'e, Kahoiawa and Manini'ōwali.
8. The State needs to allocate more resources to the park at Kīholo. It should not rely forever on Hui Aloha Kīholo.
9. The State should take the lead in seeking out additional groups for creating curatorships. The State needs to put more effort in community outreach, finding people in the communities to help care for and maintain the parks. Instead, they sit back and wait for others to come to them.
10. There should be greater flexibility in the reservation process so that if people show up and there are empty spaces, they can take advantage of them.
11. The Loretta Lynn house should be put to use. It is a wasted resource as it now stands. Put a Ranger in that house, have a concession that sells water, firewood, campstoves, tents. Be creative about what it can be used for.
12. Overnight campers will not, for the most part, walk from the highway to camp sites. Who going to watch their cars that are parked $\frac{3}{4}$'s of a mile away at the highway.
13. Kīholo is not really wilderness. You can see the highway, and so the designation is inappropriate.
14. Trails go everywhere within the park and the map shows only some of them.
15. Need to relate trails within the park to the National Park Service's Ala Kahakai.

**APPENDIX C.SURVEY OF TERRESTRIAL INVERTEBRATE
RESOURCES AT KĪHOLO**

Survey of Terrestrial Invertebrate Resources at Kiholo State Reserve Park, North Kona, Hawai'i Island

FINAL DRAFT



Prepared by:
Steven Lee Montgomery, Ph. D., Waipahu, Hawai'i

July 16, 2011

Submitted to: Rana Biological Consulting, Inc.

For: Planning Solutions, Inc
210 Ward Avenue, Suite 330, Honolulu, HI 96814

Table of Contents

Summary	1
Introduction	1
General site description	3
Survey methods	5
Previous surveys and literature search	5
Fieldwork schedule	6
Methods	7
Survey limitations	8
Results of Invertebrate Survey	12
Native species	14
Alien species	19
Species not observed	27
Medically important species	32
Potential impacts to protected species	33
Recommendations	33
Acknowledgments	37
Nomenclature; Abbreviations	38
Glossary	39
Literature cited	41

Tables

Table 1. List of Invertebrates: Kiholo park locality	24
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Figures

cover	Looking makai across Kiawe and fountain grass	i
Figure 1.	Map showing location of project site on island of Hawai'i	2
Figure 2.	Kiawe (<i>Prosopis pallida</i>) and 'Ilima (<i>Sida</i> sp.)	4
Figure 3.	Pua kala or Prickly poppy (<i>Argemone glauca</i>)	4
Figure 4.	Sweeping with net for flying insects	7
Figure 5.	Night active invertebrates responded to the MV light census	9
Figure 6.	UV light is attractive to invertebrates	9
Figure 7.	Map Kiholo area showing light monitoring sites	10
Figure 8.	Honu or Green sea turtles	12
Figure 9.	'Auku'u or Black-crowned Night-Heron	13
Figure 10.	Kioea or Bristle-thighed Curlew	13
Figure 11.	Native seed bugs (<i>Nysius</i> sp.)	14
Figure 12.	<i>Tamsica</i> moth sits on prickly poppy	16
Figure 13.	<i>Tamsica</i> moth sips prickly poppy nectar	16
Figure 14.	Globe skimmer (<i>Pantala flavescens</i>)	17
Figure 15.	Native beach cricket (<i>Caconemobius sandwichensis</i>)	18
Figure 16.	<i>Caconemobius</i> live in the splash zone of rocky beaches	18
Figure 17.	<i>Macaria abydata</i> moth and caterpillar	19
Figure 18.	Black witch moths (<i>Ascalapha odorata</i>)	19
Figure 19.	Kou trees damaged by <i>Ethmia nigroapicella</i>	20

Table of Contents: Figures (continued)

Figure 20. Sonoran carpenter bee, female, male (<i>Xylocopa sonorina</i>)	21
Figure 21. Holes are likely to house the Sonoran carpenter bee	21
Figure 22. 'Ilie'e showing effect of leaf-cutter bees (<i>Megachile</i> sp.)	22
Figure 23. Common green darner (<i>Anax junius</i>)	23
Figure 24. Big-headed ants (<i>Pheidole megacephala</i>) attack other invertebrates	27
Figure 25. Feral goats were numerous; undeterred by thorny plants	28
Figure 26. <i>Hylaeus</i> male bee with yellow face	29
Figure 27. <i>Manduca blackburni</i> 's distinguishing orange markings	30
Figure 28. Orangeblack Hawaiian Damselfly (<i>Megalagrion xanthomelas</i>)	31
Figure 29. Pāhoehoe lava fields, home to lava crickets (<i>Caconemobius anahulu</i>)	31
Figure 30. Paper wasp (<i>Polistes exclamans</i>)	32
Figure 31. Healthy roots from overhead vegetation support lava tube ecosystems	36

SUMMARY

The North Kona shoreline area sampled in this survey yielded native and adventive invertebrates. No invertebrate listed as endangered or threatened under either federal or state statutes was observed within the survey area. One candidate species, *Megalagrion xanthomelas* or the Orangeblack Hawaiian Damselfly (Figure 28), is reported from the area, but was not observed during this search.

INTRODUCTION

This report summarizes the findings of a reconnaissance level field survey conducted by Steven Lee Montgomery, Ph. D., in support of a master planning process. The area is now referred to as Kīholo State Park Reserve (Figure 1). The survey inventoried terrestrial invertebrate resources¹ on approximately 4400 acres / 1780 hectares along the Kīholo Bay and adjacent shorelines and mauka to Queen Ka'ahumanu Highway, North Kona, Hawai'i.

The goal of this survey was to provide an overview or snapshot of the above ground terrestrial invertebrates present in the study area. The primary emphasis was on endemic and indigenous terrestrial arthropods. Particular effort was made to locate and identify any species having legal status under federal and / or state endangered and threatened species statutes (DLNR 1996, 1997, USFWS 2005a, 2007, 2010a, 2010b).

Native Hawaiian plant, vertebrate, and invertebrate populations are interdependent. Certain insects are obligatorily attached to host plants, using only that plant as their food and others provide pollination for native plants. Invertebrates such as insects and snails, as well as the fruit and seeds of native plants, are the natural foods of native birds. The health of native Hawaiian ecosystems depends on habitat quality and absence or low levels of continental predators and herbivores. Sufficient food sources, host plant availability, and the absence of continental dominants comprise a classic native, healthy ecosystem. Where appropriate in the survey discussion, host plants and introduced arthropods, birds, and mammals, are noted.

¹ Animals without backbones: insects, shrimp, snails, spiders, etc. A glossary is provided on page 39 to explain terms which may be unfamiliar to the general reader.

GENERAL SITE DESCRIPTION

The project area is on 8 miles of North Kona shoreline and extends from the ocean mauka to Queen Ka'ahumanu Highway, on the Island of Hawai'i (Figure 1). The area is bounded on the south by the Pu'uwa'awa'a – Ka'ūpūlehu district boundary and on the north by the Pu'uana'hulu – 'Anaeho'omalu boundary. The ground elevation within the survey area rises from sea level to approximately 300 feet (ft.) above sea level / 91 meters (m.) at the highest point where the property meets Queen Ka'ahumanu Highway.

Geologically, the site is a mix of 'a'ā and pāhoehoe lava. Lava tubes are present throughout the area. Much of the surface is uneven and irregular 'a'ā with ashy soil only in selected locations. Aside from older pāhoehoe areas, a few small kīpuka of vegetation are scattered across the property with a denser strand community.

Kiawe (*Prosopis pallida*) and fountain grass (*Pennisetum setaceum*) are often widespread (Figure 2). 'Ilima (*Sida* sp.) is present, but frequently browsed by goats (see *Species Not Observed*). Pua kala or prickly poppy (*Argemone glauca*) is locally abundant and provides pollen for invertebrates (Figure 3).

'Uhaloa (*Waltheria indica*) is widespread. Around the ponds, hala or pandanus (*Pandanus* spp.), niu or coconut (*Cocos nucifera*), milo (*Thespesia populnea*), hau (*Hibiscus tiliaceus*), and ironwood (*Casuarina equisetifolia*) mix with kiawe.

Biologically, the most diverse areas surround the coastal ponds. The ponds provide a year-round source of surface brackish water that supports some water dependent invertebrates and breeds food for some birds. There are no fresh water streams. Brackish and near-fresh water is present in shallow wells.

The area has been through a variety of changes as Polynesians and later residents adapted the area to their needs. Early Hawaiian use of the marine resources, construction of fish ponds, and establishment of dwellings, including use of lava tubes for shelter and storage, began the process of change (Ellis 1963). In the last two centuries lava flows in the area, most recently the Mauna Loa flow of 1859, have altered the landscape. Modern grazing of cattle at Kīholo Bay as part of ranch shipping operations and the change created by increased access on bulldozed roadways contributed to the decline of native vegetation and native invertebrate populations (Ahlo 1982; Baker 1922). This survey found evidence of extensive damage to plants by goats.



Figure 2. Kiawe is abundant but does not host native invertebrates. 'Ilima is present but under pressure from grazing by goats.



Figure 3 . Pua kala or prickly poppy hosts several native invertebrate species. Here *Tamsica hyacinthina* sips nectar.

SURVEY METHODS

Since 1970, I have taken part in field projects in many dryland locations on the Island of Hawai'i and throughout the island chain. In the 1980s, I was afforded a visit to Keawaiki, one of the private inholdings, where I was able to observe invertebrates. Surveys of other dryland areas have created a sizeable body of information on native invertebrate, vertebrate, and related botanical resources found in areas similar to the proposed Kiholo park (Bridwell 1920, Swezey 1935). My study design and my analysis of results utilize those experiences and the results of surveys conducted by others in similar locations.

Previous Surveys and Literature Search

A 1993 (TNC) survey was done at Kiholo Bay. The survey was helpful in preparing for this fieldwork and understanding the environment of the area. Surveying for terrestrial invertebrates was limited. Also, it appears fieldwork was restricted to the immediate Kiholo Bay area.

A search at the State's Office of Environmental Quality Control (2011) web site for surveys done on the property or in adjacent areas returned only one applicable project, a state land exchange with E. Bakken (Terry 2000), but invertebrates were not surveyed for that report. It appears the report was compiled from other writings, and little fieldwork was conducted. Most of the private inholdings predate the 1970s EIS process and no reports are on file for those projects (OEQC 2009, 2011; Alakai pers. com. 2010).

A search was made for independent biological studies associated with this site or with nearby sites. Searches were made in the Hawai'i State Library, Bishop Museum, and University of Hawai'i libraries. Online proprietary data bases such as Ingenta Connect were searched. Searches were made for publicly available articles mounted on the web (Google Scholar, Google Books, University of Hawaii's Scholar Space and eVols (2009, 2011). Data base searches were made in Bishop Museum's Arthropod (2002a) and Mollusk (2002b) checklists, and the University of Hawai'i, Hamilton Library's Hawai'i-Pacific Journal Index. (2009, 2011)

Searches were made in regional and national specimen databases which provide geographic access, such as the Pacific Basin Information Node (2009, 2011) and Hawai'i Natural Heritage Program (2011). The Hawai'i Natural Heritage Program (2011) database returned only one terrestrial invertebrate record: *Megalagrion xanthomelas* or orange-black damselfly. It was associated with the anchialine ponds in 1994.

Methods (continued)

Access to the area has always been limited by geography. Access by land was limited prior to construction of Queen Ka'ahumanu Highway and more recently a higher quality unpaved road leading to private in-holdings and nearly to the beach. In historic times, canoes and later inter-island passenger vessels stopped at Kīholo (Ellis 1963; Eve. Bull. 1896). Historic visitors to the area mention birds and plants, but not invertebrates (Ellis 1963, Independent 1897). Cattle operations brought people to Kīholo Bay and some vegetation can be discerned in photos of those operations, but images are not distinct enough to determine host plants for invertebrates (example: Baker 1922). A search for photographs or field notes by early archaeologists and biologists such as W. T. Brigham, J. F. G. Stokes, R. C. L. Perkins, or C. N. Forbes did not return results. Ornithologist George C. Munro did visit the area June 5-12, 1923, as part of a larger ornithological survey. His field notes from that visit do exist, but there is no mention of terrestrial invertebrates (Munro 1923). Botanist Joseph Rock visited in 1957, but again, no mentions of invertebrates. The area lacked the commercial sugar and pineapple agriculture which generated much of Hawaii's formal entomological surveys since the 1900s. The combination of these factors makes it unremarkable that this review showed no previous invertebrate surveys of the specific site.

Fieldwork

Field surveys were conducted between May 3 - 6, 2011. I conducted a general assessment of terrain and habitats at the start of the survey. Surveying efforts were conducted at various times of day and night, vital for a thorough survey. I particularly searched for and examined native plants as these were likely to host native invertebrates.

Fieldwork schedule:

May 3, 2011	Orientation, general collecting; light survey
May 4, 2011	General collecting; deploy bottle traps; light survey (see pg 8)
May 5, 2011	General collecting, deploy bottle traps; light survey
May 6, 2011	General collecting; retrieval of bottle traps

Survey Methods:

The following survey methods for terrestrial invertebrates were used as appropriate to the terrain, botanical resources, and target species.

General visual observation: At all times, I was vigilant for any visual evidence of arthropod presence or activity (e.g., in flight). Visual observations are a cross check that extends the reach of sampling techniques. Visual observation included turning over rocks, and examining dead wood and other debris.

Host plant searches: Potential host plants, both native and introduced, were searched for arthropods that feed or rest on plants. Wandering transects were followed throughout the coastal and inland area with emphasis on reaching native host plants.

Sweep nets: Sweeping is a common method of general collecting for most flying and perching insects. A fine mesh net was swept across plants, leaf litter, rocks, pond surfaces, etc. to collect any flying, perching, or crawling insects. (Figure 4) Transfer from the net was either by aspiration, or by placing the net contents directly into a holding container.



Figure 4. The borders and shallows of anchialine ponds were swept for flying insects attracted to the water.

Baiting: Baits are used to attract insect species to specific tastes or smells. For example, both native beach and lava crickets respond to a strong odor of decaying proteins. Baits can mimic that smell and attract those insects. Baits of old fish and odoriferous blue cheese, proven attractants, were placed at likely locations in bottle traps and checked periodically. Any insects at the bait are then observed and censused. This is much more efficient than roaming the research area seeking cryptic or night active insects. Baiting is a recognized method of censusing beach and lava crickets.

