WEST MAUI WATERSHED
ISLAND OF MAUI, HAWAI`I

Photo Courtesy of S. Langsdale

SECTION 905(B) WRDA 1986 ANALYSIS REPORT
RECONNAISSANCE

PREPARED BY:
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
CIVIL AND PUBLIC WORKS BRANCH
PROGRAMS AND PROJECT MANAGEMENT DIVISION

9 SEPTEMBER 2010

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DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

July 22, 2011

Civil and Public Works Branch
Programs and Project Management Division

ADDENDUM: West Maui Watershed Project, Section 905(b) Analysis Report/Initial Watershed Assessment

1. On 18 July 2011, Headquarters U.S. Army Corps of Engineers (HQUSACE) approved the request to convert the West Maui Watershed planning effort from a feasibility study pursuant Section 209 of the Flood Control Act of 1962 to a watershed assessment pursuant to Section 729 of the Water Resources Development Act (WRDA) of 1986, as amended.

2. In accordance with Section 729 of WRDA 1986, an initial watershed assessment (IWA) is completed during the reconnaissance phase. The purpose of the IWA is to identify a cost sharing partner(s), define the scope and the objective of the assessment and negotiate the cost sharing agreement. This IWA is similar to a reconnaissance study completed in accordance with Section 905(b) of WRDA 1986 required for all feasibility studies (Engineering Circular (EC) 1105-2-410).

3. With the approval of the change in authority for the planning effort, the West Maui Watershed Project, Section 905(b) Analysis Report is amended to be the West Maui Watershed Plan Initial Watershed Assessment.

4. In accordance with Section 729 WRDA 1986, a Watershed Assessment Management Plan (WAMP) is developed in lieu of a Project Management Plan (PMP) for feasibility studies. The purpose of the WAMP is to be a living document that defines the planning approach, activities to be accomplished, schedule and costs associated with the West Maui Watershed Plan. The costs and schedules included in this IWA/Section 905(b) report are superseded by the West Maui WAMP, dated 3 April 2012.

DEPARTMENT OF THE ARMY
PACIFIC OCEAN DIVISION, U.S. ARMY CORPS OF ENGINEERS
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF

CEPOD-PDC

SEP 27 2010

MEMORANDUM FOR COMMANDER, HONOLULU ENGINEER DISTRICT, ATTN: CEPOH-PP-C/CINDY BARGER

SUBJECT: Water Resources Development Act (WRDA) of 1986 Section 905(b) Analysis, West Maui Watershed, Island of Maui, Hawaii (CWIS No. 146440)

1. POD has completed its review of the WRDA 1986 Section 905(b) report for the West Maui Watershed Plan, Island of Maui, Hawaii, (CWIS No. 146440) and concurs with its finding of Federal interest in continued feasibility studies. The enclosed WRDA 1986 Section 905(b) analysis is approved for proceeding into the feasibility phase of planning and the preparation of the Project Management Plan (PMP) and the preparation and negotiation of the Feasibility Cost Sharing Agreement (FCSA).

2. A copy of the negotiated PMP and FCSA will be submitted to POD for review prior to execution of the FCSA. POD has been delegated the authority to approve the FCSA if there are no deviations from the model. An FCSA that deviates from the model will require HQUSACE review and approval.

3. Should you have any questions or need additional information, the point of contact is Russell Iwamura at (808) 438-8859.

FOR THE COMMANDER

GMB

Encl

EUGENE M. BAN, P.E.
Director of Programs

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WEST MAUI WATERSHED PLAN
SECTION 905(B) (WRDA 86) ANALYSIS

EXECUTIVE SUMMARY

Based on a request made by the State of Hawai`i, Department of Land and Natural Resources (DLNR) to address water resource issues including impacts to coral reefs in the West Maui area on the island of Maui, Hawai`i, the U.S. Army Corps of Engineers, Honolulu District (USACE) received appropriation from Congress in 2008 to initiate a reconnaissance study. The purpose of this reconnaissance study was to confirm there is a need for aquatic ecosystem restoration and watershed planning in the study area; determine if there is a federal interest in pursuing a watershed project; define the scope, cost and schedule of the feasibility study and Environmental Impact Statement (EIS) for the project; and gain non-federal sponsor commitment. The reconnaissance phase culminates in a Water Resources Development Act (WRDA) of 1986 Section 905(b) Analysis, a Project Management Plan (PMP), and a Feasibility Cost Share Agreement (FCSA). This document fulfills the commitment of the WRDA 1986 Section 905(b) Analysis.

The document finds that the primary problems in the watershed include impacts to stream resources, impacts to groundwater quality and quantity, watershed degradation, impacts to coral reef/nearshore waters associated, flooding and sedimentation, and general concerns associated with climate change, land ownership, transparency of regulations, and education and outreach. There has been and continues to be a variety of studies and efforts in the watershed at the federal, State, local, and community levels to address portions of these problems but an integrated and collaborative plan is needed to effectively resolve the problems and ensure long-term sustainability. Through the USACE watershed planning authorities, there is a federal interest for USACE to pursue an integrated and collaborative watershed project in West Maui. As a result of this finding, the National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency (EPA) have agreed to have funded actions by the State of Hawai`i be integrated into the plan as part of the non-federal sponsor match in accordance with Section 2007 of WRDA 2007. The State of Hawai`i DLNR Division of Aquatic Resources (DAR), Division of Forestry and Wildlife (DOFAW), and Commission for Water Resources Management (CWRM) and the State of Hawai`i, Department of Health (DOH) are committed to be sponsors for this project.

Based on availability of funds, the feasibility study area has been reduced from the Reconnaissance Study area of 90,000 acres to 24,000 acres, coinciding with priority areas for restoration identified by the State. In the event more funds become available, the feasibility study will be expanded and/or tiered studies will be initiated based on the findings of this report. The FCSA is scheduled to be executed in October 2010 with the feasibility study/EIS to be completed in 2016.

1. Study Authority

This Section 905(b) Water Resource Development Act (WRDA) of 1986 Analysis was prepared as an initial response to the Section 209 of the Flood Control Act of 1962 (PL 87-874), which reads as follows:

> "The Secretary of the Army is hereby authorized and directed to cause surveys for flood control and allied purposes, including channel and major drainage improvements, and floods aggravated by or due to wind or tidal effects, to be made under the direction of the Chief of Engineers, in drainage areas of the United States and its territorial possessions, which include the following named localities: *Provided,* That after the regular or formal reports made on any survey are submitted to Congress, no supplemental or additional report or estimate shall be made unless authorized by law except that the Secretary of the Army may cause a review of any examination or survey to be made and a report thereon submitted to Congress, if such review is required by the national defense or by changed physical or economic conditions: *Provided further*, That the Government shall not be deemed to have entered upon any project for the improvement of any waterway or harbor mentioned in this title until the project for the proposed work shall have been adopted by law: … Harbors and rivers in Hawai`i, with a view to determining the advisability of improvements in the interest of navigation, flood control, hydroelectric power development, water supply, and other beneficial water uses, and related land resources…."

Funds in the amount of $295,000 were appropriated in Fiscal Year 2008 to conduct the reconnaissance phase of the study.

2. STUDY PURPOSE

The purpose of the reconnaissance phase study is to determine if there is a Federal (U.S. Army Corps of Engineers [USACE]) interest in participating in a cost shared feasibility phase study that will identify, evaluate, and recommend solutions to address the problems and opportunities in the West Maui watershed. In response to the study authority, USACE initiated the reconnaissance study on April 1, 2008. The reconnaissance study has resulted in the finding that there is a Federal interest in continuing the project development into the feasibility phase. The purpose of this Section 905(b) Analysis is to document the basis for this finding and establish the scope of the feasibility phase. As the document that establishes the scope of the feasibility study, the Section 905(b) Analysis is used as the chapter of the project management plan that presents the reconnaissance overview and formulation rationale.

3. LOCATION OF STUDY, NON-FEDERAL SPONSOR AND CONGRESSIONAL DISTRICTS

The West Maui watershed study area includes the entire area associated with the portion of the island of Maui comprising the West Maui Mountains (approximately 90,000 acres), encompassing all West Maui drainages from Hāhākea to Waihe`e. As discussed under Section 5 - Plan Formulation, the feasibility study will focus only on a priority section of the

study area because of funding constraints. In the event that the Sponsor is able to obtain additional funding, the geographic scope of the feasibility study may be increased. The priority area for the feasibility study extends from Kā`anapali northward to Honolua and from the top of the West Maui Mountains at the summit of Pu`u Kukui to the outer reef and includes the watersheds of Wahikuli, Honokōwai, Kahana, Honokahua, and Honolua (24,000 acres). Figure 1 shows both the study area for the reconnaissance phase and the reduced feasibility study area that will be covered under the Project Management Plan (PMP) and Feasibility Cost Share Agreement (FCSA). This report considers the entire reconnaissance study area (90,000 acres) as the project may be expanded based on availability of future funds with more detail provided in applicable sections on the reduced feasibility study area (24,000 acres). Recommended additional study phase locations in no particular order would include: (a) Honokōhau to Waipi`i watersheds; (b) Wai`olai to `Īao watersheds; (c) Waikapū to Ukumehame watersheds; and (d) Olowalu to Kahoma watersheds.

The study area supports existing near-pristine forestlands and offshore coral reefs, which are valuable ecological resources that are also important to the economy of state of Hawai`i. The University of Hawai`i (UH) estimated that coral reefs provide $800 million a year in gross annual revenue for the State of Hawai'i, and the island of Maui is losing more than $20 million a year in gross revenue due to loss of coral reef habitat from land-based pollution and invasive species. U.S. Geological Survey (USGS) studies have shown that the coral reefs in West Maui are also critical to the health of the coral reefs on Lāna`i, as the West Maui coral reefs provide the larvae that settle and grow on the Lāna`i reefs. Approximately 48 species listed under the Endangered Species Act (ESA) and 17 candidate species reside in the upper watershed of the study area. In addition, the study area supports 62 designated critical habitats. There are 20 species listed under the ESA and/or protected by the Marine Mammal Protection Act that occur in the study area's marine waters, including habitat designated as part of the Hawaiian Humpback National Marine Sanctuary. (Appendix D) Out-dated agricultural practices and recent land use shifts from agrarian activities to resort, residential, and urban activities have resulted in increases in erosion and sedimentation, decreases in stream flows, impairments to stream habitat, losses of wetland resources, and impairment of coral reef ecosystems and other marine habitats.

Within the 24,000 acres of the feasibility study area, approximately 6,000 acres are native forests, bogs, and wet cliffs, 10 acres are native shrub/dry cliffs, 6,500 acres are alien forest, 2,000 acres are alien grasses and shrubs, and 45.9 miles of streams are classified under Section 303(d) of the Clean Water Act (Honokōwai, Honolua and Kahana streams).

The non-Federal sponsor for the feasibility phase of the study is the State of Hawai`i, Department of Land and Natural Resources (DLNR) – represented by the Division of Aquatic Resources (DAR), the Division of Forestry and Wildlife (DOFAW), and the Commission on Water Resource Management (CWRM) – and the State of Hawai`i Department of Health (DOH). Maui County is considering participating as a joint sponsor with DLNR and DOH on this project.

The study area lies within the jurisdiction of the 2nd Congressional District of Hawai`i.

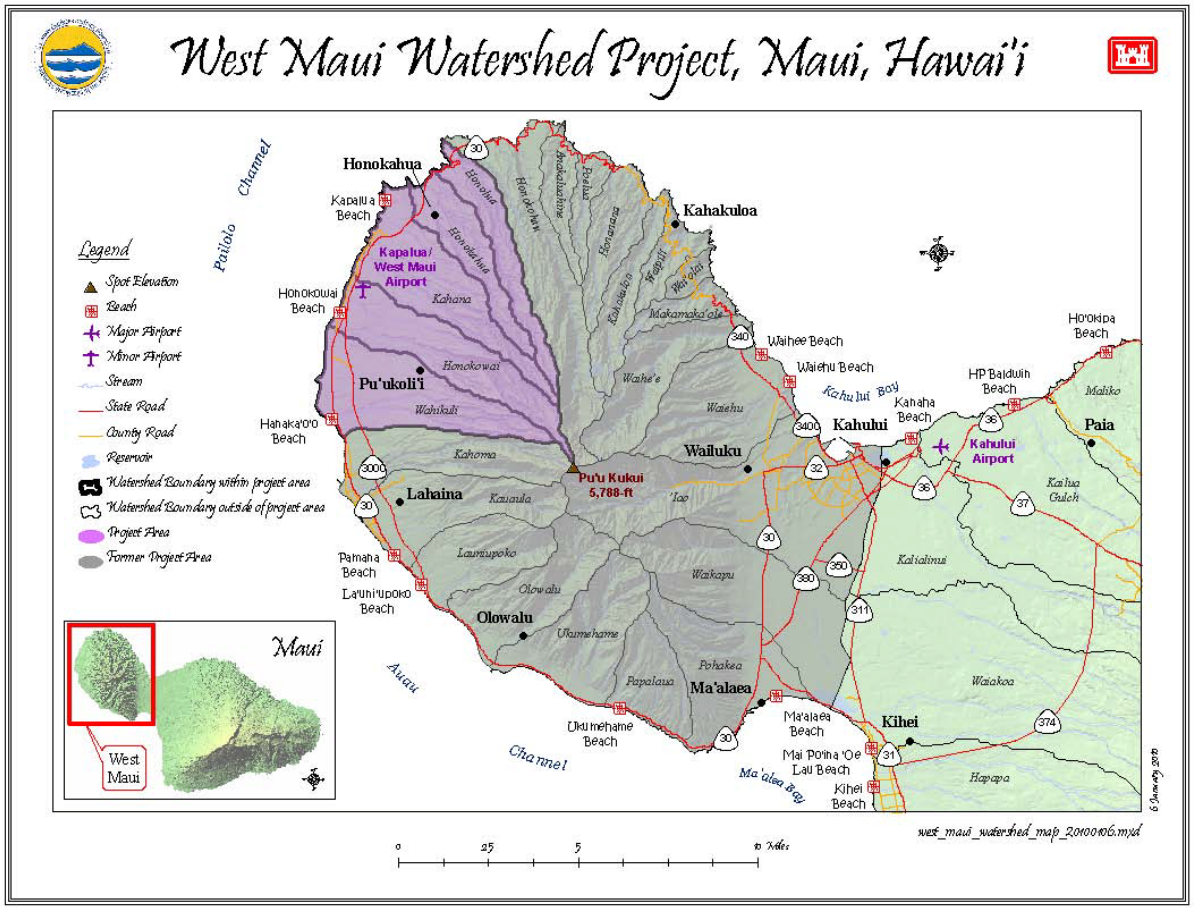


Figure 1: West Maui Watershed – Reconnaissance Study Area compared to Reduced Feasibility Study Area.

4. PRIOR REPORTS AND EXISTING PROJECTS

Because of the importance of the study area to Maui County, the residents of Maui, and the State of Hawai`i, a considerable amount of research on the West Maui study area has occurred. Following is a list of the primary reports that were reviewed for this reconnaissance study.

1) West Maui Watershed Owner's Manual, prepared by West Maui Watershed Management Advisory Committee for the Community (1997):

The West Maui Watershed Owner's Manual is a collection of recommendations for protecting and improving water quality and ocean resources for West Maui. It recommends responsible actions for all the watershed's residence and users, and identifies specific tasks that the large plantations, government agencies, and other users can undertake. It is a comprehensive plan that seeks to protect both drinking water and

coastal waters and includes actions to control erosion from agriculture and construction, improved management practices for agriculture landscaping and fertilizer use, better drainage designs, and recommendations for more effective algae removal programs.

2) West Maui Mountains Watershed Management Plan, prepared by West Maui Mountains Watershed Partnership (1999):

In recognition of the West Maui Watershed resources, and the need for coordinated protection and management of the native ecosystems that provide such a vital ecological service, the eight-member West Maui Mountains Watershed Partnership (WMMWP) developed a management plan that reflects their long-term commitment toward a shared responsibility. It stresses the importance of watershed management, and outlines the cost and contents of a comprehensive management plan for the 50,000 acres of forest and watershed vegetation occupying the summit and slopes of the West Maui Mountains on the island of Maui. The plan presents the consensus interests and goals of the eight members of the WMMWP. It describes current watershed management programs and activities occurring in the West Maui Mountains and projects future programs in each of six areas of management priority: 1) Feral animal control, 2), Weed control, 3) Human activities management, 4) Public education & awareness, 5) Water and watershed monitoring, and 6) Management coordination improvements.

3) Preliminary Restoration Plans (PRPs) for West Maui, Honokōwai, Honokahua, Mokupe'a, and Hāhākea Ecosystem Restoration Projects, prepared by the U.S. Army Corps of Engineers, Honolulu District (2003):

The Preliminary Restoration Plans (PRPs) prepared for the above listed watersheds provide plans for the management and execution of studies in the above subject areas through completion of the reconnaissance stage and preparation of preliminary restoration plans. The study areas are located in the West Maui mountains, near Kapalua, island of Maui, Hawai'i. Each study proposed addressing the degradation of terrestrial habitat caused by development, former agricultural activities, and invasive alien species and other impacts to the ecosystem as evidenced by the degradation of aquatic and marine environments. Upon review, USACE Pacific Ocean Division recommended that these five PRPs be combined into a single study. The problems and opportunities identified in these 5 PRPs have been incorporated and expanded in this 905(b) report.

4) The Draft Maui Island Plan, prepared by the County of Maui (December 2009 with May 2010 supplement):

The Maui Island Plan is the result of three years of public coordination and collaboration activities conducted by the County of Maui to identify the priorities for public policy in the County. The goals identified by the community are "the desire to maintain the small towns and open countryside that is such a large part of who and what Maui is, while at the same time providing vibrant urban areas that will provide an

equally positive quality of life for those who make their lives in our largest towns." The plan identifies the following strategies: adoption of a directed growth strategy, protection of Maui's small towns and rural character, affordable housing, protection of watersheds and coastal resources, identification of transit corridors, economic diversification, and integration of land use and infrastructure planning. The West Maui Watershed project will assist in promoting the protection of watersheds and coastal resources and the integration of land use and infrastructure planning.

5) The Hawai`i Ocean Resources Management Plan (ORMP), prepared by State of Hawai`i Coastal Zone Management Program (2006):

Mandated by Chapter 205A, Hawai`i Revised Statues, the ORMP is the statewide plan for the management of natural and cultural resources across the State. Building on traditional Hawaiian management principles and lessons from past efforts, the ORMP is a shift toward integrated and area-based approaches to natural and cultural resources management that require greater collaboration among jurisdictional authorities and that will catalyze community involvement and stewardship. In effect, it is a bottom-up approach that builds on community partnerships. However, because the change is comprehensive, it will take significant time, effort, and considerable thought to realize. The ORMP maps incremental 5-year management priorities to embark on a new course of action and achieve the primary goal: to improve and sustain the ecological, cultural, economic, and social benefits we derive from ocean resources today and for future generations. The three key perspectives of the plan are: Connecting Land and Sea, Preserving Our Ocean Heritage; and Promoting Collaboration and Stewardship. The West Maui Watershed Project integrated and collaborative framework is based on the principles of the ORMP. The joint sponsorship is an output of interagency collaboration via the ORMP Working Group forum.

6) Recent Hydrologic Conditions, Lahaina District, Maui, Hawai`i, prepared by U.S. Department of the Interior, U.S. Geological Survey, and Pacific Islands Water Science Center (2009):

This is a web page that summarizes pumpage, water-level, chloride-concentration, deep monitor wells, stream flow, stream diversion and rainfall data for the Lahaina District, Maui. Current data is for the third quarter of 2009. The site also provides a summary of the 12-month moving mean of reported pumping in the aquifer system.

7) State of the Coral Reef Ecosystems of the Main Hawaiian Islands, prepared by National Oceanic and Atmospheric Administration (2008):

This report summarizes the status and trends of the nearshore coral reefs in the Main Hawaiian Islands. A short description of the threats to coral reefs is followed by summaries of data collected for the key components of coral reefs including fish population trends, baseline data on algae, benthic cover assessments, and data on miscellaneous invertebrates. A summary of current management actions undertaken to address the identified threats is followed by a short list of recommendations.