Methods (continued)

Light survey: A survey of insects active at night is vital to a complete record of the fauna. Many insects are only active at night to evade birds, avoid desiccation and high temperatures, or to use night food sources, such as night opening flowers. Light sampling uses a bright light source in front of a white cloth sheet (Figure 5). Nocturnal insects seem to mistake the collecting light for the light of the moon, which they use to orient themselves. In attempting to navigate, disoriented insects are drawn toward the collecting light and land on the cloth in confusion. This type of collecting is most successful during the dark phase of the moon or under clouds blocking moonlight.

Sampling was conducted for approximately 9 hours on each night of surveying. The light source was a mercury vapor (MV) bulb. An additional, ultraviolet (UV) (Figure 6) light source was used at all sites. Due to the remote location, competing light from street lights and other artificial sources was not a factor.

Locations were chosen based on experience, host plant proximity, and terrain. As the interconnection of arthropods and host plants is strong, light sampling was concentrated in areas with more host plants. The sample locations, marked on Figure 7, therefore are near the coastal ponds and strand vegetation.

Survey Limitations / Conditions

My ability to form advisory opinions is influenced in the following ways:

Collecting conditions:

Weather: Weather was favorable for surveying May 3-6, 2011. Thirty minutes of rain May 3 was not heavy and did not greatly disrupt collecting efforts. The atmospheric vog did not appear to alter the behavior of invertebrates and cleared skies after the rains did not make measurable differences in survey results.

Seasons: Weather and seasonal vegetation play an especially important role in a biological survey. Host plant presence/absence, and seasonal changes, especially plant growth after heavy rains, affect the species collected. Many arthropods time their emergence and breeding to overlap or follow seasonal weather, to coincide with growth spurts of important food plants. After seasonal rains, vegetation in the survey area was in a reasonable state to act as host to many invertebrates. Nevertheless, the low number of native plants, in part due to consistent browsing by goats, was a stronger factor in determining the invertebrates encountered than was the seasonal condition of vegetation. Monitoring at a different time of the year might produce a longer / shorter / different list of species.



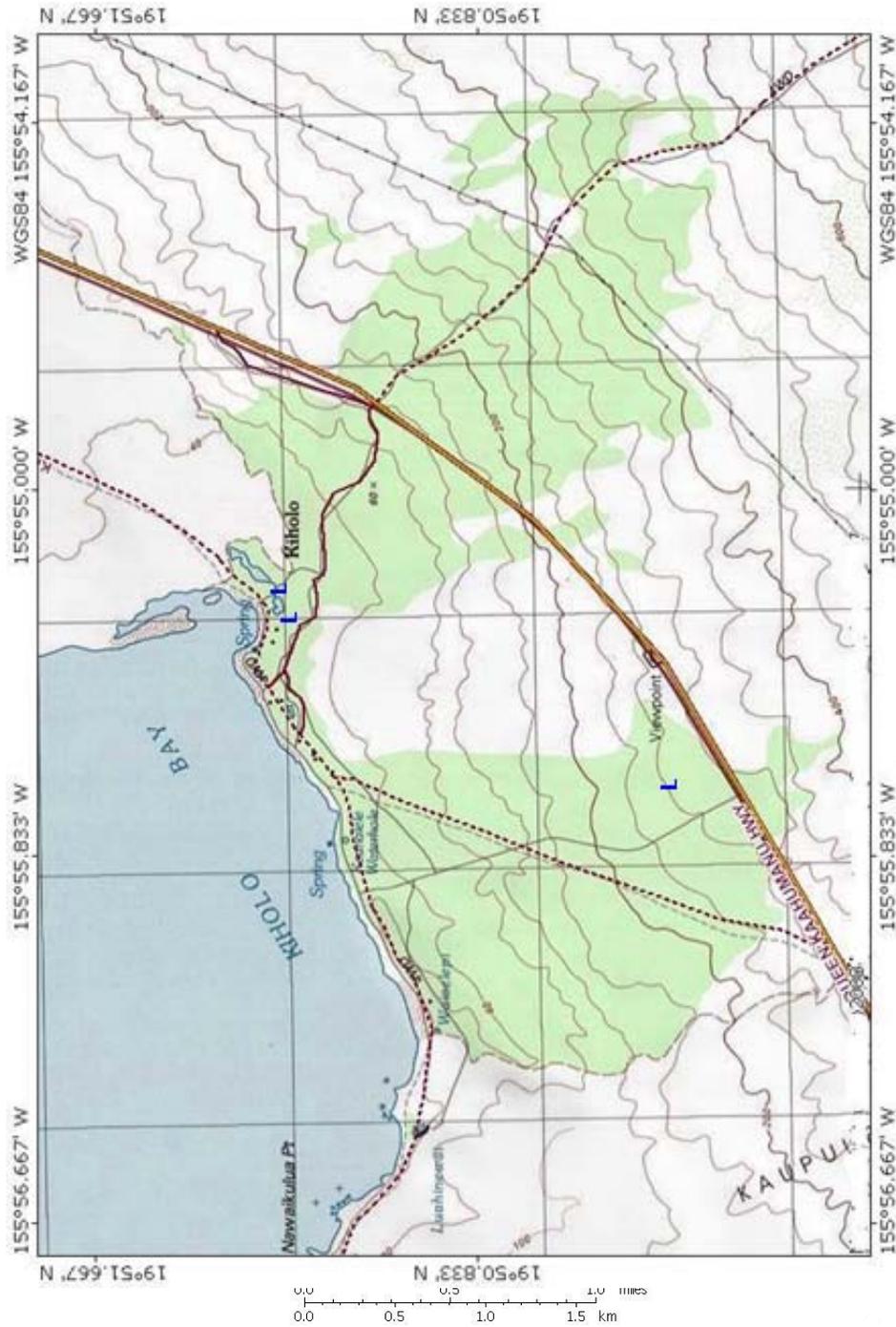
Figure 5. Night active invertebrates responded to the MV light census.



Figure 6. UV light is attractive to invertebrates as well.

Figure 7. Map of Kīholo area showing light monitoring sites.

L = light monitoring



Survey Limitations / Conditions (continued)

Moon: The moon was 'dark' and presented no competition to the collecting light on the evening of May 3, 2011. May 4-5 the moon was a waxing crescent with increasing portions visible, but rose in the early morning and set at roughly 8 and 9 pm leaving most of the night as dark (U.S. Naval Observatory). The complete lack of artificial light sources at the chosen sites compensated for the little competition offered by the sliver of moon in the earliest hours of the survey.

Limited duration: I believe the survey provides a reasonable review of the invertebrate resources present given the size of the property and the time allotted. It was however only a reconnaissance survey and is not definitive.

Difficulties in sampling a large area for a diversity of species assure that some will elude even the most experienced collector. The overall study strategy and site selections were designed to mitigate this recognized handicap to the extent possible. Given the size of the property, surveying for a longer period of time would enlarge the list of invertebrate species. A few species reasonably expected to occur on the property were not found (see Species Not Observed).

Selectivity: Within the proposed park area there are several in-holdings of private lands. Those areas are not part of this survey. Some outlying sections of the proposed park could not be reached in the time available. Due to the blockage of transit created by the inholdings, it would have been necessary to return to the highway and re-enter state coastal lands from mauka, reducing time that could have been given to the survey as a whole.

A review of lava tube invertebrate resources was not requested as part of this survey. Lava tubes are present throughout the area as noted by archaeological surveys. It is reasonable to assume lava tube fauna are present and indeed a previous partial survey noted the presence of lava tube species (Christiansen & Bellinger 1992; TNC 1993).

The invertebrate survey was focused on finding any terrestrial endemic and indigenous Hawaiian land species. No attempt was made to completely document the common alien arthropod species present. Marine and fresh / brackish water invertebrates were reviewed by other surveyors.

RESULTS OF SURVEY:**Incidental records:**

In addition to invertebrates, the following species were noted during the survey:

Honu or Green sea turtles	<i>Chelonia mydas</i>
Feral goat	<i>Capra hircus</i> Linnaeus
Rat	<i>Rattus</i> sp.
House Mouse	<i>Mus musculus</i> Linnaeus, 1758
African Silverbill	<i>Lonchura cantans</i>
‘Auku’u or Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>
Black Francolin	<i>Francolinus francolinus</i>
Kioea or Bristle-thighed Curlew	<i>Numenius tahitiensis</i>
Common Myna	<i>Acridotheres tristis</i>
Gray Francolin	<i>Francolinus pondicerianus</i>
House Finch	<i>Carpodacus mexicanus</i>
House Sparrow	<i>Passer domesticus</i>
Japanese White-eye	<i>Zosterops japonicus</i>
Northern Cardinal	<i>Cardinalis cardinalis</i>
Spotted Dove	<i>Streptopelia chinensis</i>
‘Ūlili or Wandering Tattler	<i>Tringa incanus</i> [audio only]
Yellow-billed Cardinal	<i>Paroaria capitata</i>
Yellow-fronted Canary	<i>Serinus mozambicus</i>
Zebra Dove	<i>Geopelia striata</i>



Figure 8. Honu or Green sea turtles (*Chelonia mydas*) were abundant

Incidental records (continued)



DISCUSSION

Native terrestrial invertebrate and vertebrate species of note are discussed. Also, information is provided on adventive species often misidentified or confused with native species by the public. Non-native species that constitute a danger to native species (e.g., ants; goats) or human beings (e.g., paper wasp) are discussed.

RESOURCES: NATIVE SPECIES PRESENT ON SITE

INVERTEBRATES: ARTHROPODA

ARANEAE (spiders)

Lycosidae: *Lycosa hawaiiensis* Simon, 1899 wolf spider

This endemic spider is known in similar habitat along this coast. They hide by day and hunt by night in established individual territories. This quick, strong predator will feed on non-native invertebrates allowing it to adapt to a changed menu. Females provide maternal care to their young. One individual was seen but not captured. (Manning/Montgomery in Liittschwager & Middleton 2001)

INSECTA

HETEROPTERA (True bugs)

Lygaeidae: *Nysius coenosulus* Stal 1859

This native seed bug (Figure 11), commonly found in dryland locations, uses many alien and native host plants. It is known from most islands in the Hawaiian chain. (Swezey 1954) It was found on site by the light survey.



Figure 11. Native seed bugs found the light a good place to meet partners.

Native species present (continued)

LEPIDOPTERA (butterflies, moths)

Cosmopterigidae: *Hyposmocoma* sp.

Several species of *Hyposmocoma*, as adults, came to light. *Hyposmocoma* are called “case bearers” because after an early beginning inside a leaf curl or similar hiding place, the caterpillars create protection in an intricately constructed portable “cave” woven of their own silk. For camouflage, using their silk, they cement to the case bits of their surroundings (snips of dry grass or leaves, flakes of bark, and a little dirt). The case is then easily mistaken by a predator as another part of the inedible landscape. These bunkers are fitted with a hinged lid (operculum), pulled shut by tiny mandibles to defend them from enemies. Their relationship to the case is similar to that of a hermit crab to his shell. They are dependent on their case, and die if removed – even if protected from predators and given food. They don’t move far, but feed while partly emerged from the case, dragging along protective armor by their six true legs. Cases are sometimes attached to rocks or tree trunks and foliage. (Manning/Montgomery in Liittschwager & Middleton 2001)

With over 500 kinds, *Hyposmocoma* micromoths are the greatest assemblage of Hawaiian Island moths, showing astonishing diversity. After writing 630 pages on them, Dr. Elwood Zimmerman lamented the inadequacy of his study. He noted an enormous cluster of species with explosive speciation and diverging radiation (Zimmerman 1978). Much remains to be learned about the life ways of this interesting group of insects now under study by University of Hawaii’s Dr. Daniel Rubinoff and his students (Rubinoff 2011).

Crambidae: *Eudonia* sp. (moss moth)

This endemic, narrow winged, speckled moth is represented on Hawai’i Island by more than 30 of the 60 species known in the island chain. None are considered rare, endangered, or threatened.

Some species have been reared from moss where they build silken tunnels of protection in which to feed (Swezey 1910), but for many species the host plant is not recorded yet. (HBS 2002a, HOSTS, Zimmerman 1958b)

Native species present: Lepidoptera (continued)

Tamsica hyacinthina (Meyrick 1899)

The caterpillars feed on a wide variety of grasses, allowing them to adapt to the



island's changing flora. The genus was described by E. C. Zimmerman as "a cluster of poorly understood, obscure, difficult little species." (1958b) Pioneering biologist R. C. L. Perkins noted, "They are able to flourish in the driest localities near the coast..." (Perkins 1913). Adults sip nectar at many different plants. At Kīholo, pua kala or prickly poppy provides nectar.

(Figures 12 and 13)

Figure 12. *Tamsica* moth sits on prickly poppy



Figure 13. *Tamsica* moth sips prickly poppy nectar.

Native species present (continued)

ODONATA (Dragonflies and Damselflies)

Libellulidae: *Pantala flavescens* Globe skimmer

An indigenous dragonfly (*Pantala flavescens*) (Figure 14) was observed on the property. Among the most easily observed native insects, they are large, easily approached by people, and graceful in flight. Any small amount of fresh water will attract them and they often colonize human maintained water sources such as golf-course water hazards and stock tanks. Globe skimmers are widely distributed throughout the Hawaiian Islands, from Kure to Hawai'i Island (HBS 2002a, Nishida 2002) and have even been found flying at sea (Howarth & Mull 1992).



©¹ Figure 14. Globe skimmers use a wide variety of water sources.

¹ Some images used in this report were not taken in the course of this project. These photos, marked by © symbol were made by Anita Manning and/or S. L. Montgomery prior to this contract and were chosen because they best illustrate the subject.

Native species present (continued)

ORTHOPTERA (Praying Mantis, Grasshoppers, Crickets)

Gryllidae: *Caconemobius sandwichensis* Beach cricket

Caconemobius sandwichensis (Figure 15) are specialists feeding on marine detritus in the splash zone among boulders statewide (Figure 16). Being nocturnal, they were seen only by baiting - luring them into bottles and similar traps with baits of rotten fish or blue cheese. They were widespread in the littoral zone.