8) Status of Maui's Coastal Reefs, prepared by State of Hawai`i Department of Land and Natural Resources, Division of Aquatic Resources (no date):

This is a two page summary document that outlines the status and trends of reefs around Maui that have been monitored for a period of 7-13 years. The trends specifically show that many of the reefs have declining coral cover. The document points to several causes of this decline but most notably discusses the growing problem of invasive algae and the consequences of elevated nutrient levels in the nearshore waters. The paper outlines the important role of grazing fishes in controlling the invasive algae and discusses a case study for a site at Mā`alaea where coral cover loss is severe.

9) Coral Reefs of Maui – Status, Stressors, and Suggestions, prepared by Hawai`i Coral Reef Initiative Algal Bloom Workshop (2008):

This material includes a series of articles and research papers on a variety of reef ecosystem functions and related nearshore water quality needs. The overall findings from the participants summarize the current state of knowledge and reef health indices for West Maui. The recommendations from the workshop are summarized in a bulleted outline under key topic areas including reducing nutrient inputs from the land and enhancing marine herbivore populations.

10) He Wahi Mo'olele No Kaua'ula A Me Kekāhi `Āina O Lahaina I Maui – A Collection of Traditions and Historical Accounts of Kaua'ula and Other Lands of Lahaina, Maui, prepared by Kumu Pono Associates, LLC (2007):

This document is a detailed study of numerous archival and documented literature and oral history interviews from those individuals descended from traditional and historical residents for the lands in the Kaua'ula-Makila vicinity in the Lahaina District on the island of Maui. Significant accounts, many never before translated from Hawaiian to English, were included in the study. The documentation covers land tenure, features of the cultural or sacred landscape (*wahi pana*), practices of native Hawaiian residency and land use, transitions from traditional land tenure and jurisdiction (*kuleana)* and subsistence practices to the development of the sugar plantations and ranching, and detailed documentation of the historical land ownership in the region.

11) Coastal Circulation and Sediment Dynamics along West Maui, Hawai`i Part I (2003), Part II (2003), Part III (2004), and Part IV (2005), prepared by U.S. Department of Interior and U.S. Geological Survey:

The ultimate goal of these four studies was to better understand coastal dynamics such as the transport mechanisms of sediment, larvae, pollutants, and other particles in coral reef settings along the West Maui coast. Long-term, high resolution measurements of currents, water level, temperature, salinity, and turbidity were made using a variety of data acquisition methods to analyze the varying special and temporal impacts of these

properties on nearshore coral reef systems. Specific focus was placed at two study sites Kahana and Honolua, the latter being adjacent to a major stream flow.

12) Economic Valuation of the Coral Reefs of Hawai`i, prepared by Cesar Environmental Economics Consulting (2002):

Using three case study sites (Hanauma Bay, O`ahu; Kīhei and Kā`anapali, Maui; and, the Kona Coast of Hawai`i), the focus of this study was to: 1) assess the economic value of selected sites and of the main Hawaiian Islands as a whole, 2) determine the economic costs of reef degradation, and 3) compare the costs and benefits of various management options that aim to reverse the trend. An integrated model and the interactions between the ecological and economic components served as the basis for the analysis. The overall asset value of coral reefs in Hawai`i was estimated to be worth $9.7 billion. Individual asset site values at the three case study locations and the costs associated with management activities were also provided, as well as comparisons between sites.

13) Atlas of Hawaiian Watersheds and Their Aquatic Resources, Island of Maui, prepared by State of Hawai`i Department of Land and Natural Resources, Division of Aquatic Resources (2008):

The State of Hawai`i compiled all the aquatic resource surveys and data of streams, estuaries, lakes, ponds, reservoirs, ditches, and diversions throughout the Hawaiian Islands collected over the last 50 years to provide critical information for monitoring, assessing, managing, and protecting freshwater resources. The streams within the West Maui Watershed study area are included in this atlas.

14) Studies in Honolua Bay and West Maui via the State of Hawai`i Coral Reef Local Action Strategy for Land-Based Pollution Threats (1999-2009).

Primarily through a grant from the National Oceanic and Atmospheric Administration (NOAA) Coral Reef Conservation Act, the State of Hawai`i's Coral Reef Local Action Strategy (LAS) for land-based pollution threats has conducted a variety of studies to better assess the threats to Honolua and West Maui reefs. Topics within these studies include: Anthropogenic and Natural Stresses on Coral Reefs (Honolua, Maui); Assessment, Mapping, and Monitoring of Selected "Most Impaired" Coral Reef Areas in the State of Hawai'i (Kāne`ohe Bay, O`ahu; South O`ahu; West Maui; and South Moloka`i); Carrying Capacity Study for Managing Public Use of Honolua Bay; Hawai'I Coral Reef Assessment and Monitoring Program (Honolua, Maui); Honolua Ecosystem Restoration Project; Innovative Wastewater and Storm-Water Management System Workshop and Design Recommendations for Public Restroom Facility and Parking Lot in a Sensitive Coastal Environment (Honolua, Maui); Long-Term Variability of Currents, Temperature, Salinity, and Turbidity off Kahana, Northwest Maui (Honolua, Maui); Screening Level Monitoring for Pesticides and Herbicides in Honolua Bay; Soil Erosion and Surface Water Runoff Control for Land Use Transition from Pineapple Cultivation to Resort, Residential, and Recreational Development, (Honolua, Maui); Soil Erosion Control Best Management Practices and Water Quality Monitoring for Pineapple

Cultivation and Monitoring (Honolua, Maui); Spatial and Temporal Variability in Historic Near-Shore Sedimentation Recorded in Coral Skeletons (Honolua, Maui or Kawela, Moloka`i); Synthesis and Critical Analysis of Available Data and Information on Land Use, Runoff, Water Quality, and the Health of Coral Reef Ecosystem at Honolua Bay; Technical Assistance for Stormwater Management for Residential and Golf Course Development at Honolua Bay, and West Maui coastal circulation and sediment dynamics experiment (Honolua, Maui).

15) Maui County Hazard Mitigation Plan (2006).

Developed by Maui County Civil Defense Agency with joint support from NOAA's Office of Ocean and Coastal Resources and the Federal Emergency Management Agency (FEMA), this plan is a multi-hazard management plan addressing hydrologic hazards (floods, coastal storms, stream flooding), coastal erosion (beach lifecycle and erosion), seismic hazards, tsunami hazards, wind hazards (hurricanes and strong winds), drought and wildfire hazards. The document includes a hazard risk and vulnerability assessment and highlights potential mitigation actions and projects to reduce the hazard risks. The document determines that the study area is at risk from all of the hazards reviewed in varying degrees based on specific locations with the more critical risks for the study area being risk of sheet flow and stream flooding, coastal erosion and drought and wildfire.

A detailed list of reports related to the study area is provided in Appendix B – West Maui Watershed Reconnaissance Study, Final Stakeholder Coordination Report. A detailed list of ongoing studies and reports in the study area is provided in Appendix C – West Maui Watershed Reconnaissance Study, Inventory of On-going Activities.

The following USACE authorized projects occur in the Reconnaissance Study area:

- Feasibility Phase:
  - Mokuhinia/Moku`ula Ecosystem Restoration, Lahaina, Maui
  - Kanahā Pond Ecosystem Restoration, Kahului, Maui
  - Kahului Deep Draft Harbor Modification, Kahului, Maui
- Design Phase/Re-Evaluation Study/Under Construction:
  - `Īao Stream Flood Control Project Modification, Wailuku, Maui
  - Launiupoko Shore Protection Project, Olowalu, Maui
  - Mā`alaea Small Boat Harbor, Mā`alaea, Maui
- Completed:
  - `Īao Stream Flood Control Project, Wailuku, Maui
  - Kahului Bay Prevent and Mitigation of Shore Damages
  - Kahului Deep Draft Harbor, Kahului, Maui
  - Kahului Small Boat Harbor, Kahului, Maui
  - Kahoma Stream Flood Control Project, Lahaina, Maui

There are no USACE authorized projects in the feasibility study area. The feasibility study would investigate implementation of new management measures to address the problems

and opportunities in the study area and the potential modification of flood risk management structures, diversions, irrigation systems, sediment detention/retention basins, and shore protection activities that have been implemented by the State, County, other Federal agencies, and/or other organizations (e.g. West Maui Mountains Watershed Partnership, West Maui Soil and Water Conservation District).

5. PLAN FORMULATION

During a study, the six planning steps set forth in the Water Resource Council's Principles and Guidelines are repeated to focus the planning effort and eventually to select and recommend a plan for authorization. The six planning steps are: 1) specify problems and opportunities, 2) inventory and forecast conditions, 3) formulate alternative plans, 4) evaluate effects of alternative plans, 5) compare alternative plans, and 6) select recommended plan. The iterations of the planning steps typically differ in the emphasis that is placed on each of the steps. In the early iterations, those conducted during the reconnaissance phase, the step of specifying problems and opportunities is emphasized. That is not to say, however, that the other steps are ignored since the initial screening of preliminary plans that results from the other steps is very important to the scoping of the follow-on feasibility phase studies. The sub-paragraphs that follow present the results of the initial iterations of the planning steps that were conducted during the reconnaissance phase. This information will be refined in future iterations of the planning steps that will be accomplished during the feasibility phase.

National Objectives

The national or Federal objective of water and related land resources planning is to contribute to national economic development (NED) consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to NED are increases in the net value of the national output of goods and services, expressed in monetary units; they are the direct net benefits that accrue in the planning area and the rest of the nation.

USACE has added a second national objective for ecosystem restoration in response to legislation and administration policy. This objective, referred to as the National Ecosystem Restoration (NER) objective, is to contribute to the nation's ecosystems through ecosystem restoration, with contributions measured by changes in the amounts and values of habitat.

Public Concerns:

A number of public concerns have been identified during the course of the reconnaissance study. Initial concerns were expressed in the PRPs discussed above. Additional input was received through coordination with the sponsors and some initial coordination with other agencies. The public concerns that are related to the establishment of planning objectives and planning constraints are:

- Coral Reef Habitat – Maui County has a documented loss of over $20 million a year in gross annual revenue associated with impacts to coral reefs from land based pollution, algal blooms, and other activities. DAR has documented a 72 percent decline in coral reefs in 10 years in Honolua Bay, which is a designated Marine Conservation Land District.

- Land Based Pollution - Increased sedimentation, pollutant loading, and debris on nearshore reefs is causing a decline in the health of the reef ecosystem and an increase in the presence of alien species.

- Stream Alteration - Alterations to natural stream beds (diverted water, hardening/de-channelization, etc) has compromised stream habitat and limited the supply of water available for traditional and customary Native Hawaiian practices.

- Water Quality - Water quality and quantity in streams and ground water has decreased causing concerns for human health and impacts to native flora and fauna.

- Overall Watershed Degradation - Watershed degradation in the upper watersheds from a variety of sources has resulted in significant ecosystem degradation, an increase in alien species, and the inability of the watershed to effectively recharge stream and ground water resources.

- Risk of Flooding and Coastal Storm Hazards - Loss of wetlands and floodplains due to development activities and increased sediment and debris associated with the human alteration of the landscape has increased the risk of property being damaged or destroyed during major storm events. Shoreline development has resulted in changes to coastline stability and/or resulted in increased number of properties at risk from coastal storm hazards including increased coastal erosion.

- Infrastructure - Infrastructure from current channels and sediment basins is not well maintained. There is inadequate infrastructure (i.e. waste water, potable water, etc), to support the growing demand due to development.

- Incorporation of Native Hawaiian Traditional Practices – The public raised a desire to have Hawaiian traditional cultural practices incorporated or enhanced within the West Maui study area. For example, the public would like to see the incorporation of *ahupua'a* concepts in water resource management, increased opportunities for traditional farming practices such as taro (*lo`i*) ponds, changes in water management, and opportunities for applying traditional ecological knowledge in land, water, and fisheries management as management measures.

Problems and Opportunities:

The evaluation of public concerns often reflects a range of needs as perceived by the public. Figure 2 is an influence diagram created by the stakeholders in a Stakeholder Workshop to

define the variety of concerns, problems, and influences that are affecting the health of the coral reefs in West Maui. This section is separated by topic and describes these needs in the context of problems and opportunities that can be addressed through water and related land resource management. For the problems and opportunities, the existing conditions and the expected future conditions are described as follows:

1) Impacts to Stream Resources:
Problems

- Need for in-stream flow standards, which are the minimum flows necessary to sustain various uses and are the primary tool to protect streams and the public uses dependent upon them.
- Native Hawaiian traditional and customary practices; not enough available water for cultural uses (taro (*kalo*) cultivation, native aquatic species, protocol for sacred sites (*heiau)*, etc).
- Lack of or degraded stream habitat for native species; native freshwater shrimp (*opae`ula)* serve as an indicator of system health.
- Stream hardening/de-channelization compromises stream habitat.
- Stream gauging stations funding being reduced and stations eliminated.
- Lack of stream maintenance (rubbish, vegetation, logs, etc.) affects flooding and stream habitat.
- Water quality decreased by disease from invasive species (human health impacted – Clean Water Act Section 303(d) list).
- Water diversions and water systems date back to the plantation era and earlier; most lack proper maintenance and are not efficient carriers of water.

Opportunities / Data Gaps

- Baseline stream data needed (flow, habitat, water quality, etc.).
- Stream studies for setting of in-stream flow standards; studies done for Nā Wai Ehā but not for other West Maui streams.
- Long term monitoring of effects of stream restoration on native species.
- Streamflow data for management decisions.
- Collect historic data on rainfall and stream flow from the old sugar companies (i.e. water sampling).
- Restore stream functions while remnants of the stream ecosystems have the ability to recover.

Expected Future Conditions (No Action)

- If no action is taken to restore stream habitat, habitat for important and rare aquatic species (i.e. native gobie fish (*'o'opu)* and shrimp (*`ōpae`ula*)) will be completely lost, water quality will continue to decline, and surface water will continue to decrease and there will be insufficient water to support the variety of needs in the study area (traditional cultural practices, agricultural, residential, tourism, etc.)

2) Impacts to Groundwater Quality and Quantity*:*
Problems

- The amount of aquifer recharge has been declining while pumping has increased, resulting in an increase in chloride concentrations in the water pumped from wells.
- The sustainability of the water supply is in question, due to the relative nature of recharge and pumpage to meet population demands.
- Loss of wetlands has meant loss of recharge.
- Quality of groundwater can be affected by activities in the well head areas.
- Abandoned wells can be a conduit for contaminates into the aquifer.
- Injection wells/reclamation (recycled water) infrastructure may affect the ground water quantity and quality.

Opportunities/Data Gaps

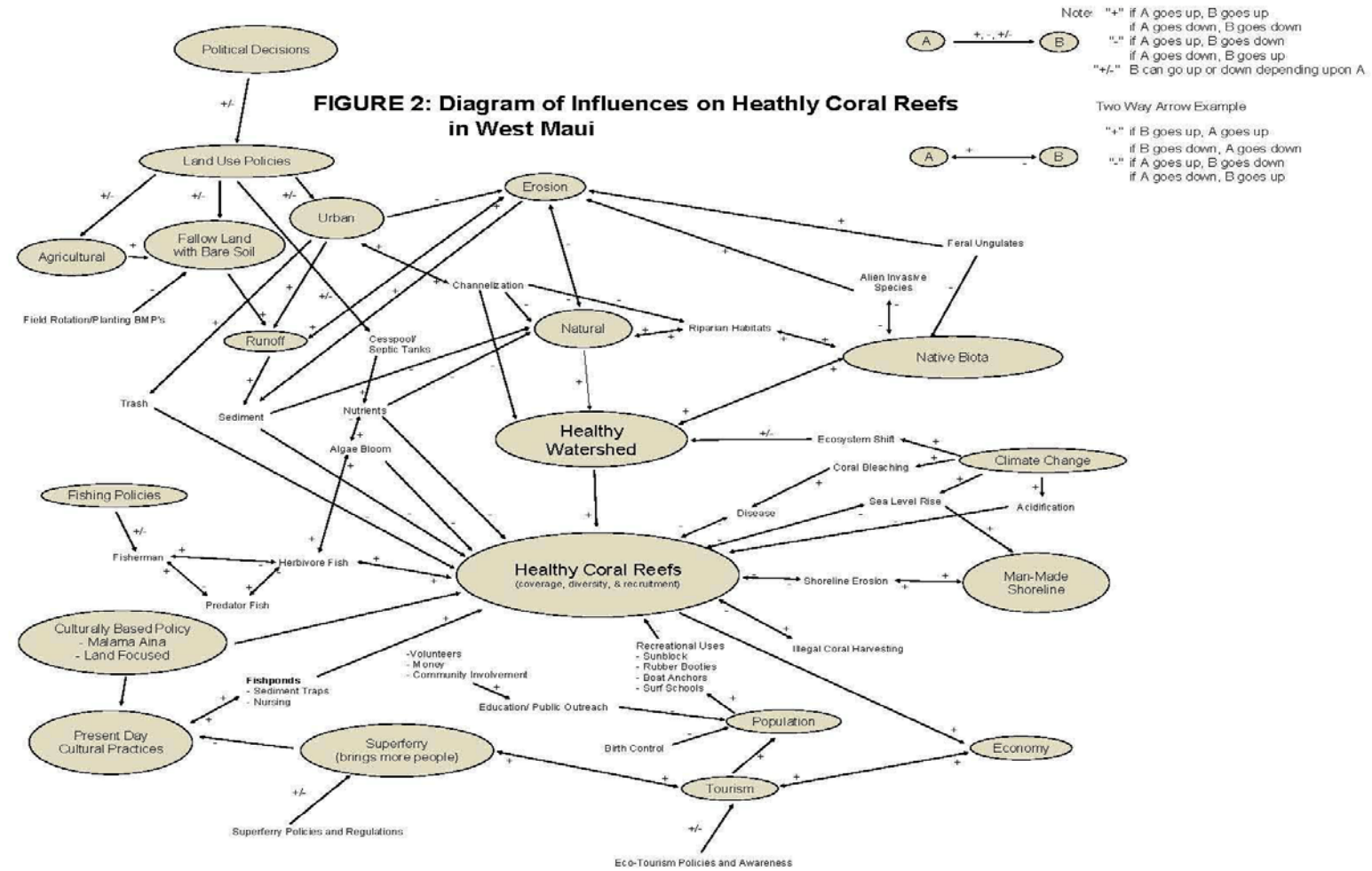
- Inventory private wells for possible aquifer withdrawal locations.
- Gather data and establish protocol to determine future well placement locations
- Survey of abandoned wells for future capping.
- Research the possible effects of salt water intrusion with climate change.
- Institutionalize groundwater protection measures.

Expected Future Conditions (No Action)

- If no action is taken to protect and restore groundwater quality and quantity, the groundwater aquifer will not be able to sufficiently recharge and support the needs of the variety of habitats and users within the West Maui study area. The declining quality of the groundwater will continue to impair the nearshore areas including coral reefs. Lack of understanding of the groundwater function and contributing factors to the degradation could result in implementation of management measures that do not address the primary source of the problem.

3) Watershed Degradation:
Problems

- Fires create areas where colonizing invasive weed species gain a foothold over native species. Debris from fires can clog streams during storm events and contribute to flooding problems. Post-fire erosion and sediments impair nearshore waters.
- Feral ungulates graze on native species (selectively over less “tasty” invasive species) and transport invasive weed species into the upper reaches of the watershed.
- Weed species management is challenging and costly in the extremely rugged terrain.
- Predators (mongoose, feral cats, feral and domestic dogs) often threaten the survival of seabirds.
- Ecosystem restoration needs funding resources and property access to be successful.
- Mountain (*mauka*) to sea (*makai*) access is not always possible and can prevent native Hawaiian traditional and customary practices in the upper watershed.