Figure 16 *Caconemobius* live in the splash zone of rocky beaches, emerging at night to feed on marine debris .

ALIEN SPECIES PRESENT ON SITE
INVERTEBRATES: ARTHROPODS: INSECTA

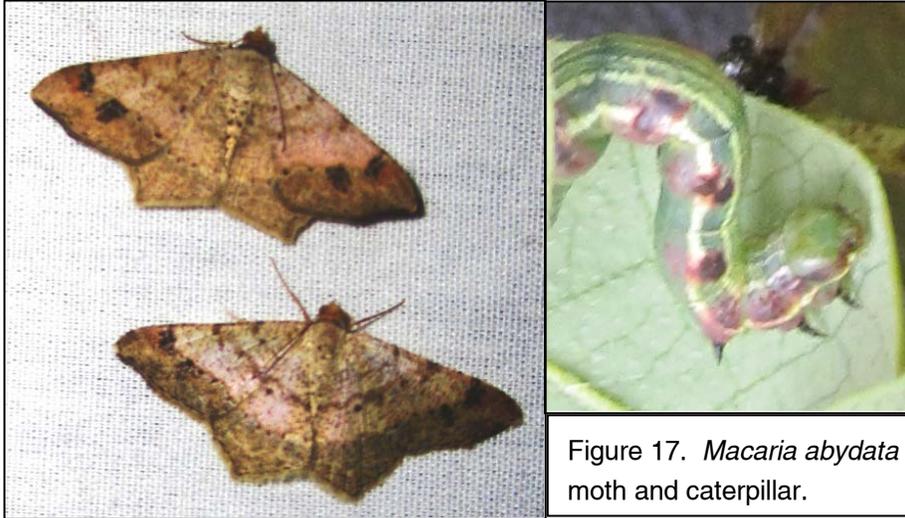


Figure 17. *Macaria abydata* moth and caterpillar.

LEPIDOPTERA (butterflies and moths)

Geometridae: *Macaria abydata* Guenee, 1857 Koa haole moth

The Koa haole moth (Figure 17) is common throughout the islands. It feeds on a wide variety of native and alien plants, especially legumes. Caterpillars can reach large numbers and strip plants. Usually, parasites and predators are attracted to this large food source and reduce the population.

Noctuidae: *Ascalapha odorata* (Linnaeus, 1758)

Black witch moth



© Figure 18. Black witch moths, eyes glowing in the camera flash, dine on a banana slice.

The black witch moth (Figure 18) has been widely distributed in the island chain since the first sightings at Hōnaunau in 1928 (Bryan 1929). This large moth is occasionally mistaken for a bat, especially as it is most frequently seen at dawn or dusk. Although in cities it rests under the eaves of roofs during the day, at Kīholo it is likely to hide in lava tubes, or high on tree trunks. It responded to my light survey.

Alien species present: Lepidoptera (continued)

Oecophoridae: *Ethmia nigroapicella* (Saalmueller, 1880) *Cordia* defoliator
Kou trees on the property may reflect chewing damage by the caterpillar of *Ethmia nigroapicella*, erroneously, but officially, named the Kou leafworm (caterpillars are not worms). Dr. Hillebrand, Honolulu physician / botanist, remarked on their damage in his 1888 *Flora of the Hawaiian Islands* (1888, in Hardy 1978) indicating their relatively recent introduction to the islands. As late as 1944, O. H. Swezey remarked on their destruction of trees. Today their numbers appear reduced, but caterpillar populations can become large and do great damage to the trees. Additionally, the associated webbing is unsightly. The moth responded to my light survey.



© Figure 19. Kou tree leaves showing typical damage by caterpillars of *Ethmia nigroapicella*. Moth inset above left.

Alien species present (continued)



© Figure 20. Female bees are black; Male bees are golden.

HYMENOPTERA (wasps, bees, ants)

Anthophoridae: *Xylocopa sonorina* F. Smith, 1874 Sonoran carpenter bee
 The Sonoran carpenter bee (*Xylocopa sonorina*) a large, introduced bee (Figure 20) was seen in several areas. Their name derives from their activity of chewing distinctive round, shallow tunnels for a home in soft, dry, dead wood. Males are golden and limited in number; females more numerous and black. Although relatively large, and noisy in flight, they are usually harmless. When dry wood where carpenter bees might live is disturbed, the bees will fly out to protest and come quite close to people, but do not sting unless handled. At Kiholo, abandoned fence posts and other dry wood are being used as carpenter bee homes (Figure 21).



Figure 21. Dry wood showing round holes are likely to house the Sonoran carpenter bee



Alien species present: Hymenoptera (continued)

Megachilidae: *Megachile* sp. leaf-cutter bee

Although this bee was not seen, the presence of leaf-cutter bees is inferred from the distinctive damage to leaves (Figure 22). Two species are known from Hawai'i Island: *M. diligens* and *M. timberlakei*. The female bees use their jaws to scissored out a half-round of leaf. The circlet is flown back to their solitary nest in a hollow stem or natural hole in dry wood. They have also been known to use human discards (umbrella handles, broken tent poles, abandoned bamboo fishing poles, and similar human-made 'hollow stems'). At the nest, the leaf becomes a combination wallpaper and Ziploc baggie lining and partitioning the nest into cells to hold nectar and pollen as food stores for the young that will emerge from an egg laid atop the food.

The bees are known to sting humans only when handled (Cranshaw 2006). The bees may well compete with native bees (*Hylaeus* sp.) for pollen. Although they do not strip plants, the reducing of leaf area does lessen photosynthesis capability. As balance, they are considered beneficial as their gathering transfers pollen from plant to plant (Cranshaw 2006, Williams 1931). As wild honey bee populations decline, like the native bees, the *Megachile* may become more important pollinators in home gardens and for wild plants.



Figure 22. 'Ilie'e (*Plumbago zeylanica*) showing effect of leaf-cutter bees.

Alien species present (continued)

ODONATA (Dragonflies and damselflies)

Aeshnidae: *Anax junius* (Drury, 1770) common green darner

This wide-spread introduced species responded to my light survey (Figure 23) near the ponds.



Figure 23. *Anax junius* attracted to the UV light survey.

ORTHOPTERA (Praying Mantis, Grasshoppers, Crickets)

Gryllidae: *Gryllodes sigillatus* (Walker), 1869 Flightless field cricket

This world-wide traveler was first recorded in the Hawaiian Islands in 1895 (Zimmerman 1948). In the years since, it has spread up and down the island chain.

Although superficially similar in appearance, *Gryllodes sigillatus* males 'sing' by rubbing vestigial wings together, while the native species *Caconemobius anahulu* is wingless and mute.

Table 1: Invertebrates: Kīholo State Reserve Park area, North Kona, Hawai'i

Species	Common Name	Status	Frequency	Notes
ARTHROPODA				
ARACHNIDA				
ARANEAE	spiders			
Lycosidae				
<i>Lycosa hawaiiensis</i> Simon, 1899	wolf spider	End	U	with egg sac
INSECTA				
COLLEMBOLA	springtails			
Entomobryidae				
undetermined sp. 1		?	U	under stones
DERMAPTERA				
<i>Euborellia eteronoma</i> (Borelli, 1909)	earwig	End	C	in shore traps
DIPTERA	flies			
Canaceidae				
<i>Canaceoides hawaiiensis</i> Wirth, 1969	beach fly	End	A	
Ceratopogonidae				
<i>Forcipomyia hardyi</i> Wirth & Howarth, 1982	Hardy's midge	End	A	at light
Chironomidae	bloodworm midges			
<i>Chironomus hawaiiensis</i> Grimshaw, 1901		End?	C	at light
Culicidae	Mosquitoes			
<i>Aedes albopictus</i> (Skuse, 1894)	forest day mosquito	Adv	O	breeds in trash
<i>Culex quinquefasciatus</i> Say, 1823	Southern house mosquito	Adv	O	breeds in water on boat cover
Dolichopodidae				
<i>Hydrophorus williamsi</i> Parent, 1938	tidal long-legged fly	End	A	
Ephydridae				
<i>Scatella</i> sp.	shore flies	End	C	pond edges; observed only
HETEROPTERA	true bugs			
Lygaeidae	seed bugs			
<i>Nysius coenosulus</i> Stal 1859		End	A	at light

Species	Common Name	Status	Frequency	Notes
HOMOPTERA	planthoppers			
Cicadellidae	leafhoppers			
<i>Balclutha hospes</i> (Kirkaldy)		End	U	
<i>Nesophrosyne</i> sp. 1		End	R	
HYMENOPTERA	wasps, bees, ants			
Anthophoridae				
<i>Xylocopa sonora</i> F. Smith, 1874	carpenter bee	Adv	C	
Formicidae	ants			
<i>Camponotus variegatus</i>	carpenter ant	Adv	U	to light
<i>Anoplolepis gracilipes</i> (F. Smith, 1857)	longlegged ant	Adv	C	
<i>Pheidole megacephala</i> (Fabricius, 1793)	big-headed ant	Adv	A	
Megachilidae	leaf-cutter bees			
<i>Megachile</i> sp.		Adv	C	
Vespidae	wasps			
<i>Polistes exclamans</i> Viereck, 1906	common paper wasp	Adv	C	
LEPIDOPTERA	butterflies & moths			
<i>Anatrachyntis incertulella</i> (Walker, 1864)		Adv	U	
<i>Hyposmocoma</i> sp. 1	black adult	End	O	at light
Crambidae (Pyalidae)	micro-moths			
<i>Eudonia</i> sp. 1	moss moth	End	C	at light
<i>Mestolobes</i> sp.		End	U	at light
<i>Omiodes blackburni</i> (Butler, 1877)	coconut leafroller	End	U	leaf damage only
<i>Orthomecyna exigua exigua</i> (Butler, 1879)		End	C	at light
<i>Tamsica hyacinthina</i> (Meyrick 1899)	dryland grass moth	End	A	at light
Geometridae				
<i>Macaria abydata</i> Guenee, 1857	koa haole moth	Adv	A	at light
Noctuidae				
<i>Ascalapha odorata</i> (Linnaeus, 1758)	black witch moth	Adv	O	observed at light
Oecophoridae				
<i>Ethmia nigroapicella</i> (Saalmueller, 1880)	Kou leafworm	Adv	O	leaf damage, widespread

Species	Common Name	Status	Frequency	Notes
ODONATA	dragonflies; damselflies			
Aeshnidae				
<i>Anax junius</i> (Drury, 1770)	common green darner	Adv	C	at light
Libellulidae	skimmers			
<i>Pantala flavescens</i> (Fabricius, 1798)	globe skimmer	Ind	O	in flight
ORTHOPTERA	praying mantis, grasshoppers, crickets			
Gryllidae	crickets			
<i>Caconemobius sandwichensis</i> Otte, 1994	beach cricket	End	C	in shore traps
<i>Grylodes sigillatus</i> (Walker) 1869	flightless field cricket	Adv	C	on lava

STATUS:

End endemic to Hawaiian Islands
 Ind indigenous to Hawaiian Islands
 Adv adventive
 Pur purposefully introduced
 ? unknown

FREQUENCY = occurrence ratings:

R Rare seen in only one or
 perhaps two locations.
 U Uncommon- seen in several locations
 O Occasional seen with regularity
 C Common observed numerous times
 A Abundant found in large numbers
 AA Very abundant abundant and dominant

SPECIES NOT OBSERVED ON THE SITE

INVERTEBRATES

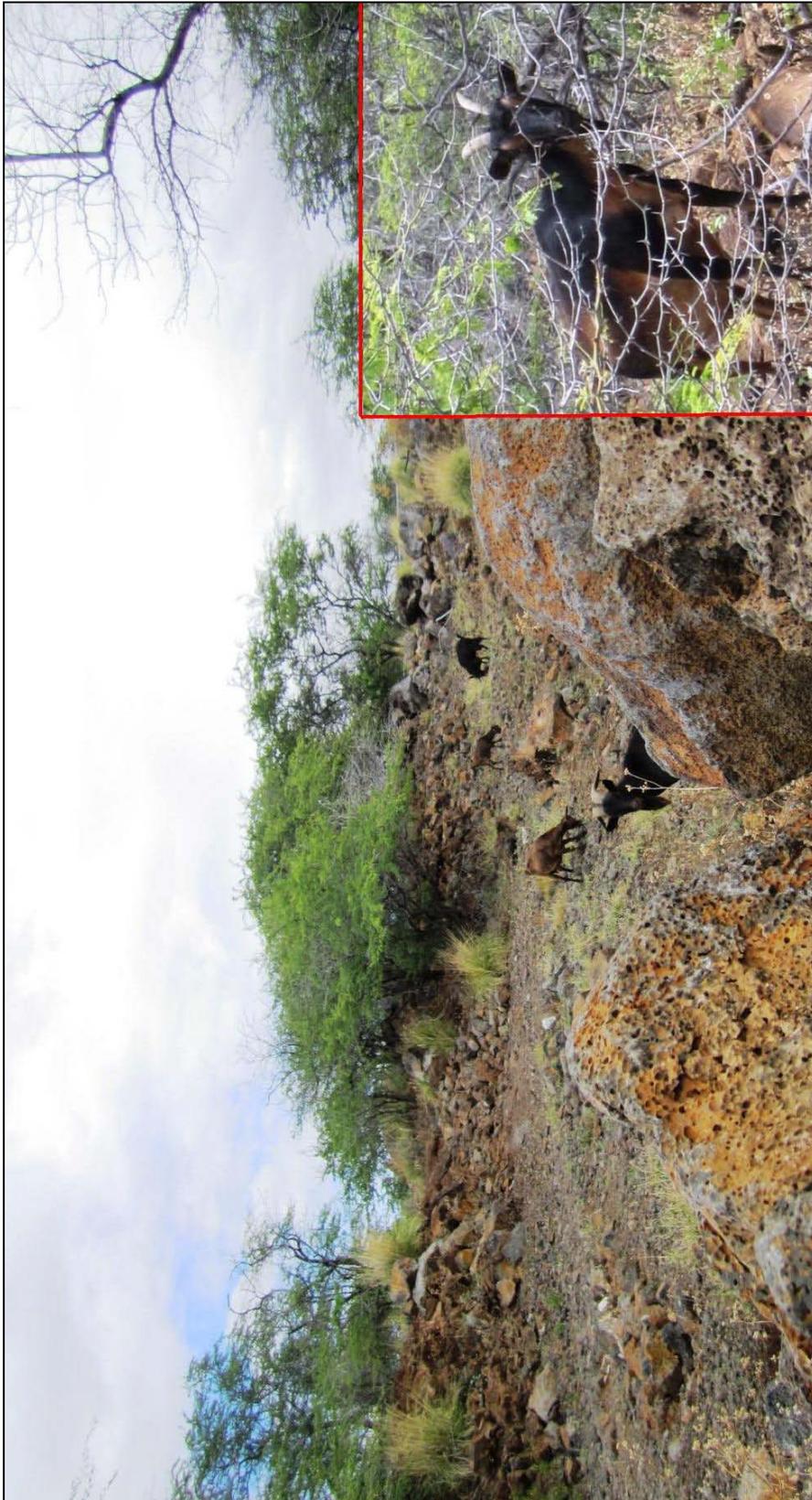
Alien predatory ants are a major cause of low numbers of native arthropods. The bigheaded ant (*Pheidole megacephala*), and longlegged ant (*Anoplolepis gracilipes*), which prey on other insects (Zimmerman 1948-80), are present on the property. Ants are well documented as a primary cause of low levels of native arthropods at elevations up to 2000 ft. (Perkins 1913). On all nights, during light censusing, ants quickly appeared and began attacking the resting moths and smaller insects at my light (Figure 24). Ant populations often do not overlap. Rather they have separate territories, effectively apportioning the hunting grounds between themselves, offering few, if any, ant-free zones where native arthropods can thrive.