This diagram is a compilation of the five group diagrams created at the US Army Corps of Engineers West Maui Reconnaissance Study workshop on March 4, 2009. Additional arrows have been added to show the interrelatedness of factors from the various group diagrams. However, no new factors have been added.

- All-terrain vehicles can introduce and spread invasive species to *mauka* areas, increase the fire risk, encourage trespassing, and increase hiking and hunting along the new all-terrain vehicle trails in sensitive habitats.

Opportunities/Data Gaps

- Conduct a cultural inventory to understand what the ecosystem used to be like and identify opportunities for restoration.
- Identify opportunities for reforestation and wetland restoration.
- Prioritize the impact of fire and other activities on the watershed to address the most crucial issues first.
- Quantify existing management benefits for restoration and conservation.
- Educate people on recreational impacts of watershed users.
- Prepare fire plans for all fire prone areas.

Expected Future Conditions (No Action)

- If no action is taken to reduce and reverse watershed degradation in the study area, 48 listed ESA species, 17 candidate species under ESA, and 62 designated critical habitats are at risk of loss.
- Important Native Hawaiian cultural resources and traditional cultural practices protected under the National Historic Preservation Act are at risk of permanent loss.
- Fire risks will increase, resulting increase instability of riparian areas, increased sedimentation and erosion, and increased loss of stream habitats, and nearshore marine waters.

4) Impacts to Coral Reef/Nearshore Waters:
Problems

- Nearshore water quality
- Algal bloom
- Coral reef impacts from agriculture and development
- Ocean and land-based sources of marine debris
- Illegal dumping and lack of enforcement
- Injection wells/ reclamation (recycled water) infrastructure may affect the nearshore waters.
- Restoration of streamflow with respect to nearshore water quality; concern that influxes of freshwater may impact coral reefs.

Opportunities / Data Gaps

- Determine sources of pollution and prioritize erosion hot spots including an understanding of the relationship between sedimentation and land use.
- Assess functioning of existing sedimentation basins.
- Define public education initiative to reduce contamination load in Shoreline Management Area.
- Characterize public health issues from exposure to pathogens.
- Develop and research plan to characterize natural breakdown of pollutants.

- Determine if there is a need for beach remediation.
- Follow up on effectiveness of West Maui ownership manual BMPs and implementation barriers.
- Conduct a habitat characterization study of coral reefs.
- Assess impact of stream restoration with respect to nearshore water quality which may include mapping of groundwater intrusion and nutrient level monitoring at marine shore interface.

Expected Future Conditions (No Action)

- If no action is taken to reverse the degradation of coral reefs and nearshore waters, loss of protected habitat for 20 listed marine ESA species and marine mammals is at risk;
- Coral reefs protected under the Clean Water Act as special aquatic sites, protected under the Coral Reef Conservation Act and as designated essential fish habitat under Magnuson Stevens Act are at risk of loss.
- Coral reefs provide natural protection of shoreline from ocean storm events, habitat for marine fisheries (subsistence and commercial), water quality functions, and marine primary productivity and biodiversity in addition to the overall importance to Hawai`i and Maui County's economic stability. The loss of these coral reef functions and values will be detrimental to the State of Hawai`i and the nation.

5) Flooding and Sedimentation:
Problems

- Insufficient dam inspection and maintenance
- Agricultural diversion and erosion measures upkeep and maintenance
- Insufficient drainage inlets maintenance
- Lack of enforcement of grading and drainage standards including addressing loopholes in review process
- Illegal dumping and lack of enforcement
- Restoration of streamflow with respect to nearshore water quality; concern that influxes of freshwater may impact coral reefs.
- Documented past flooding and coastal erosion threats and damages based on the Maui County Hazard Mitigation Plan.

Opportunities / Data Gaps

- Determine sources of pollution and prioritize erosion hot spots including an understanding the relationship between sedimentation and land use.
- Assess functioning of existing sedimentation basins.
- Analyze flood management including a comparison of channel direct flow (current design) vs. natural impoundment metered flows.
- Study the effectiveness of desiltation projects vs. reforestation/buffers.
- Natural Resource Conservation Service (NRCS) Watershed Protection and Flood Prevention Act (PL 83-566) – NRCS implements the Watershed Protection and Flood Prevention Act with agencies and communities through three programs:

Watershed Surveys and Planning, Watershed Protection and Flood Prevention Operations, and Watershed Rehabilitation.

- Identify drainage way ownership for increased enforcement of maintenance.
- Follow up on effectiveness of West Maui ownership manual BMPs and implementation barriers.
- Assess impact of stream restoration with respect to nearshore water quality which may include mapping of groundwater intrusion and nutrient level monitoring at marine shore interface.

Expected Future Conditions (No Action)

- If no action is taken to address the increased risk of flooding and sedimentation in a holistic manner, there will be a risk of increased property damage in the study area and increased degradation of coral reef and nearshore habitat as discussed under paragraph 4 above.

6) General Impacts:

Problems

- Climate change and impacts on the watershed.
- Land ownership/title.
- Oversight/transparency for enforcement of regulations to protect watershed health.
- Integration of traditional knowledge and practice.
- Need to improve and increase education and outreach.
- Lack of knowledge about other watershed efforts.
- Clear scientific data to inform and base standards upon.
- Proposed solutions need to be balanced with economic financial considerations

Opportunities/Data Gaps

- Communicate effectively to the community on climate change (including having consensus on message, relevance to people's personal life and economics).
- Study climate change impacts on management strategies including droughts, changes in vegetation and increased fire risks.
- Build flexibility into plans for responding to climate change and look at post-climate change ecosystems.
- Locate clear data on the expected change with climate change.
- Integrate watershed master plan with other planning efforts and align with other sources of funding requirements; coordinate synergies, overlap and identification of information gaps.
- Create a coordinated inventory/survey like the US Fish and Wildlife Service Habitat Cover Program.
- Establish centralized records, data collection, monitoring, updating.

Expected Future Conditions (No Action)

- If no action is taken to address overall problems within the watershed in an holistic manner, there runs a risk of increased threats to the community from climate change, loss of traditional Native Hawaiian cultural practices, loss of education and

awareness of the public on the interconnectedness of water resources within the watershed and the variety of contributions that each stakeholder adds to the overall watershed degradation. Lack of a collaborative joint plan runs the risk of implementing either duplicative actions or actions that cannot fully address the threats to the watershed – thereby becoming ineffective at meeting goals of watershed preservation and restoration.

National Planning Objectives:

The national objectives of National Economic Development and National Ecosystem Restoration are general statements and not specific enough for direct use in plan formulation. The water and related land resource problems and opportunities identified in this study are stated as specific planning objectives to provide focus for the formulation of alternatives. These planning objectives reflect the problems and opportunities and represent desired positive changes in the without project conditions. Through the first step of the feasibility planning process, the specific, measurable, achievable, realistic, and timely objectives will be defined with USACE, the sponsors and the key federal partnering agencies with collaboration from the stakeholders. The planning objectives are specified as follows:

Non-Federal Sponsor Planning Goals and Objectives:

The West Maui Watershed Study goal is to improve the overall quality of the West Maui Watershed, from the summit of Pu`u Kukui to the outer reef, incorporating holistic management aspects of traditional Hawaiian land and natural resource management (such as *ahupua'a* principles) at the watershed level within a modern context.

Objectives supporting this goal include, but are not limited to:

- Aquatic Resource Restoration:
  - Enhancing and restoring the physical, biological and chemical integrity of aquatic resources.
  - Enhancing and restoring stream function and habitat.
  - Reduce key anthropogenic threats in the study area by 2015 using ahupua'a based management, including threats to near-shore coral reefs.
  - Prevent new marine and freshwater alien invasive species (AIS) introductions and minimize spread of established AIS populations by 2020.
  - Increase the abundance and average size of the top three coral reef resource species by 2015.
  - Designate sufficient area of marine waters under effective conservation by 2020 to ensure sustainable and resilient coral reef ecosystems.
  - Reduce anchor damage and trampling on coral reefs through the implementation of no-anchor zones, utilization of day-use mooring buoys and other means by 2020.

- Water Quality:
  - Improving water quality.
  - Indentify and support the expansion of waste-water and stormwater reuse opportunities.
- Water Supply:
  - Improving and preserving water supply (both surface and groundwater).
- Terrestrial Resource Restoration:
  - Assisting in the implementation of Endangered Species Act (ESA) recovery plans as stipulated by designated critical habitat.
  - Preserving and enhancing native forests.
  - Prevent new terrestrial alien invasive species (AIS) introductions and minimize spread of established AIS populations by 2020.
- Flood Risk Management:
  - Balance the needs to minimize risk of flooding for public health and safety with environmental quality needs and objectives.
- Drought Impact Mitigation.
- Wildfire Mitigation:
  - Development and Implementation of Community Wildlife Protection Plans.
- Public Collaboration.

During the initiation of the feasibility phase, the objectives will be refined through a collaborative process with the sponsors and stakeholders to follow planning principles with each final objective being specific, flexible, measurable, attainable, congruent, and acceptable. Additional potential objectives will be investigated including shoreline erosion and protection, navigation improvements, and alternative energy development.

Planning Constraints:

Unlike planning objectives that represent desired positive changes, planning constraints represent restrictions that should not be violated. The planning constraints identified in this study are as follows:

1) As a jointly sponsored study with DOH and DAR utilizing support from NOAA and U.S. Environmental Protection Agency (EPA), the study must meet NOAA and EPA requirements, including, but not limited to, the following:

- The requirements of the NOAA Coral Reef Conservation Program (CRCP) Grant to the State of Hawai`i, Fiscal Year 2010.
- Clean Water Act, Section 319.
- EPA's 9 Elements for Watershed Planning.
- Clean Water Act, Section 303(d) and associated Hawai`i Revised Statue (HRS) Chapter 91 and Hawai`i Administrative Rule (HAR) Chapter 11-54.

2) Consistent with the Federal Coastal Zone Management Act (CZMA) and as a jointly sponsored study with the State of Hawai`i, the study must comply with all applicable

State and county laws, regulations, policies, and plans, including, but not limited to, the following:

- HRS, Chapter 343 - State Environmental Policy Review Requirements.
- HRS, Chapter 343 - Cultural Inventory Assessment.
- HRS, Chapter 174C – State Water Code.
- State of Hawai`i Act 212 - Establishing the `Aha Moku System.
- Applicable state and county plans.

3) The study must comply with all applicable Federal statutes, executive orders, and regulations including, but not limited to, the following:

- Federal Laws:
    - National Environmental Policy Act.
    - Clean Water Act (Sections 404, 401, and 402).
    - Clean Air Act.
    - Fish and Wildlife Coordination Act.
    - Magnuson Stevens Act.
    - Endangered Species Act.
    - Federal Coastal Zone Management Act.
    - Farmland Protection and Policy Act.
    - National Historic Preservation Act.
    - Marine Mammal Protection Act.
    - National Marine Sanctuaries Act.
- Engineer Regulations (ER):
    - ER 1105-2-100 Planning Guidance Notebook.
    - ER 200-2-2 Procedures for Implementing NEPA.
    - ER 200-2-3 Environmental Compliance Policies.
    - ER 200-1-5 Environmental Operating Principles.
- Executive Orders (E.O.):
    - E.O. 11514 – Protection and Enhancement of the Environment.
    - E.O. 11988 – Floodplain Management and Protection.
    - E.O. 11990 – Protection of Wetlands.
    - E.O. 12898 – Environmental Justice.
    - E.O. 13045 – Protection of Children.
    - E.O. 13089 – Coral Reef Protection.
    - E.O. 13112 – Invasive Species.
    - E.O. 13158 – Marine Protected Areas.
    - E.O. 13327 – Energy Efficiency and Greenhouse Gases.
- Engineering Circulars (EC):
    - EC 1165-2-249 Civil Works Review Policy.
    - EC 1105-2-409 Planning in a Collaborative Environment.
    - EC 1165-2-211 Sea Level Rise.

4) The following plans, studies or authorities must also be taken into consideration in developing this study:

- NRCS P.L. 83-566 – Watershed Protection and Flood Prevention Act.

- Section 106 of the National Historic Preservation Act – Plantation era ditch systems may begin being considered historic and making changes to them may become more challenging.
- DLNR Mā`alaea Herbivore Management Area.

Preliminary Scenarios to Address Identified Planning Objectives.

Through the USACE planning process, management measures are first defined. A management measure is a site-specific feature or activity that addresses one or more of the planning objectives. The management measures are combined into a variety of alternatives. As shown in the influence diagram in Figure 2, there is a wide array of issues affecting the aquatic habitat of the watershed, specifically coral reefs. Because of the size of the study area and the complexities of watershed planning, preliminary scenarios have been identified below that focus or maximize an aspect of restoration. For the purposes of this analysis, these scenarios are used as an initial screening. Through the feasibility phase, these scenarios would be expanded and analyzed in greater detail. Scenarios would be combined in some sections of the watershed and parceled out in others depending on the specific needs of that subwatershed. The descriptions below note the expected benefit of the scenario, how the scenario may be measured to determine its ability to meet planning objectives, and the significant contribution of the scenario. Except for the No Action scenario, the scenarios listed below have been screened as initially feasible from technical, economic, and environmental perspectives.

1) No Action. The Corps is required to consider the option of "No Action" as one of the alternatives in order to comply with the requirements of the National Environmental Policy Act (NEPA). No Action assumes that no project would be implemented by the Federal Government or by local interests to achieve the planning objectives. No Action, which is synonymous with the Without Project Condition, forms the basis from which all other alternative plans are measured.

2) Eradication of Alien Species in the Upper Watershed. Management measures would be evaluated in the West Maui Watershed Study including the eradication/control of alien animal and vegetation, restoring native forests to improve ground water infiltration and to encourage restoration of native wildlife, riparian habitat, aquatic migration routes, and wetlands, and controlling erosion using structural measures and native plant re-vegetation:

   Expected Ecosystem Changes (With Project Condition): Transformation of alien forests to native forests is believed to be beneficial as the alien forests are single layered canopy while native forests are multi-layered canopy forests. Native fish and wildlife species have adapted over time to native forest structure and vegetation. The U.S. Fish and Wildlife Service (USFWS) has identified upland bogs/wetlands in the watershed area as once providing a major habitat to support wildlife as well as enhancing water infiltration into the soil. It is believed that restoration of native forests and vegetation will encourage the comeback of native

fish and wildlife. Restoring riparian habitat is expected to improve water quality in the streams and contribute to restoring system structures and functions as well as reduce human-induced erosion that eventually chokes out marine resources where sediments enter the ocean.

Outputs and Measurements: Outputs for each of the project features will be measured in restoration of instream functions and benefits to native fish and utilizing the DAR-developed and USFWS-approved Habitat Evaluation Protocol (HEP) for streams on the island of Maui. This valuation model will undergo model certification consistent with USACE regulations and policies.

Significance of Outputs: The outputs of the watershed project are expected to be significant as they will protect a near-pristine conservation district that is being threatened by feral animals, abate erosion in the transition zone that once supported agriculture, and prevent the marine environment from further degradation by reducing sediment loads resulting from urban activities.

3) Maximization of Sediment Detention and Retention Measures. Management measures will be evaluated that maximize opportunities to implement sediment detention and retention basins, sediment and erosion controls along trails, sediment controls along farm roads, and other measures to reduce sediment and erosion within the study area. There has been success with the implementation of sediment detention basins and other best management practices on the agricultural lands above Kahakeli through the West Maui Soil and Water Conservation District in partnership with Maui Land and Pine. The existing detention facilities will be evaluated to measure their overall effectiveness and provide lessons learned in implementing similar structures in other portions of the watershed.

Expected Ecosystem Changes (With Project Condition): The management measures will provide long-term benefits to the coral reef ecosystem in the bay where sedimentation is the primary cause of degradation. Sediment basins are expected to reduce the amount of particulate matter that is discharged into the nearshore waters, thus improving marine habitat for corals, native fish species, and turtles. The impacts of sedimentation on the lower reaches of the stream will also be reduced, thereby improving habitat for native freshwater organisms, such as *`o`opu* and *`ōpae`ula*.

Outputs and Measurements: Ecosystem restoration outputs will be measured in terms of coral density, diversity, or coverage. A coral reef valuation model will be developed as part of the feasibility study. The model will undergo model certification consistent with USACE regulations and policies. Based on the valuation model, incremental cost analysis will be conducted to identify the greatest opportunities for enhancement. A bathymetric survey of the bay will be conducted to aid in establishing the baseline condition. Outputs and measurements will be based on coral reef ecosystem function and values including physical, chemical and biological integrity and diversity of the coral reefs. The anticipated valuation model

is expected to be used in the State of Hawai`i for both Civil Works ecosystem valuations and Regulatory mitigation assessments.

Significance of Outputs: The study outputs will be significant in that they will protect and restore important species and improve the marine environment of the study area which is heavily used for recreational, scientific, and economic purposes, and part of the Hawaiian Islands Humpback Whale National Marine Sanctuary. Endangered species, such as humpback whales, the green sea turtle, and the rare coral (*Porites convexa),* will benefit from habitat improvements in the marine environment. Additionally, native freshwater species will benefit from improvements to streams below the sediment basin.

4) Maximization of Restoration of Low Flow Stream Conditions. Management measures to restore low flow stream conditions will be evaluated to include the removal of defunct diversions, modifications to concrete or altered stream channels, improved efficiencies of irrigation systems to minimize amount of withdrawals, restoration of low flow channels, and restoration of step/pool and riffle/pool complexes.

Expected Ecosystem Changes (With Project Condition): The management measure will provide long-term benefits to in-stream species, such as *`o`opu* and *`ōpae`ula* by providing improved access to their habitat range. Presently, native species migration up- and down-stream is impaired during low flow conditions. Maximizing restoration of low flow stream conditions will allow species to migrate within the stream during critical development stages in their life histories. Restoration of low flow stream conditions will also provide opportunities to restore hydraulic connections necessary to support wetland habitat.

Outputs and Measurements: Ecosystem restoration outputs will be measured in terms of flow duration, flow velocity, and hydraulic connectivity. HEC-RAS hydrology and hydraulic modeling combined with the DAR HEP stream habitat model and an incremental cost analysis will be used to identify the greatest opportunities for enhancement.

Significance of Outputs: The study outputs will be significant in that they will protect and restore important freshwater species and wetland habitats in addition to supporting shallow groundwater recharge within the stream system.

5) Removal of Invasive Marine Aquatic Species. Management measures to remove invasive marine aquatic species including invasive algae will be maximized. Some success has been made in the mechanical removal of invasive algae with the "Super Sucker" on the islands of O`ahu and Maui. Research is ongoing on the effectiveness of enhancing native urchin populations to aid in algae removal in Kāne`ohe Bay and in implementing protected management areas to enhance the populations of native marine herbivores in Kahakeli. The feasibility study will evaluate the use of these measures as well as other potential measures including reducing adverse water

quality inputs via natural freshwater groundwater seeps in the nearshore, reducing habitat characteristics favorable for invasive species, and enhancing habitat characteristics favorable for native species.

Expected Ecosystem Change (With Project Condition): The management measures will provide long-term benefits of improving nearshore marine habitat. Invasive marine species are outcompeting native species, including coral reefs. Reduction in invasive species will support coral reef recovery efforts. Herbivore enhancement measures will increase the native species population, mimicking a balanced equilibrium similar to historic conditions where appropriate. In addition, invasive algae accumulation affects tourism in some areas where algae growth is excessive, creating an aesthetic (visual and olfactory) nuisance to recreational areas.

Outputs and Measurements: Ecosystem restoration outputs will be measured in terms of improved coral health (coral density, diversity, or coverage), improved water quality, and nearshore native species abundance. A coral reef valuation model will be developed as part of the feasibility study. The model will undergo model certification consistent with USACE regulations and policies. Based on the valuation model, incremental cost analysis will be conducted to identify the greatest opportunities for enhancement. Poor water quality entering the nearshore waters via submerged groundwater discharges may be enabling invasive marine species. Groundwater surveys and other analyses will be conducted to confirm contributing water quality and other sources and establish baseline conditions. Outputs and measurements will be based on nearshore and coral reef ecosystem functions and values including the physical, chemical, and biological integrity and diversity of the coral reefs. The anticipated valuation model is expected to be used in the State of Hawai`i for both Civil Works ecosystem valuations and Regulatory mitigation assessments.