©Figure 24. Big-headed ants appeared each night at my light survey. Their hunting technique is to overpower prey in large numbers, dismember the insect, carrying off parts to the nest. The group on the right is guarded by a soldier (larger, far left).

Feral goats (*Capra hircus* Linnaeus) (Figure 25) were present in large numbers and browsing on plant resources in several locations in the property. Although goats do not eat native invertebrates, they destroy the required host plants, effectively denying habitat to endemic and indigenous invertebrates. The lack of native yellow-faced bees may be, in part, due to goat browsing on 'ilima severely reducing pollen sources.

Figure 25. Feral goats were numerous on the site and undeterred by thorny plants



Not observed: Invertebrates (continued)

MOLLUSCA

GASTROPODA (Snails)

The place name 'Kiholo' is associated with Bishop Museum specimen records indicating the past presence of several land snail species (PBIN 2011). Although none were seen in this short survey, it is likely a longer search or a search at a different time of year would have found some representatives of *Succinea*. *Succinea*, one of the species previously collected from this locality (MO49860 MO 50046, Gouveia 1919), are generalist surface feeders and persistent in even degraded habitat.

ARTHROPODA

INSECTA

DIPTERA: Drosophilidae: *Drosophila* spp. Picture-winged flies

The location does not provide appropriate habitat for any of the 12 native *Drosophila* species recently listed as endangered or threatened and none were observed. (USFWS 2006a, b).

HYMENOPTERA

(Bees, wasps, and ants)

Colletidae: *Hylaeus* sp. yellow-faced bee

The yellow-faced bee was expected based on habitat and elevation, but not observed. Nine species of this bee are recorded pollinating 'ilima flowers, but the 'ilima present at Kiholo has been heavily browsed by feral goats and no blooms were present. Although it is possible a longer search or surveying at a different time of year might locate the bees, the damage to an important food source by goats surely harms their chances of survival at this site.



© Figure 26. *Hylaeus* male with yellow face

This native, non-stinging bee is widespread in island coastal zones. Yellow-faced bees comprise over 60 species, more than 25 on Hawai'i Island. They are important to the native flora as pollinators. The females of this native, ground nesting bee are larger than males and lack the yellow face spots of males (Figure 26). Males and females live in individual tunnels. Daly & Magnacca (2003)

Not observed: Hymenoptera (continued)

These bees may become more important in pollinating crops and home gardens due to a reduction in honey bee populations. The parasitic *Varroa* mite, recently introduced to O'ahu from North America is now spreading through Hawai'i Island honey bee hives. As the *Varroa* mite kills many individual honey bees, entire colonies die. In the future, the unaffected yellow-faced bee may fill some pollinating needs.

LEPIDOPTERA:

Noctuidae: *Agrotis* sp. nr. *microreas* Meyrick, 1899

Agrotis moths are found from the barren, high elevations of Mauna Kea and Mauna Loa to these lava coasts. These interesting moths are found only on what appear to humans as barren, open lava flows and cinder areas. Although the adults did not respond to the light survey, I believe they would be found in a longer, more wide-spread survey. Their life history and the diet of caterpillars are little known, making it hard to search for a host plant to verify their presence.

Sphingidae: *Manduca blackburni* Blackburn's sphinx moth

Blackburn's sphinx moth (*Manduca blackburni*), (Figure 27) an endangered species (Fed Reg 1999-2000) which favors leeward slopes, was not found in this survey. The moth's solanaceous native host plant, 'aiea (*Nothocestrum* sp.), and best alien host, tree tobacco (*Nicotiana glauca*), were not observed on the property. *Capparis sandwichiana*, a nectar plant favored by the adult moth, was not encountered in my surveying, but is common at other Kona coastal sites.

Although the original *Recovery Plan* (USFWS 2005b) for this large sphinx moth proposed two small management areas in North Kona, Hawai'i, the *Final Rule* (USFWS 2003) designated habitat only at the more inland location, Pu'uwa'awa'a. Neither originally proposed location was near the survey site.



© Figure 27. Blackburn's sphinx moth is distinguished from other hawk moths by orange markings.

Not observed: Invertebrates (continued)



© Figure 28. An Orangeblack Hawaiian Damselfly rests between flights

ODONATA:

Coenagrionidae: *Megalagrion xanthomelas*
Orangeblack Hawaiian Damselfly

This native dragonfly (Figure 28) is a candidate for Endangered Species Act protection because of threats to habitat and predation by non-native species (USFWS 2010c). *M. xanthomelas*, however, is rated priority level 8 for U.S. Fish & Wildlife Service protective action, meaning they are not likely to receive action soon (USFWS 2010a). Only a single male was reported from the general area of the ponds in 1994 (Haw. Nat. Heritage Prog. 2011). A longer search might well yield a sighting.



Figure 29. Pāhoehoe lava with multiple cracks is typical cricket habitat .

ORTHOPTERA (Praying Mantis, Grasshoppers, Crickets)

Gryllidae: *Caconemobius anahulu* Lava cricket

This species was first discovered by Dr. D. Otte on open lava 1 km from 'Anaeho'omalu Bay, Hawai'i. In a major revision of Hawaiian crickets Otte writes the species "may be widespread along the western slopes of Hawaii Island."(Otte 1994) This writer

Not observed: Orthoptera (continued)

has indeed found them at more sites, including Keawaiki. The lava cricket is not known as an agricultural or household pest. Rather, the crickets are part of the food chain that consumes dead insects and other aeolian organic debris. I collected this species at Keawaiki in the 1980s as well as north and south of this location over the past years. Due to the short time allotted in this survey, traps were not laid out specifically for this species. I believe if a dedicated search was made, the species would be common as habitat (Figure 29) and resources are appropriate.

MEDICALLY IMPORTANT SPECIES ON THE SITE



© Figure 30. Paper wasp

Invertebrates:

Although not seen during the survey, the project area includes some classic habitat for centipedes, scorpions, and widow spiders. The Western yellow-jacket is unlikely in this habitat. Common paper wasps (*Polistes exclamans*) (Figure 30) and honey bees were seen on the property.

Those entering the property should be alert for these species which may pose a serious risk to some individuals. Supervisors should be aware of any employee allergies. Some individuals can experience anaphylactic reactions to venom.

Wasps can sting repeatedly and pose a particular hazard to children due to their smaller body weight. Before entering lava tubes, inspect overhangs for wasp nests. Never put hands where eyes cannot see. When moving stones or piled brush, workers can greatly reduce the risk of accidental contact and bites or stings with all species noted here by the use of gloves and wearing long sleeved shirts, long pants, boots with socks pulled up over pant cuffs. Campers should not leave sweet liquids in the open or unattended as these will attract bees or wasps.

Mosquitoes: *Aedes albopictus* was seen in small amounts of water created in the drooping cover of a small boat. *Culex quinquefasciatus* also is likely to be present. Both species are widespread in the islands and known to be vectors of disease for humans (*A. albopictus*, dengue) and birds (*C. quinquefasciatus*, bird malaria) (Goff & van Riper 1980). Care should be taken during planning and design of new facilities not to create standing water without control methods. Control of trash will also be important in preventing breeding of both species.

Please see *What Bit Me?* (Nishida & Tenorio 1993) and *What's Bugging Me?* (Tenorio & Nishida 1995) for further advice and cautions.

Medically Important (continued)

Vertebrates:

Evidence of rats and mice was observed on the property. Rats have a long history as hosts to insects (fleas) which posing a danger to human health by transmitting disease . They are documented as attacking nesting birds (Tomich 1986). Both rats and mice damage the seeds of native plants reducing natural replacement of mature plants which host invertebrates. The abundance of Fountain Grass seed heads probably helps sustain to the mice population. Mice particularly appeared unafraid of humans. Both will damage campers' equipment, food, and tents. Mice easily hide in vehicles, boxes, etc. and are carried back to a residence. Care should be taken during the construction phase not to create conditions that will lead to an increase in populations. Once the park is in use, trash disposal will be important in rodent control and so allow native seeds to sprout and host invertebrates.

POTENTIAL IMPACTS**Potential Impacts on Native, Rare, Federally or State Listed Species**

No federally or state listed endangered or threatened land invertebrate species were noted in this survey (USFWS 2010b).

The anchialine ponds support and affect all other wildlife within the project area and are extremely fragile. Several invertebrates spend part of their life cycle in the ponds, including some that are useful food sources for rare birds. Actions related to the ponds should be specifically assessed as project plans are finalized.

RECOMMENDATIONS**Shield external lighting:**

During construction and in the finished project and roadways, it will be important to plan to shield outdoor lighting. Artificial lighting would be attractive and confusing to many arthropods (see *Methods: Light survey*), concentrating them as easy prey for feeding bats at night. Insects attracted to lights at night often remain in place at dawn and are easily seen and consumed by birds. Unshielded lighting is well-known for confusing, exhausting, and stranding sea birds and turtles making them vulnerable to predators. Additionally, the Hawaii County Code § 14 – 50 et seq. requires shielding exterior lights, to reduce glare interference for the astronomical observatories located on Mauna Kea.

Recommendations (continued)

Landscape with native dryland plants for lower cost maintenance:

We anticipate a botanical survey will recommend landscaping any areas disturbed by roadway and rest room construction with native dryland adapted plants. Information also could be given to inholding landowners on landscaping with native plants. Planted in a mix of ground cover, shrub, and tree heights, native plants will slow run off and retain moisture when rains do come. Native plants will remain green and more fire resistant throughout dry periods. Most native plantings have lower maintenance costs as well. Native species need less hedge trimming, weed whacking, and usually grow well without fertilizers, reducing cost and the potential for non-point pollution potential for the ocean and anchialine ponds. Native species will provide educational, visual, and aesthetic benefits to park users while conserving water. Native plants will create interesting areas for walking, cultural learning, nature study, and bird watching. Native invertebrates will find this refuge over time. Native birds will obtain food from fruits and seeds and the native invertebrates hosted by the plants.

Resources helpful in understanding Hawaiian plants include *Native Hawaiian Plants for Landscaping, Conservation, and Reforestation* (Bornhorst & Rauch 1994) and *Growing Native Hawaiian Plants* (Bornhorst 2005). By prior arrangement with growers, native Hawaiian plants can be as convenient to mass plant as the introduced plants commonly used to re-vegetate after new construction. Plants grown from seeds gathered from plants in the Kiholo area would be especially well adapted to local conditions.

Prevent habitat degradation:

We recommend removal of selected alien plants in and around the pond and beach areas (e.g., Mangrove seedlings). Replacement of alien plants with natives during the park realization can provide invertebrate host plants and food for native birds.

It is important to prevent establishment of new competitive plant or predatory alien invertebrate species during any building activities (such as restrooms or roads).

In coordination with native plant fostering, the exclusion of goats and or a goat hunting program can be very helpful in encouraging native plants and the zoological resources which depend on them. Goats contribute to plant deaths, resulting in open soil. In areas such as this, where rains come only very sporadically, erosion from flash run-off can seriously affect off-shore water quality and fishing resources or despoil anchialine ponds with silt. Browsing also removes growing tips, where flowering, pollen and seed production take place, resulting in reduced or no replacement generations, creating a senescent plant community. [see also Lava tube species below]

Recommendations (continued)

A **Best Practices Management Plan** should be written prior to any construction specifying methods and controls for the construction zone to prevent or minimize runoff, spills, and impact on the makai coastal habitats and anchialine ponds as well as archaeological sites. A part of the plan would establish construction staging areas and storage of materials well away from the most fragile sites.

Invasive species, alien to a Hawaiian ecosystem, can do terrible damage to native invertebrates and reduce native plant pollinators, and food resources for native birds. Two factors influence establishment of alien species which prey on and compete with native species: access and regular food sources. Soil packed in tires, on helicopter runners, or workers' or hikers' boots can transport seeds and insect or snail eggs. Ants, snails and slugs, and many other invertebrates can hide in boxes or equipment resting at one location and later be carried to Kiholo sites.

To prevent establishment of alien species:

Inspect construction materials for hitchhiking seeds or animals. When establishing landscape plantings after construction, care should be taken to prevent alien plant or animal species from being introduced on the plantings, associated soil, or pots. Signage could warn park users of the damage done by releasing pets, dumping potted plants, etc. For example, released pet Jackson's Chameleon (*Chamaeleo jacksonii*) will feed on both native snails and arthropods (Holland, Montgomery, Costello 2010).

Clean tools, boots, and equipment used at other projects to minimize the chance of transporting new pest plants or animals to the area during construction / road building. Boot cleaners should be installed at all trail heads and near rest rooms.

Remove trash regularly. Predatory invertebrate species such as ants easily establish in areas where food trash is consistently available. Food trash can attract and / or increase mongoose, cat, and rat and mice populations as well, resulting in predation on birds and native seeds. Provide trash cans at construction and camping areas where food is consumed, provide can covers, and empty cans frequently. Importantly, construction supervisors need to establish with crew members a culture of using the receptacles. [also see comments on trash and mosquito, mouse, and rat control]

Restrict food sources: Do not allow employees or park users to feed cats or encourage cat colonies. Food meant for cats will feed rats and mice and attract ants and mongoose. Rats appear to be eating fallen coconuts that are not collected. This is a rich source of calories and thought should be given to removing them regularly.

Restrict animal access: Do not allow employees or park users to bring pet dogs or cats to the site. Even well behaved animals can escape a leash and fail to return on command. Dogs will harass and kill birds and turtles.

Recommendations (continued)

Lava tube species:

Fulfillment of any plan to preserve lava tube archaeological sites will help protect any cave adapted invertebrate species which may be present in lava tubes not examined by this survey. Control of goats would reduce damage to and loss of plants atop lava tubes. Plant roots descending into lava tube interiors are the basis of that ecosystem and needed by the cave plant hoppers (Figure 31). The roots are reduced or destroyed when plants are damaged or killed by goat browsing.



© Figure 31. To support a thriving lava tube ecosystem, a cavern needs healthy roots penetrating from overhead vegetation. photo Feb 2008 near Volcano

Community Education:

The best defense any fragile ecosystem can have is an informed public. Providing defined pathways would reduce trampling of plants and disturbance of wildlife. Signage to explain the botanical, avian, and invertebrate resources and their role in the history and future life of the community will be important. Partnering with community environmental and cultural groups to provide information and guidance about enjoying preserved beach side areas, archaeological, and natural features, would make preservation more effective. The area could function as a resource for schools K-graduate studies while age-appropriate instructional materials were developed for use by teachers and home schoolers.

Recommendations (continued)

Examples of invertebrates that might be seen by visitors and be part of an interpretation program include

- Damselflies and dragonflies, magnificent in flight, are easily seen and approached;
- Carpenter bees are large enough to see and their size and noise give people the inaccurate impression they are dangerous;
- Yellow-faced bees as ground nesters need the visitor's understanding to assure their protection;
- Leaf-cutter bee damage to leaves is easily seen and often causes questions about what creature created the cut-outs;
- Lava tube invertebrates could be added to the explanation of why it is important for visitors to stay out of the tubes.

ACKNOWLEDGMENTS

Thanks are extended to Nicholas Mitchell for assistance in the field. Special thanks are due to R. David for shepherding access. The Dept of Land and Natural Resources provided permits to collect voucher specimens to validate identification of native invertebrates and State Parks Division for camping.

Steven Lee Montgomery directed all surveys and is responsible for all conclusions. Anita Manning contributed to preparation of this report.

STANDARD NOMENCLATURE

Bird names follow *Hawaii's Birds* (Hawaii Audubon Society 2005)

Invertebrate names follow

Freshwater & Terrestrial Mollusk Checklist (HBS 2002b)

Common Names of Insects & Related Organisms (HES 1990)

Hawaiian Terrestrial Arthropod Checklist (HBS2002a; Nishida 2002)

Mammal names follow *Mammals in Hawai'i* (Tomich 1986)

Place name spelling follows *Place Names of Hawai'i* (Pukui et al. 1976)

Plant names follow

Manual of the Flowering Plants of Hawai'i (Wagner et al. 1999)

A Tropical Garden Flora (Staples and Herbst 2005)

ABBREVIATIONS

DLNR	Department of Land and Natural Resources, State of Hawai'i
DOFAW	Division of Forestry and Wildlife, State of Hawai'i
ft.	feet
HBS	Hawai'i Biological Survey
m.	meter
MV	mercury vapor
n.	new
sp.	species
spp.	more than one species
TMK	Tax Map Key
UH	University of Hawai'i
USFWS	United States Fish and Wildlife Service
UV	ultraviolet

GLOSSARY²

Adventive: organisms introduced to an area but not purposefully.

Alien: not native; occurring in the locality it occupies ONLY with human assistance, accidental or purposeful. Polynesian (e.g., coconut) and post-1778 introductions (e.g., guava, goats, and sheep) are aliens.

Anaphylactic: hypersensitivity; may cause shock, respiratory distress, swelling, other problems

Arthropod: insects and related invertebrates (e.g., spiders) having an external skeleton and jointed legs

Aeolian: wind blown, a habitat dominated by effects of wind blowing over it

Aspiration: invertebrates are transferred from the original location (leaf, net, etc.) into a large vial. Two tubes are lodged in one stopper in the vial. Air drawn in on one tube, creates suction at the end of the second tube; the target insect is drawn into the vial by the pulling air.

Endemic: naturally occurring, without human transport, ONLY in the locality occupied. Hawaii has a high percentage of endemic plants and animals, some in very small microenvironments.

Indigenous: naturally occurring without human assistance in the locality it occupies; may also occur elsewhere, including outside the Hawaiian Islands (e.g., Naupaka kahakai (*Scaevola sericea*) is the same plant in Hawai'i and throughout the Pacific)

Insects: arthropods with six legs, and bodies in 3 sections

Invertebrates: animals without backbones (insects, spiders, snails, shrimp)

Kīpuka: an area of vegetation surrounded by younger lava flows

Larva/larval: an immature stage of development in young of many animals

Littoral: belonging to / along the sea shore

² Glossary based largely on definitions in *Biological Science: An Ecological Approach*, 7th ed., Kendall/Hunt Publishing Co., Dubuque, a high school text; on the glossary in *Manual of Flowering Plants of Hawai'i*, Vol.2, Wagner, et al., 1999, Bishop Museum Press, and other sources.

Glossary (continued)

Makai: toward the ocean

Mauka: toward the mountains

Midden: human food refuse in an archaeological setting, often in a heap or pile

Mollusk: invertebrates in the phylum Mollusca. Common representatives are snails, slugs, mussels, clams, oysters, squids, and octopuses.

Native: organism that originated in area where it lives without human assistance; may be indigenous or endemic

Naturalized: an alien organism that, with time, yet without further human assisted releases or plantings, has become established in an area to which it is not native

Nocturnal: active or most apparent at night

Pupa: the stage between larva and adult in insects with complete metamorphosis, a non-feeding and inactive stage often inside a case

Purposefully introduced: an organism brought into an area for a specific purpose, for example, as a biological control agent

Rare: threatened by environmental factors and in low numbers

Senescent: aged; said of a plant community when most or all of the individual plants are mature and there is no regeneration or young plants in the complement

Species: all individuals and populations of a particular type of organism, maintained by biological mechanisms that result in their breeding mostly with their kind

Vertebrates: animals with backbones (birds, mammals, reptiles)

Wandering transect: surveyor moves in a general direction (e.g., mauka-makai), but not in a straight line or at a set pace; rather surveyor changes course to target suitable habitat occurring sporadically across the landscape. This technique provides the highest potential species list, the goal of a survey for planning and decision making. It does not produce results useful for statistical analysis, not a goal of a survey of this type.

Waxing: describes gradual increase in visible amount of the moon's disk

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APPENDIX D. BIOLOGICAL SURVEY

**Botanical, Avian and Terrestrial Mammalian Surveys
Conducted for the Kīholo State Park Reserve Master
Planning Process, North Kona District,
Island of Hawai‘i**

Prepared by:

Reginald E. David
Rana Biological Consulting, Inc.
P.O. Box 1371
Kailua-Kona, Hawai‘i 96745

&

Eric Guinther
AECOS Consultants
45-309 Akimala Pl.
Kāne‘ohe, Hawai‘i 96744

Prepared for:

Planning Solutions, Inc.
210 Ward Street
Suite 330 Ward Plaza
Honolulu, Hawaii 96814-401

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Table of Contents

Introduction and Background	3
General Site Description	3
Methods	6
Botanical Survey Methods	6
Avian Survey Methods.....	6
Mammalian Survey Methods.....	6
Results	7
Botanical Surveys	7
Avian Surveys.....	18
Mammalian Survey.....	18
Discussion	21
Botanical Resources	21
Avian Resources.....	21
Mammalian Resources.....	22
Potential Impacts to Protected Species	22
Botanical.....	22
Seabirds	22
Recommendations	23
Critical Habitat	24
Glossary	25
Literature Cited	26

Introduction and Background

The State of Hawai'i Department of Land and Natural Resources Division of State Parks is preparing a Master Plan for the Kīholo State Reserve Park, North Kona, Island of Hawai'i. The planning area consists of virtually all of the land *makai* of Queen Ka'ahumanu Highway from the Pu'uwa'awa'a-Ka'ūpūlehu district boundary on the south and the Pu'uanahulu-'Anaeho'omalu district boundary on the north (identified by TMK: 7-1-02: 02, 08 and 7-1-03: 02, 07). Altogether, it encompasses 4,362 acres of land and eight miles of relatively undisturbed coastline (Figure 1).

This report describes the methods used and the results of botanical, avian and mammalian surveys conducted within the Park as part of the environmental disclosure and planning processes.

The primary purpose of the surveys was to determine if there are any botanical, avian or mammalian species currently listed, or proposed for listing under either federal or State of Hawai'i endangered species statutes within the Park boundaries. The secondary goals were to identify habitats within the Park that are particularly sensitive from a biological perspective, and which are candidates for protection, restoration or other resource management activities

The federal and State of Hawai'i listed species status follows species identified in the following referenced documents, Department of Land and Natural Resources (DLNR) 1998; U. S. Fish & Wildlife Service (USFWS 2005a, 2005b, 2011). Fieldwork was conducted between July 7, and 11, 2011, with additional site visits conducted by David in late July, August and September.

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document, which may be unfamiliar to the reader, are included at the end of the narrative text.

General Site Description

The Park encompasses 4,362 acres of land and eight miles of relatively undisturbed coastline, and contains numerous private in-holdings. The plant habitats present within the Park are largely determined by the age of the substrates on which the vegetation is growing. The substrate is a mix of *'a'ā* and *pāhoehoe* lava flows disgorged from Mount Hualālai and Mauna Loa between 10,000 years ago and 1859 (Wolfe and Morris 1996). Generally speaking the lava flows south of the north edge of Kīholo Bay to the southern boundary of the Park originated from Mount Hualālai, and those lava flows north of Kīholo Bay came from Mauna Loa.

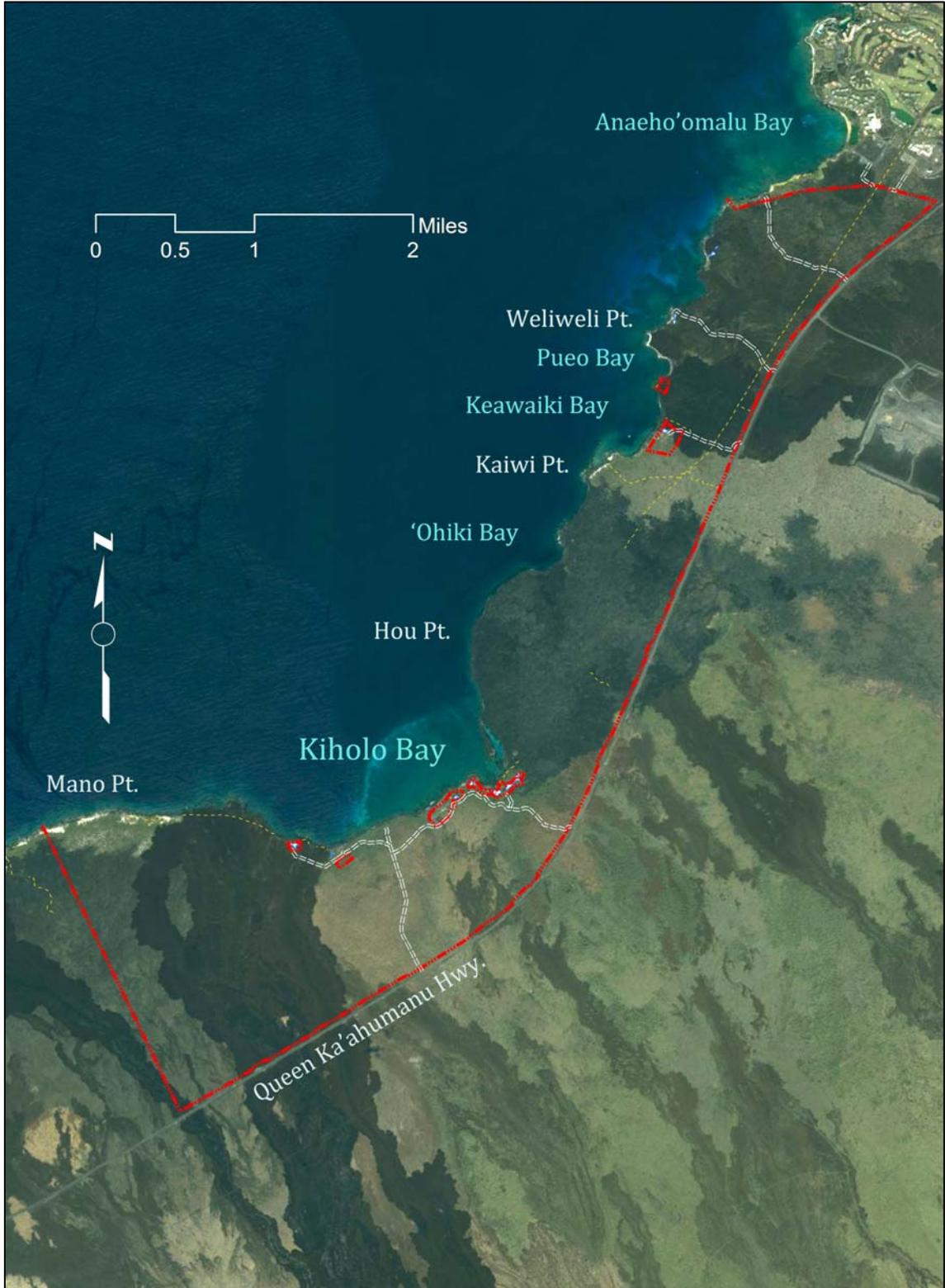


Figure 1 – Kiholo State Park Reserve

The entire park is within an extremely dry climatic zone, and this fact combined with the young ages of a goodly proportion of the lava flows that created the land surface here, limits the vegetation types that occur. These vegetation types range from essentially all but barren recent flows (Figure 2) to coastal strand and *kiawe* (*Prosopis pallida*) forest, to *kiawe* savannah, to fountain grass (*Pennisetum setaceum*) grassland.