Significance of Outputs: The study outputs will be significant in that they will protect and restore important species and improve the marine environment of the study area, which is heavily used for recreational, scientific, and economic purposes and is part of the Hawaiian Islands Humpback Whale National Marine Sanctuary. Endangered species, such as monk seals, threatened green sea turtles, and rare corals (e.g. *Porites convexa*) will benefit from habitat improvements in the marine environment.

6) Restoration of Riparian Corridors. Riparian corridors would be restored by incorporating improved fire management strategies (weed control, fire breaks, fire roads, etc,), removal of invasive species (flora and fauna) via weed control or fencing, and revegetation of riparian corridors with native plant species.

Expected Ecosystem Change (With Project Condition): The management measures would restore riparian habitat that is critical to stream habitat – providing shade to cool water and improving dissolved oxygen levels in the stream, providing refugia for native species, acting as a filter to capture contaminants in stormwater runoff

before entering the stream, providing habitat and debris to support the stream food web, controlling sediment and erosion, stabilizing the stream bank, regulating hydrologic functions, and assisting in groundwater recharge. Riparian restoration restores function and habitat for native flora and fauna species, including federally listed species, dependent upon healthy riparian zones. By reducing sediment inputs, reducing contaminants, and helping restore hydrologic functions, healthy riparian zones also improve nearshore waters and coral reefs.

Outputs and Measurements: Ecosystem restoration outputs will be measured in terms of riparian coverage and diversity, reduction in sediment/erosion inputs, and improvement in water quality. The DAR HEP stream habitat model, sediment budget analysis, models to determine priority buffer locations and precision buffer widths, and an incremental cost analysis will be used to identify the greatest opportunities for enhancement. All models will be submitted for model certification consistent with USACE policies and regulations.

Significance of Outputs: The study outputs will be significant in that they will protect and restore important freshwater species habitats and lost riparian function within the stream, support improved groundwater recharge, and improve water quality for nearshore marine habitat. In addition, loss of native plant species and changes in development have made the study area prone to fire risk. Incorporation of fire risk management measures for riparian restoration will have a secondary benefit of improving fire risk management in the study area overall.

7) Wetland Restoration. Wetland habitat, functions, and values would be restored by enhancing and restoring wetlands adjacent to stream beds, in flood plains, along coastal reaches, and as *lo`i* ponds.

Expected Ecosystem Change (With Project Condition): Wetland restoration will restore and enhance flood water retention and detention functions, floodplain connectivity, coastal storm protection, sediment retention and detention functions, groundwater recharge, water quality filtration, and critical habitat for ESA bird species dependent upon wetlands. Water quality and hydrologic functions of wetlands will help enhance and restore water quality conditions important for the health of nearshore waters and coral reefs.

Outputs and Measurements: Ecosystem restoration outputs will be measured in terms of habitat diversity and functional benefits. Outputs and measurements will be based on wetland ecosystem function and values including physical, chemical, and biological integrity and diversity of wetland habitat. The anticipated valuation model is expected to be used in the State of Hawai`i for both Civil Works ecosystem valuations and Regulatory mitigation assessments.

Significance of Outputs: The study outputs will be significant in that they will protect and restore important wetland habitat and habitat for ESA bird species dependent upon wetland systems. Restoring wetland functions improves water quality,

groundwater recharge, flood attenuation, sediment retention, and storm protection in coastal systems. Incorporation of traditional *lo`i* ponds not only mimics the historical wetland condition in the study area but restores important traditional native Hawaiian cultural practices and sustainable land use practices.

8) Coastal/Shoreline Restoration. Coastal habitat and functions would be restored through the restoration of coastal dunes and coastal shorelines, revegetation of coastal buffers, removal of outdated structures impairing sediment transport within littoral drift cells, and incorporation of setback zones and recreational features such as pathways and public access routes.

Expected Ecosystem Change (With Project Condition): Restoration of the coastal zone and shoreline will provide habitat for native species, including marine mammals, sea turtles, and shorebirds listed under ESA, provide for natural measures to protect against storms and sea level rise, reduce sediment and erosion inputs for coastal areas, maintain, enhance, and restore the natural sediment transport system within the coastal zone, provide for water quality filtration of runoff before it reaches nearshore waters, and provide recreational features and increased access for the public.

Outputs and Measurements: Outputs and measurements will be based on coastal ecosystem functions and values including the physical, chemical, and biological integrity and diversity of coastal zones. The anticipated valuation model is expected to be used in the State of Hawai`i for Civil Works ecosystem valuations. Models and concepts developed through the USACE Hawai`i Regional Sediment Management program will also be incorporated. All models will be submitted for model certification consistent with USACE policies and regulations.

Significance of Outputs: With Hawai'i facing the severe threat of sea level rise associated with climate change, it is important for all activities in Hawai`i to restore and protect the coastal zone. In addition, the coastal zone provides habitat for several listed ESA species and is anticipated to be designated as critical habitat for the monk seal in the near future. Lastly, public access to the coastal zone is mandated through the CZMA.

9) Restoration of Fallow Agricultural Fields. Agricultural activities are diminishing in Hawai`i and on the island of Maui. Fallow agricultural fields and farm roads would be restored to native forests and grass lands, irrigation diversions would be removed, sediment and erosion controls would be implemented, and fire management strategies would be incorporated.

Expected Ecosystem Change (With Project Condition): Restoration of the fallow agricultural fields would remove major contributions of sediment and contaminants into streams and nearshore waters. Revegetation with native plant species would help restore hydrologic functions and improve groundwater recharge and restore terrestrial habitat for a wide array of native species. Removal of abandoned

irrigation systems would help restore stream flow and facilitate shallow groundwater recharge.

Outputs and Measurements: Outputs and measurements will be based on contributions to the improvement of water quality, reduction of sediment and erosion, and improvement of hydrologic flow to streams and nearshore waters. In addition, outputs on the potential for native habitats to support terrestrial ESA-listed species and Recovery Plans for those species will also be measured. The DAR HEP model would be used to assist in the valuation of stream habitat improvements. Sediment budget and water quality models would be used for the measurement of water quality improvements. DOFAW and USFWS methods would be used to measure terrestrial habitat improvements.

Significance of Outputs: Presently, agricultural lands are assumed to be a primary contributor of sediment, contaminants, and nutrients to streams and nearshore waters. If left fallow, erosion rates would continue and may increase without maintenance activities. Restoring fallow agricultural lands would address significant issues related to sediment and erosion concerns in the aquatic ecosystem, restore stream flows and groundwater recharge, potentially reduce fire risk, and provide opportunities for recovery of habitat for native species, including species listed under ESA.

10) Nonstructural Solutions. Non-structural solutions would include consideration of policy and regulatory changes for development activities or resource users (recreational, tourism, fishing, hunting, etc.), designation of setback zones, designation of conservation zones or marine protected areas, improvement and expansion of waste water reuse activities, improvement of existing infrastructure, incorporation of low impact development within the watershed, and public outreach and education activities. Non-structural solutions would be discussed within the feasibility study but would likely be implemented by the non-federal sponsors.

Integrated Watershed Plan.

The preliminary screening of the management scenarios listed above leads to the conclusion that a comprehensive and integrated watershed management plan is the appropriate study output. The potential magnitude and types of benefits from the proposed actions could highly increase the existing functions and values of stream habitat, wetland habitat (almost non-existent under present day conditions), and coral reef and nearshore waters habitat. Scenarios would also support the goals and objectives of non-federal sponsors to improve water quality, enhance and restore critical habitat for terrestrial species, and improve water supply in the study area.

While the overall outcome of the project is expected to have a beneficial effect on aquatic ecosystems, the size and extent of the study are likely to pose significant effects on a cumulative basis. As such, the project will include an Environmental Impact Statement

(EIS) with the feasibility study. Likely resources of concern are: short term and indirect socio-economic impacts, impacts to cultural resources, short-term impacts to public infrastructure, potential for hazardous, toxic and radioactive waste, potential short-term impacts to water quality (with reintroduction of stream flow conditions), impacts to listed marine and terrestrial ESA species or their designated critical habitat in the short term, impacts to protected areas such as the Hawaiian Islands Humpback Whale National Marine Sanctuary, farmland protected under the Farmland Protection Policy Act (FPPA), designated Marine Protected Areas, and designated conservation areas, impacts to recreational activities, and short term impacts to nearshore and stream habitats.

Based on a comparison with similar scale multi-purpose watershed plans, the rough order of magnitude cost for design and construction of the preliminary scenarios ranges from $80-$100 million within the reduced feasibility study area and is potentially as high as $500 million for the full Reconnaissance Study area. During the feasibility phase and the plan formulation, potential alternatives will be formulated to include detailed cost estimates including design, construction, operations, management considerations, and an identification of agency programs available to develop these alternatives.

Establishment of a Plan Formulation Rationale.

The conclusions from the preliminary screening form the basis for the next iteration of the planning steps that will be conducted in the feasibility phase. Future screening and reformulation will be based on the Principles and Guidelines for Water Resource Implementation Studies –Effectiveness, Efficiency, Completeness, and Acceptability.

6. FEDERAL INTEREST

Since aquatic ecosystem restoration and watershed planning are high budget priorities for USACE and the other objectives of water quality, water supply, and waste-water and other infrastructure improvements are integral to any comprehensive plans that would be evaluated in the feasibility phase, there is a strong Federal interest in developing a comprehensive watershed management plan in the feasibility phase. USACE is the appropriate agency to lead this comprehensive and collaborative plan because of the need to have large scale implementable solutions to these problems. Unlike USACE, the other federal agencies engaged do not have the authority to implement large scale aquatic ecosystem restoration and water resource improvements. In addition, USACE has a greater ability than the other federal partners to engage other federal partners through various technical Memoranda of Agreement (MOAs) and environmental authorities such as the Fish and Wildlife Coordination Act (FWCA).