Figure 2 - 1800 'a'ā lava flow, showing lack of vegetation – southern end of the Park

Only one public access road, running downslope from Queen Ka'ahumanu Highway to Kīholo Bay, connects the highway to the coast. Additionally, there is another improved dirt road, which runs in a north-south direction perpendicular to the entrance road and located east of the main in-holdings along Kīholo Bay; this road is currently gated and vehicular access is restricted to in-holder vehicles. There are several other trails and former roads which provide access to the shore from the highway. A well-marked (in most places) coastal trail runs the length of the park behind the shoreline.

Methods

Plant names follow *Manual of the Flowering Plants of Hawai'i* (Wagner *et al.*, 1990, 1999) for native and naturalized flowering plants and *A Tropical Garden Flora* (Staples and Herbst, 2005) for crop and ornamental plants. Place names follow *Place Names of Hawaii* (Pukui *et al.*, 1974). The avian phylogenetic order and nomenclature used in this report follows the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998), and the 42nd through the 52nd supplements to the Check-List (American Ornithologists' Union, 2000; Banks *et al.*, 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser *et al.*, 2009, 2010, 2011). Mammal scientific names follow (Tomich, 1986).

Botanical Survey Methods

A botanical survey was undertaken on July 7 and 8, 2011 by wandering over selected areas of the Park and noting the plants growing there. No attempt was made to cover the entire 4,362-acre area; instead, the coastal section was walked from one end to other, several times in most areas. Interior portions of the park were inspected both from the coastal points of entry and from entry points along the Queen Ka'ahumanu Highway. Each of the distinctive geological zones found within the park were inspected and several of the roads and trails, which connect the coast to the highway were traversed. Plants typical of each geological formation were noted, along with their relative abundance. This approach allowed a characterization of parklands by terrain type, although obviously any very rare species could be missed. Species not immediately recognized in the field were photographed and/or material collected for identification in the laboratory.

Avian Survey Methods

The avian surveys were conducted between July 7 and 11, 2011. Three linear transects were established, one each along the coast – main human usage area, one on the relatively barren 1859 lava flow and one in the kiawe/buffle grass grasslands on the 3,000-5,000 year old Mount Hualālai flow between Kīholo Bay and Queen Ka'ahumanu Highway. Ten avian point count stations were sited along each of these three linear transects. Six-minute point counts were conducted at each of the 30 stations, and stations were each counted once. Field observations were made with the aid of Leica 10x42 binoculars and by listening for vocalizations. The counts and subsequent searches of the surrounding area, was conducted between 6:30 am and 10:00 am each morning, the period when birds are most active. In addition to the avian point counts the entire coastline within the park was walked, as were all of the 4x4 roads, and several of the foot trails within the park. Time not spent counting the point count stations was used to search the remainder of the park for species and habitats not detected during the point counts.

Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or 'ōpe'ape'a as it is known locally, all terrestrial mammals currently found on the Island of

Hawai'i are alien species, and most are ubiquitous. The survey of mammals was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. A running tally was kept of all terrestrial vertebrate mammalian species detected within the Park. The mammalian survey was conducted concurrently with the avian surveys between July 7 and 11, 2011.

As previously mentioned in the avian survey methods section, the entire coastline was walked, as were all of the 4x4 roads, and several of the foot trails within the park. A record of all mammalian species detected during these forays was also recorded

Results

Botanical Surveys

Flora

A plant checklist (Table 1) was compiled from field observations, with entries arranged alphabetically under plant family names (standard practice). Each species observed during the survey is identified on the list by its scientific name, common name, and status (whether native or non-native). The species status given in **bold** indicates a plant of particular interest to the Hawaiian Islands flora (indigenous, endemic, or Polynesian introduction). In addition to identifying the plants present within the survey areas, qualitative estimates of plant abundance were made. Abundance values are coded in the table as explained in the legend and are applied to observations made on July 7-8 mostly in the coastal zone of the park. Elsewhere, although a vast area, the vegetation is relatively unvaried, and for the most part absent on the more recent lava flows.

For some species, a two-level system of abundance is used, with an alphanumeric code indicating a species having a clustered distribution; e.g. a species infrequently encountered, but numerous where observed. Thus, an abundance rating of "R" indicates a plant encountered between one and three times during the entire survey. An "R2" indicates a plant encountered in a few places, but with several to many individuals present where encountered. An "R3" would be a plant seldom encountered (i.e., rare over the entire Park), but locally abundant in one or more of the locations where it was encountered.

Table 1 - Listing of Plants (Flora) from Kīholo State Park, July 2011

Family Species	Common name	Status	Abund.	Notes
<i>FLOWERING PLANTS</i>				
DICOTYLEDONES				
ASCLEPIADACEAE				
<i>Calotropis gigantea</i> (L.) W. T. Aiton	crown flower	Nat	R1	GL, CS
ASTERACEAE (COMPOSITAE)				
<i>Ageratum conyzoides</i> L.	<i>maile hohono</i>	Nat	O	2, SV
<i>Conyza bonariensis</i> (L.) Cronq.	hairy horseweed	Nat	U	2
<i>Pluchea carolinensis</i> (Jacq.) G. Don	sourbush	Nat	U	AP, CS
<i>Pluchea indica</i> (L.) Less.	Indian fleabane	Nat	U	AP
<i>Pluchea x fosbergi</i> Cooperr & Galang	hybrid pluchea	Nat	R	AP
<i>Sphagneticola trilobata</i> (L.) Pruski	wedelia	Nat	R2	AP, PL
BORAGINACEAE				
<i>Tournefortia argentea</i> L. fil.	tree heliotrope	Nat	U	CS
CAPPARACEAE				
<i>Cleome gynandra</i> L.	wild spider flower	Nat	R	1, 2
CASSURINACEAE				
<i>Cassurina equisetifolia</i> L.	ironwood	Nat	U1	PL
CHENOPODIACEAE				
<i>Atriplex semibaccata</i> R. Br.	Australian saltbush	Nat	U1	CS
<i>Chenopodium murale</i> L.	<i>'āheahea</i>	Nat	A	SV
CLUSIACEAE				
<i>Calophyllum inophyllum</i> L.	<i>kamani</i>	Pol	R	PL
CONVOLVULACEAE				
<i>Ipomoea pes-caprae</i> (L.) R. Br.	<i>pōhuehue</i>	Ind	A	CS
<i>Jacquemontia ovalifolia</i> (Choisy) H. Hallier	<i>pa'u-o-Hi'iaka</i>	Ind	U	SV
EUPHORBIACEAE				
<i>Euphorbia albomarginata</i> (Torr. & A. Gray) Small	rattlesnake weed	Nat	R	1, SV
<i>Euphorbia hirta</i> L.	garden spurge	Nat	U	1, SV
FABACEAE				
<i>Acacia farnesiana</i> (L.) Willd.	<i>klu</i>	Nat	U	3, SV
<i>Prosopis pallida</i> (Humb. & Bonpl. ex Willd.) Kunth	<i>kiawe</i>	Nat	AA	SV
GOODINIACEAE				
<i>Scaevola sericea</i> Vahl	<i>naupaka kahakai</i>	Ind	U	CS
MALVACEAE				
<i>Hibiscus tiliaceus</i> L.	<i>hau</i>	Ind	U	AP
<i>Thespesia populnea</i> (L.) Sol. ex Corrêa	<i>milo</i>	Pol?	U	PL

<i>Sida fallax</i> Walp.	<i>'ilima</i>		Ind	C	SV
MOLLUGINACEAE					
<i>Mollugo cerviana</i> (L.) Ser.	threadstem carpetweed		Ind	A	2, SV
NYCTAGINACEAE					
<i>Boerhavia repens</i> L.	<i>alena</i>		Ind	R	CS
PAPAVERACEAE					
<i>Argemone glauca</i> (Nutt. ex Prain) Pope.	<i>pua kala</i>		End	R2	3,SV
RUBIACEAE					
<i>Morinda citrifolia</i> L.	<i>noni,</i> mulberry	Indian	Pol	U	PL, AP
STERCULIACEAE					
<i>Waltheria indica</i> L.	<i>'uhaloa</i>		Ind	U	SV, GL
MONOCOTYLEDONES					
ARECACEAE					
<i>Cocos nucifera</i> L.	coconut		Pol	O	AP, CS, PL
<i>Dyopsis lutescens</i> (H. Wendl.) Beentje & J. Dransfield	golden-fruited palm		Orn	R	PL
<i>Phoenix dactylifera</i> L.	date palm		Nat	R	AP
<i>Pritchardia</i> sp.	<i>loulu</i>		End?	R	3, PL
CYPERACEAE					
<i>Bulboschoenus maritimus</i> (L.) Palla	<i>kaluhā</i>		Ind	R	AP
<i>Cyperus laevigatus</i> L.	<i>makaloa</i>		Ind	R	AP
<i>Mariscus javanicus</i> (Houtt.) Merr. & Metcalfe	<i>'ahu'awa</i>		Ind	C	AP
<i>Schoenoplectus</i> sp.	giant bulrush		?	R	2, AP
PANDANACEAE					
<i>Pandanus tectorius</i> S. Parkinson ex Z.	<i>hala</i>		Ind	R	AP, PL
POACEAE (GRAMINEAE)					
<i>Cenchrus ciliaris</i> L.	buffelgrass		Nat	O	GL
<i>Digitaria</i> sp.	---		Nat	R	1, 2
<i>Eragrostis tenella</i> (L.) P. Beauv. ex Roem. & Schult.	lovegrass		Nat	U	1
<i>Heteropogon contortus</i> (L.) P. Beauv.	<i>pili</i>		Ind	R3	3, GL
<i>Pennisetum setaceum</i> (Forssk.) Chiov.	fountain grass		Nat	AA	GL, SV
<i>Sporobolus virginicus</i> (L.) Kunth	<i>'aki'aki</i>		Ind	U	CS

Legend to Table 1

Status = distributional status	
End. =	endemic; native to Hawaii and found naturally nowhere else.
Ind. =	indigenous; native to Hawaii, but not unique to the Hawaiian Islands.
Nat. =	naturalized, exotic, plant introduced to the Hawaiian Islands since the arrival of Cook Expedition in 1778, and well-established outside of cultivation.
Orn. =	exotic, ornamental or cultivated; plant not naturalized (not well-established outside of cultivation).
Pol. =	Polynesian introduction before 1778.

Abundance = occurrence ratings for plants seen in July 2001.

R - Rare -	only one to three plants seen.
U - Uncommon -	several to a dozen plants observed.
O - Occasional -	found regularly, but not abundant anywhere.
C - Common -	considered an important part of the vegetation and observed numerous times.
A - Abundant -	found in large numbers; may be locally dominant.
AA - Abundant -	abundant and dominant; defining vegetation type.

Notes:

- 1 Typically seen mostly beside the roadway or similar disturbed areas (ruderal plants).
- 2 Observed plant(s) lacked flowers or fruit, or were no longer alive; identification uncertain.
- 3 Reported by S. Montgomery from a couple of areas near the highway. *Pili* grass seen by R. David in an interior area.

AP - Typically or only associated with anchialine pond environments.
CS - Typical of coastal strand.
GL - Typical in open grassland.
PL - Plantings (or spread from plantings) in or around private holdings.
SV - Typically in *kiawe* savannah.

A total of 43 different plant species were recorded growing within the area surveyed at Kīholo Park. Some private in-holdings were included only because there was difficulty in determining exact boundaries in the field. A number of additional species would have been recorded during the survey if all private in-holdings were included in the survey. Posted or fenced areas, and areas prohibiting access (i.e. posted with “no trespassing” signs) were respected. Developed properties were typically landscaped, and these plants were mostly not included in the accounting of species present in the park, except perhaps where naturalized species had spread out from the original planting. This number of species is rather low for the size of the area. A survey conducted following a period of rainfall might well bolster this number, although the additions would likely be non-native, ruderal species and non-native annuals.

One species observed, but only outside the park boundary at the north end, is pickleweed (*Batis maritima*). This plant was growing on a small dune associated with an anchialine feature. *Batis* or ‘*akulikuli kai*’ as it is known in Hawai‘i, can be very invasive of coastal ponds, eventually forcing native wetland plants out. It is possible that ‘*akulikuli kai*’ is growing within the private holdings where most of the coastal ponds in the Kīholo area are located.

Vegetation

The vegetation found at Kīholo State Park Reserve is very homogeneous, despite the large area of the park. More than any other factors, the young ages of the lava flows and extreme dryness of this part of the Island of Hawai‘i are responsible for the small number of recognizable vegetation types on this property. The young age of the lava flows establishes that there has been little time for soil development and on the most recent flows that account for better than 60 percent of the total area, there is remarkably little or no vegetation present. In the vegetation maps developed as part of our survey (see Figures 3, 4, 5, and 6) these areas are coded “**BL**” for barren lava. The flows may be either ‘*a‘ā*’ or *pāhoehoe* types, or mixed. They lack soil and their surface is mostly too high above the groundwater table to enable plants to establish and flourish. Where these flows extend to the coast, groundwater may be near the surface or even sometimes exposed as anchialine pools. This accounts for the fact that scattered shrubs and trees (typically, *kiawe*) will occur

on otherwise barren basalt, growing in low areas of the topography, mostly near the coast. A sparse growth of fountain grass marks a relative young *pāhoehoe* flow at the southern end of the park (Figure. 7). While this flow is easily differentiated from the adjacent 1859 *ʻaʻā* flow which is barren of vegetation, the cover by grass is so sparse on the *pāhoehoe* flow that it is difficult to characterize as a grassland.

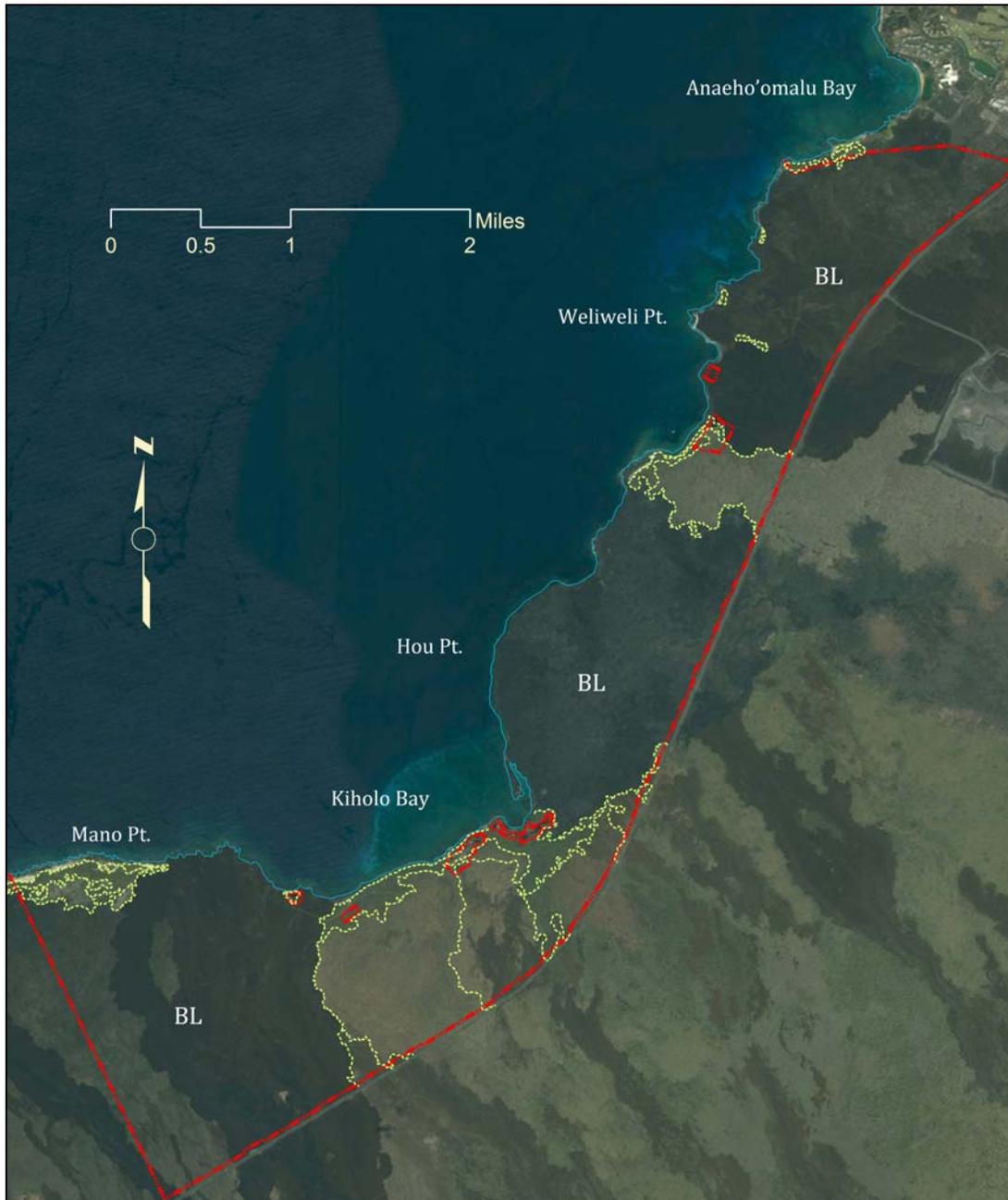


Figure 3 - Overall vegetation map for Kīholo State Park Reserve showing large amount of area that is essentially bare lava flow (BL) supporting no or very minimal vegetation.

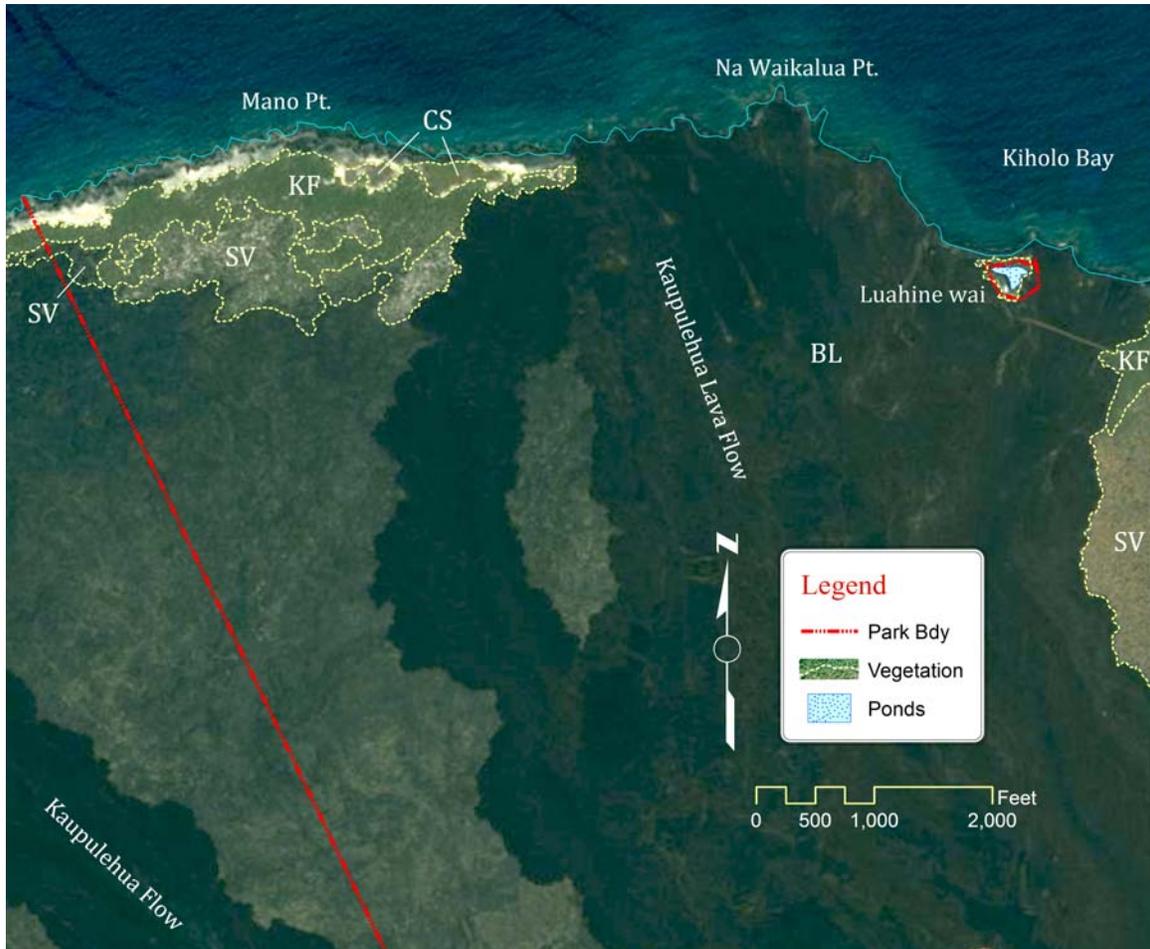


Figure 4 - Vegetation map covering the southern end of the Kiholo State Park Reserve. Vegetation types are explained in the text.



Figure 5 - Vegetation map covering the northern portion of the Kiholo State Park Reserve. Vegetation types are explained in the text.

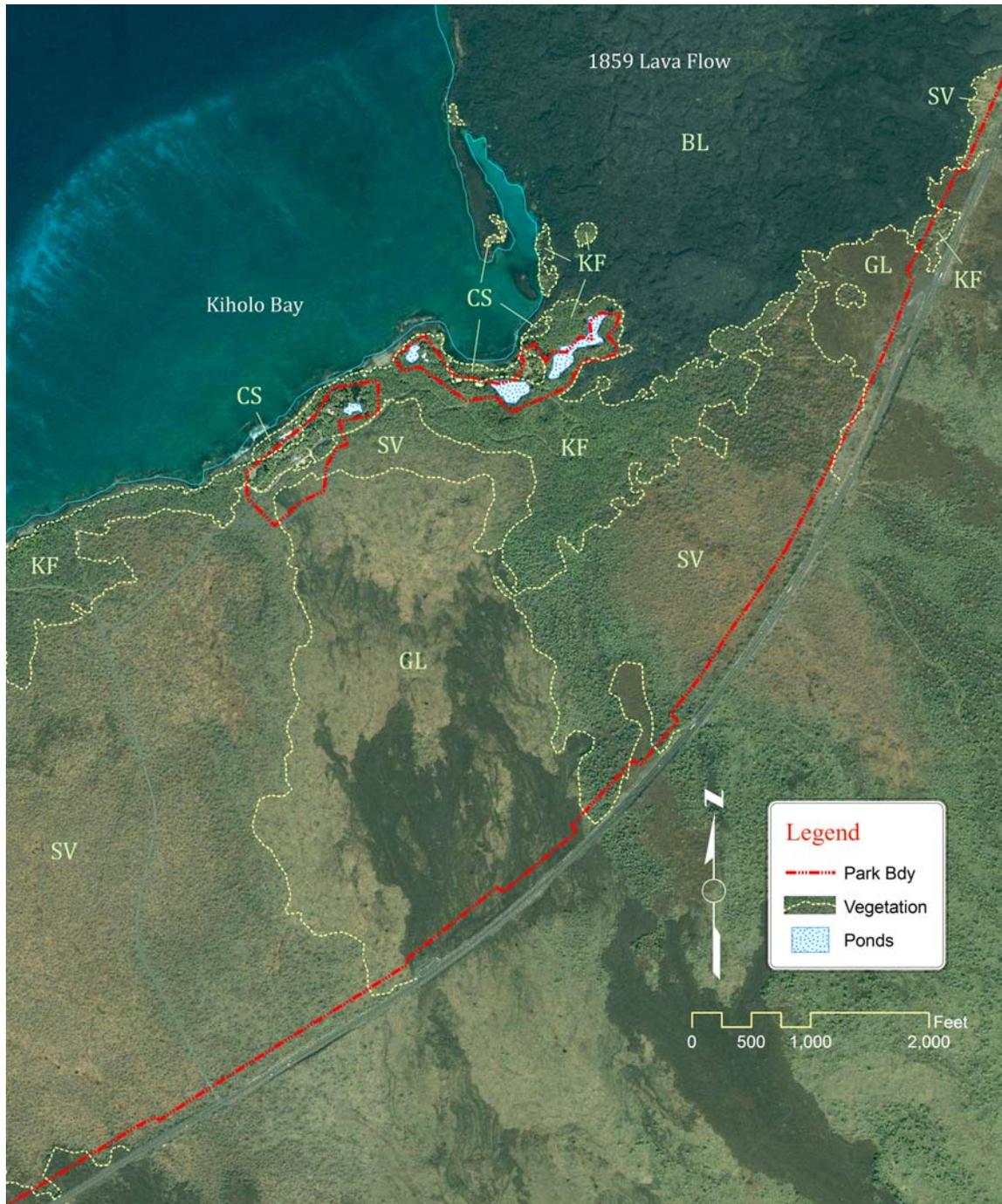


Figure 6 - Vegetation map covering the south central (Kīholo Bay) portion of the Kīholo State Park Reserve. Vegetation types are explained in the text.



Figure 7 - Pāhoehoe flow near the coast with fountain grass succeeding in colonizing some cracks in the surface. Because of the low elevation here near the coast, *kiawe* is also getting a foothold in some larger depressions.

Geologically, much older lava flows have weathered over time and developed a thin soil that accumulates in pockets. These flows are dominated in this area by fountain grass (*Pennisetum setaceum*) as a grassland vegetation (“GL”; see Figure 8), or mixed with *kiawe* as a savannah vegetation (“SV”). Savannah is a type of open forest with a grassland understory. It is actually a continuum of densities of tree growth from very sparse with mostly grass to a nearly closed canopy with sparse understory growth of forbs and grasses. In general terms, tree density on these old flows is a factor of proximity to groundwater, so the densest forests—with the largest *kiawe* trees—occur in the coastal zone (*kiawe* forest or “KF”). Only these dense, coastal forests appear to create enough shading to restrict the growth of the understory plants. In some areas, the savannah understory is dominated by forbs (non-grass herbs; Figure 9) and in others by fountain grass (Figure 10). Forbs noted as common or abundant in this savannah are ‘ilima (*Sida fallax*), threadstem carpetweed (*Mollugo cerviana*), ‘aheahea (*Chenopodium murale*), and maile hohono (*Ageratum conyzoides*). Only ‘ilima is considered a native species.

Two other vegetation types are present but limited in distribution. These are coastal strand and riparian or anchialine pond associated vegetation. Both are typically small or narrow areas difficult to show on the scale of the vegetation maps. However, both are significant as they represent the only native plant dominated vegetation types in the park. Further, these habitat types are associated with areas along the coast where the majority of park users visit.

Coastal strand (“CS”) refers to vegetation directly influenced by proximity to the ocean, in this case occurring immediately inland of sand and boulder beaches. CS vegetation typically consists of several species common to coastal and strand environments in Hawai‘i, and which differentiate it from nearby inland *kiawe* forest or *kiawe* savannah. Plants at Kīholo State Park Reserve typical of coastal strand environments are *naupaka kahakai* (*Scaevola sericea*), *pōhuehue* (*Ipomoea pes-caprae*), tree heliotrope (*Tournefortia argentea*), ‘aki‘aki (*Sporobolus virginicus*), and *niu* (*Cocos nucifera*).

Plants associated with anchialine ponds (“AP”) also occur in the coastal zone close to the ocean. These ponds are only found a relatively short distance inland where groundwater is exposed at the surface. Further inland, the land rises quickly and groundwater occurs at depths too far down to appear at the surface (except perhaps as springs in lava tubes). Plants associated with this vegetation type include several sedges (see under Family Cyperaceae in Table 1), *hau* (*Hibiscus tiliaceus*), *niu*, sourbush (*Pluchea carolinensis*), Indian fleabane (*Pluchea indica*), and the hybrid between these two species of *Pluchea* (*Pluchea x fosbergii*). Also, in the same area are a number of “ornamental” plantings made or tended by local residences as many of these ponds are in private in-holding.



Figure 8 - Fountain grass forming a monotypic and rather sparse growth on an older basalt flow



Figure 9 – *Kiawe* savannah with mostly forbs in the understory



Figure 10 – Unusually lush growth of fountain grass in a *kiawe* savannah

Avian Surveys

A total of 343 individual birds of 17 species, representing 13 separate families, were recorded during the station counts. Three of the species recorded, Black-crowned Night-Heron (*Nycticorax nycticorax hoactli*), Pacific Golden-Plover (*Pluvialis fulva*), and Bristle-thighed Curlew (*Numenius tahitiensis*) are indigenous. The remaining 14 species recorded are alien to the Hawaiian Islands (Table 2).

No avian species currently protected or proposed for protection under either the federal or State of Hawai'i endangered species programs were detected during the course of this survey (DLNR, 1998; USFWS, 2005a, 2005b, 2011).

Avian diversity and densities were extremely low, but in keeping with the habitats present within and adjacent to the Park. Four species, Zebra Dove (*Geopelia striata*), House Finch (*Carpodacus mexicanus*), Common Myna (*Acridotheres tristis*) and African Silverbill (*Lonchura cantans*), accounted for slightly more than 46 percent of all birds recorded during the station counts.

Predictably, avian diversity and densities varied significantly depending on the vegetation and human presence within the three major habitats sampled. These relative differences are presented in Table 2.

Mammalian Survey

Six terrestrial mammalian species were detected during the course of these surveys. A lone unidentified rat (*Rattus* sp.) was seen close to the dumpsters near the Loretta Lynn house. Several European house mice (*Mus musculus domesticus*) were seen within the kiawe/grasslands. A large number of feral goats (*Capra h. hircus*) were seen within the kiawe/grasslands, the largest group that we saw had over 300 animals in it. A total of 12 small Indian mongooses (*Herpestes a. auropunctatus*) two cats (*Felis catus*) and three dogs (*Canis f. familiaris*) were seen at various locations within the park. Scat, tracks and sign of all of the mammalian species mentioned were encountered at numerous locations within the park.

No mammalian species currently protected or proposed for protection under either the federal or State of Hawai'i endangered species programs were detected during the course of this survey (DLNR, 1998; USFWS; 2005a, 2005b, 2011).

Table 2 – Avian Species Detected Within the Kīholo State Park

Common name	Scientific name	Status	Costal RA	Kīawe RA	Lava RA	Comb. RA
Gray Francolin	PHASIANIDAE - Pheasants & Partridges Phasianinae - Pheasants & Allies <i>Francolinus pondicerianus</i>	A	1.60	.80	0.10	0.83
Black-crowned Night-Heron	PELECANIFORMES ARDEIDAE - Herons, Bitterns & Allies <i>Nycticorax nycticorax hoactli</i>	IB	0.20	-	-	0.07
Pacific Golden-Plover	CHARADRIIFORMES CHARADRIIDAE - Lapwings & Plovers Charadriinae - Plovers <i>Pluvialis fulva</i>	IM	-	0.10	-	0.07
Bristle-thighed Curlew	SCOLOPACIDAE - Sandpipers, Phalaropes & Allies Scolopacinae - Sandpipers & Allies <i>Numenius tahitiensis</i>	IM	-	1.10	-	0.03
Spotted Dove	COLUMBIFORMES COLUMBIDAE – Pigeons & Doves <i>Streptopelia chinensis</i>	A	0.60	0.20	0.30	0.37
Zebra Dove	<i>Geopelia striata</i>	A	2.30	2.30	0.60	1.73
Japanese White-eye	PASSERIFORMES ZOSTEROPIIDAE – White-eyes <i>Zosterops japonicus</i>	A	0.80	0.50	-	0.50
Northern Mockingbird	MIMIDAE - Mockingbirds & Thrashers <i>Mimus polyglottos</i>	A	0.40	0.50	-	0.30
Common Myna	STURNIDAE – Starlings <i>Acridotheres tristis</i>	A	2.00	0.90	0.70	1.17
Yellow-billed Cardinal	EMBERIZIDAE – Emberizids <i>Paroaria capitata</i>	A	1.70	0.20	-	0.63

Table 2 continued.

Common name	Scientific name	Status	Costal RA	Kiawe RA	Lava RA	Comb. RA
Northern Cardinal	CARDINALIDAE – Cardinals Saltators & Allies <i>Cardinalis cardinalis</i>	A	1.20	0.90	0.10	0.73
House Finch	FRINGILLIDAE – Fringilline and Carduline Finches & Allies <i>Carpodacus mexicanus</i>	A	1.60	1.30	0.70	1.20
Yellow-fronted Canary	<i>Serinus mozambicus</i>	A	1.60	1.80	-	1.13
House Sparrow	PASSERIDAE – Old World Sparrows <i>Passer domesticus</i>	A	1.80	-	-	
African Silverbill	ESTRILDIDAE - Estrildid Finches <i>Lonchura cantans</i>	A	1.20	2.30	-	1.17
Nutmeg Mannikin	<i>Lonchura punctulata</i>	A	-	0.70	-	0.23
Java Sparrow	<i>Padda oryzivora</i>	A	1.60	0.30	-	0.63

Key to Table 2.

A	Alien – Introduced to the Hawaiian Islands by humans
IB	Indigenous Breeding – Native to Hawai'i, but not unique to the Hawaiian Islands, breeds in the Islands
IM	Indigenous Migratory – Native migratory species, not unique to the Hawaiian Islands, does not breed in Hawai'i
Coastal RA	Coastal Relative Abundance - Number of birds detected divided by the number of count stations in this strata (10)
Kiawe RA	Kiawe, grassland Relative Abundance - Number of birds detected divided by the number of count stations in this strata (10)
Lava RA	Lava Field Relative Abundance - Number of birds detected divided by the number of count stations in this strata (10)
Comb. RA	Combined Relative Abundance – Combined number of birds detected in all strata's, divided by the total number of count stations (30)

Discussion

Botanical Resources

Of the 43 species recorded, 16 species (37 percent) are recognized as truly native, all of these are moderately common endemic and indigenous plants. Several early Polynesian introductions (*niu*, *noni*, *milo*, and *kamani*) are present as well. Combined, the 45 percent of species being either indigenous, endemic, or early Polynesian introduction is a respectably high proportion of the flora generally not attained in most lowland locations in the Hawaiian Islands. Unfortunately, the vast majority of the biomass of plant matter comprises alien plant species only, plants that have become naturalized in this low elevation environment over about the last 200 years.

Avian Resources

The findings of the avian surveys are consistent with the location of the park, and the varied habitat present within it. A total of 17 species were recorded during the time spent on site (Table 2). Three of the species recorded during the course of this survey are indigenous species. One of these, Black-crowned Night-Heron is an indigenous breeding species, which is commonly found around just about any type of water feature that supports food suitable for this species to forage on. There is little suitable habitat within the park to support this species. However; there is suitable habitat within a number of the private in-holdings, which are used by this species both for foraging and nesting (David, 2011). The other two indigenous species detected, Pacific Golden-Plover and Bristle-thighed Curlew are indigenous migratory shorebird species which nest in the high Arctic, and spend their post breeding months in lower latitudes including Hawai'i and the Tropical Pacific. At least three other common indigenous migratory shorebirds, Wandering tattler (*Tringa incana*), Ruddy Turnstone (*Arenaria interpres*) and Sanderling (*Calidris alba*) use resources within the park, predominantly along the shoreline between late July and the end of April each year (David, 2011). An additional shorebird species, Semipalmated Plover (*Charadrius semipalmatus*) was recorded within the park on during a site visit on September 10, 2011. The remaining 14 species recorded are alien to the Hawaiian Islands.

No avian species currently protected or proposed for protection under either the federal or State of Hawai'i endangered species programs were detected during the course of this survey (DLNR, 1998; USFWS, 2005a, 2005b, 2011).

Although no seabirds were detected during this survey, it is probable that both the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened endemic subspecies of the Newell's Shearwater (*Puffinus auricularis newelli*), over-fly the park in small numbers between April and the middle of December each year. Both species have been recorded flying to and from their nesting colonies over the leeward areas of the island (Day et al., 2003; David 2011). Both of these pelagic seabird species nest high in the mountains in burrows excavated under thick vegetation, especially *uluhe* (*Dicranopteris linearis*) fern. There is no suitable nesting habitat for either of these seabird species on, or close to the park.

The primary cause of mortality in the two aforementioned seabird species is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983; Simons and Hodges 1998; Ainley *et al.*, 2001). Collision with manmade structures is considered to be the second most significant cause of mortality of these seabird species in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds often collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961; Telfer 1979; Sincock 1981; Reed *et al.*, 1985; Telfer *et al.*, 1987; Cooper and Day, 1998; Podolsky *et al.* 1998; Ainley *et al.*, 2001; Hue *et al.*, 2001; Day *et al* 2003).

Mammalian Resources

The findings of the mammalian survey are consistent with the location of the park, and the varied habitat present within it. All of the mammalian species recorded during the course of these surveys are alien to the Hawaiian Islands, and all are deleterious to native species and the ecosystems on which the native species depend.

The sheer number of goats present within the park represents a major threat to existing vegetation, and almost precludes re-vegetation with native species without significant efforts to install ungulate exclosure fences and measures to significantly reduce the goat population.

No Hawaiian hoary bats were detected during the course of this survey. Bats have been recorded foraging for prey over the near-shore waters of Kīholo Bay (David, 2011). Hawaiian hoary bats are widely distributed along the Kona and Kohala coast and are present in most areas that still have tree and dense shrubs (USFWS, 1998; Bonaccorso *et al.*, 2005, 2007; 2011; David, 2011). There is minimal habitat suitable for roosting bats within the park as most vegetation that may be suitable is present within one or more of the private in-holdings, rather than in the park proper.

Potential Impacts to Protected Species

Botanical

No plants currently proposed or listed (USFWS, 2010, 2011) were observed during the July 2011 survey. Thus continued use of the Park, and/or improvements to the park is not expected to result in deleterious impacts to any plant currently proposed, or listed under either the federal or State of Hawai'i endangered species statutes.

Seabirds

It is unlikely that any proposed modifications to the park, or changes in operating practices will result in deleterious impacts to listed seabird species as no lighting is proposed as part of this action.

Recommendations

The most environmentally sensitive environments at Kīholo State Park Reserve are the coastal strand and the coastal pond/anchialine pond environments. These two plant assemblages are easily damaged by high human traffic, off road vehicles, and invasive species. It is no coincidence that the best examples of coastal strand occur at the extreme southern end of the park (Figure. 11), where access is limited to the coastal trail. The coast also has a number of archaeological features. At the present time a development is under construction in this area which will likely increase human use of the area. An archaeological survey of the adjacent parcel has been undertaken as evidenced by numerous markers and protective fencing.



Figure 11 - An area of coastal strand at the southern end of the Park with lush *pōhuehue* groundcover, and trees of beach heliotrope and kiawe.

Most of the inland waters at Kīholo are on private holdings, with some present on park land or extending out into park land from the private holdings. These features provide small oases in otherwise harsh environments of barren lava and extensive *kiawe* forest and savannah. As a result the inland waters are an attractant for both park users and for house development on private holdings. The first step in protecting the integrity of these ponds at Kīholo is to remove any alien invasive plants, particularly *kiawe*, *Pluchea* spp., and *Batis* from them.

The coastal zone at the southern end of the park has a very pristine aspect to it, and should be developed cautiously. The lack of disturbance to the vegetation types is due to limited access (presently only via the coastal trail) and the rugged shore (there are no beaches). Consequently, only serious hikers and some fishermen visit this area regularly. The landscape offers an opportunity to develop interpretive material and views relating the physiological interactions between lava flows as they reach the sea and coastal processes. These interactions produce distinctive vegetation zones that encouraged utilization and settlement by the ancient Hawaiians.

It is recommended that, if and where appropriate and practicable, plant species native to this coastal environment be used in any landscaping efforts. Not only is this ecologically prudent, but if appropriate species are selected, the efforts will likely provide savings over the long term in maintenance and water costs. No purpose would be served by considering the removal of the non-native growth that covers a majority of the park land. However, the narrow coastal zone will remain important areas in the park in terms of future use. *Kiawe* is considered an invasive plant and not conducive to either the growth of native plants or enjoyment of the park by visitors. *Kiawe* branches have very large thorns which litter the ground around the plants. The branches also tend to grow low to the ground in places where the plant receives a lot of moisture from the groundwater forming barriers to travel. The roots tap the groundwater and remove the moisture, making it difficult for native strand plants to establish. Dune and back beach areas in particular should be marked for *kiawe* removal and be replaced with more suitable species. Native and Polynesian introductions, such as *naupaka kahakai* and *niu*, and the non-native beach heliotrope, are more contributory to an inviting beach experience than *kiawe*. Removal of *kiawe* may encourage natural recruitment of the strand vegetation if foot and vehicle traffic are minimal. Cut *kiawe* logs may have some monetary value.

Critical Habitat

There is no federally delineated Critical Habitat present within the Kiholo State Park Reserve. Thus the continued use of the Park or improvements to it will not result in modification of federally designated Critical Habitat. There is no equivalent statute under State law.

Glossary

'a'ā – Clinker lava formed by slow moving lava flows

Alien – Introduced to Hawai'i by humans

Endangered – Listed and protected under the Endangered Species Act of 1973, as amended (ESA) as an endangered species

Endemic – Native and unique to the Hawaiian Islands

Indigenous – Native to the Hawaiian Islands, but also found elsewhere naturally

makai – Down-slope, towards the ocean

mauka – Upslope, towards the mountains

Muridae – Rodents, including rats, mice and voles, one of the most diverse family of mammals

Naturalized – A plant or animal that has become established in an area that it is not indigenous to

Nocturnal – Nighttime, after dark

'ōpe'ape'a – Endemic endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*)

pāhoehoe – Sheet lava formed by relatively fast moving lava flows

Pelagic – An animal that spends its life at sea – in this case seabirds that only return to land to nest and rear their young

Ruderal – Disturbed, rocky, rubbishy areas, such as old agricultural fields and rock piles

Sign – Biological term referring tracks, scat, rubbing, odor, marks, nests, and other signs created by animals by which their presence may be detected

Threatened – Listed and protected under the ESA as a threatened species

Savannah - A grassy plain in tropical and subtropical regions, with few trees

DLNR – Department of Land and Natural Resources

DOFAW – Division of Forestry and Wildlife

ESA – Endangered Species Act of 1973, as amended

TMK – Tax Map Key

USFWS – United States Fish & Wildlife Service

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