7. PRELIMINARY FINANCIAL ANALYSIS

As the non-Federal sponsor, the State of Hawai`i (DAR, DOFAW, CWRM, and DOH) will be required to provide 50 percent of the cost of the feasibility phase. A letter of intent from the local sponsor stating a willingness to purse a comprehensive watershed management plan and to share in its cost is included as Appendix A. Also included as Appendix C are

letters from NOAA and EPA determining that certain Federal funds granted by those agencies are authorized to be used to carry out the feasibility study. Accordingly, consistent with Section 2007 of the Water Resources Development Act (WRDA) of 2007, USACE may accept those funds to satisfy a portion of the non-Federal share of the cost of the study.

8. ASSUMPTIONS, EXCEPTIONS AND QUALITY OBJECTIVES

Feasibility Phase Assumptions:

The following critical assumptions will provide a basis for the development of a comprehensive watershed management plan:

- Coral reefs in the study area have been degraded from a variety of threats – land based pollution, urban development, invasive species, recreational activities, fishing activities, lack of awareness, and climate change.
- Stream habitat in the study area has been degraded from a variety of threats – increased inputs of sediment from uncontrolled erosion, loss of riparian habitat, changes in hydrologic functions from changes to shallow groundwater recharge, diversions of surface water, flood risk management structures designed to move water off the land quickly, and reduction in low flow and base flow conditions.
- Wetland habitat in the study area has been drastically reduced due to changes in land use from urban development and agricultural activities.
- Current efforts have been successful at protecting sensitive native forests and designated critical habitat but the upper watershed continues to be threatened by impacts associated with development and agricultural activities (increase in invasive species, increased fire risk).
- The study area must incorporate measures to protect critical environmental resources as well as provide for sustainable development to support economic needs of the community.
- The resulting document will be an integrated Feasibility Report and Environmental Impact Statement (EIS). The EIS will meet both NEPA and State of Hawaii regulations and policies (Hawaii Revised Statute 343).
- The document will be an integrated and collaborative plan that will identify potential solutions to be implemented by any one of the sponsors or partners including USACE funded projects. USACE funded project will be addressed as an independent project that does not rely on implementation of other activities by other agencies but which could benefit from or provide benefit to the other activities through an accelerated realization of the anticipated environmental outputs.

The report will assume that adaptive management plan and strategy will be required for the implementation of the USACE funded project.

9. FEASIBILITY PHASE MILESTONES

TABLE 1: Feasibility Phase Milestones

Task/Milestone	Completion Date	Related Activities
Execute FCSA	Sep 2010	Project Management Plan (PMP) outlining the detailed scope and coordination process for the feasibility study and Peer Review Plan are completed prior to the signing of the FCSA.
PDT Kick-off Meeting	Oct 2010	
Visioning Session	Nov 2010	
Defining Goals, Objectives, Problems, Opportunities		Identify "spin-off" projects for non-federal sponsors and partners
Stakeholder Assessment and Involvement Plan	Dec 2010	
Federal Notice of Intent (NOI) for an EIS	Jan 2011	
EIS Public Scoping Meeting	Jan 2011	
EIS Public Scoping Meeting Report	Feb 2011	Identify priority baseline conditions analysis to support non-federal sponsor/partner activities
Update Peer Review Plan	Mar 2011	The Peer Review Plan will be updated as needed based on scoping process.
Feasibility Scoping Meeting (FSM) Report (aka Baseline and Future Conditions Report	May 2012	Identify "spin-off" projects for non-federal sponsors and partners
District/State Quality Review	Jun 2012	
Agency Technical Review	Jul 2012	
Division/HQUSACE Review	Aug 2012	
State EIS Prep Notice	Aug 2012	
Feasibility Scoping Meeting	Sept 2012	Includes Corps Vertical Chain of Command(District to HQ), Non-Federal Sponsors Vertical Chain of Command and key State and

Task/Milestone	Completion Date	Related Activities
		Federal Resource Agencies
Preliminary Alternatives Formulation Briefing (AFB) Report (75% complete Document)	Apr 2013	
Value Engineering Workshop	May 2013	
AFB Report (75% complete Document)	Jul 2013	Identify "spin-off" projects for non-federal sponsors and partners
District/State Quality Review	Aug 2013	
Agency Technical Review	Oct 2013	
Division/HQUSACE Review	Dec 2013	
Alternatives Formulation Briefing	Jan 2014	Includes Corps Vertical Chain of Command(District to HQ), Non-Federal Sponsors Vertical Chain of Command and key State and Federal Resource Agencies
Preliminary Draft Feasibility Report and EIS	May 2014	Identify "spin-off" projects for non-federal sponsors and partners
District/State Quality Review	Jun 2014	
Agency Technical Review	Jul 2014	
Division/HQUSACE Review	Aug 2014	
Draft Feasibility Report and EIS Notice of Availability (NOA)	Oct 2014	
Public Comment Period	Oct – Nov 2014	
Public Hearing	Oct – Nov 2014	Identify "spin-off" projects for non-federal sponsors and partners
Independent External Peer Review	Oct – Dec 2014	
Preliminary Final Feasibility Study and EIS	May 2015	Identify "spin-off" projects for non-federal sponsors and partners
District/State Quality Review	Jun 2015	
Agency Technical Review	Aug 2015	

Task/Milestone	Completion Date	Related Activities
Division Review	Oct 2015	
Final Feasibility Study and EIS	Nov 2015	
Washington Level of Review	Dec 2015 – Jan 2016	
Record of Decision	Mar 2016	
Design Agreement	Apr 2016	Dependent upon Congressional Approval.
Design Phase	May 2016- Jan 2018	
Construction Begins	Feb 2018	Dependent upon Congressional Approval

10. FEASIBILITY PHASE COST ESTIMATE

These cost estimates reflect only the estimated costs for the reduced feasibility study for the priority area. The costs may be adjusted during the development of the Feasibility Cost Share Agreement (FCSA) based on the availability of funds from the non-federal sponsors. The Project Management Plan (PMP) will define which activities or portions thereof that will be funded by the non-federal cost share as either cash or work in-kind. The cost for each of the remaining 4 phases of the reconnaissance study would be roughly equivalent to the first phase. The total feasibility study cost for the entire Reconnaissance study area would be roughly $25 million.

TABLE 2 – Feasibility Study Cost Estimate

Activity	Cost Estimate
Project Management	$500,000
Stakeholder Collaboration/Public Involvement	$300,000
Topographic/Bathymetric Surveys/LIDAR	$300,000
Hydrology & Hydraulic Studies (Coastal/Riverine/Groundwater)	$300,000
Geotechnical Studies/Sediment Budget	$200,000
Engineering Design Analysis (Alternatives Development)	$200,000
Economic Analysis	$150,000
Real Estate Analysis/Report	$125,000
Environmental Studies/Surveys/EIS Report	$580,000
Fish and Wildlife Coordination Act	$100,000
HTRW Studies/Report	$200,000
Cultural Resources Studies/Report	$200,000
Cost Estimate	$125,000
Plan Formulation and Evaluation	$425,000
USACE Value Engineering Workshop	$75,000
USACE Model Certification	$150,000
USACE Agency Technical Review	$200,000

Activity	Cost Estimate
USACE Independent External Peer Review	$150,000
Final Report Documentation	$100,000
Supervision and Administration	$200,000
Contingencies	$220,000
TOTAL	**$5,000,000**

11. VIEWS OF OTHER RESOURCE AGENCIES

Because of the funding and time constraints of the reconnaissance phase, only limited and informal coordination has been conducted with other resource agencies. Views that have been expressed are as follows:

- NOAA strongly supports this project. NOAA has determined that State of Hawai`i activities funded through the CRCP are authorized to be used to carry out this collaborative watershed plan.

- EPA strongly supports this project. EPA has determined that State of Hawai`i activities funded under Section 319 of the Clean Water Act are authorized to be used to carry out this collaborative watershed plan.

- Maui County strong supports this project. Maui County has agreed to be a member of the Steering Committee. Maui County was considering joint sponsorship but current funding is restricted. In the event that funds become available, Maui County will discuss potential joint sponsorship with the other non-Federal sponsors.

Several federal agencies have been engaged in the concept development of this project through the Hawai`i Coral Reef Working Group. These include U.S. Geological Service, U.S. Fish and Wildlife Service, Natural Resources Conservation Service, and National Park Service. Additional State and County agencies have been engaged via this process as well including Hawai`i Coastal Zone Management. Office of Hawaiian Affairs was engaged through the Stakeholder Coordination process of the 905(b) analysis.

12. POTENTIAL ISSUES AFFECTING INITIATION OF FEASIBILITY PHASE

- No issues have been identified that could impact the initiation of the feasibility phase.

- The schedule for signing the Feasibility Cost Sharing Agreement (FCSA) is October 2010. Based on the schedule of milestones in Paragraph 9, completion of the comprehensive watershed management plan, feasibility study and EIS would be in March 2016.

13. RECOMMENDATIONS

I recommend that the West Maui Watershed Project proceed into the feasibility phase. It is recognized and understood that upon completion of this feasibility study, extensive review is required at several levels in the Executive Branch of the Federal Government and may also be required at state and local levels. Consequently, the recommendations made in this report may be changed. The following paragraph is required in my recommendations. The recommendations contained herein reflect the policies governing formulation of individual projects and the information available at this time. They do not necessarily reflect program and budgeting priorities inherent in the local and state programs or the formulation of a national Civil Works construction program. Consequently, the recommendations may be modified at higher review levels within the Executive Branch before they are transmitted to the Congress as proposals for authorization and implementation funding. However, prior to transmittal to the Congress, the sponsor, the State of Hawai`i, interested Federal agencies, and other parties will be advised of any modifications and will be afforded an opportunity to comment further.

Douglas B. Guttormsen, P.E.
Lieutenant Colonel, U.S. Army
District Engineer

APPENDIX A:
WEST MAUI RECONNAISSANCE STUDY
SPONSOR LETTER OF INTENT

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
ACTING FIRST DEPUTY

LENORE N. OHYE
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

August 23, 2010

LTC Douglas Guttormsen
District Engineer
US Army Corps of Engineers
Honolulu District
Building 230
Ft Shafter, HI 96858

Dear LTC Douglas Guttormsen:

I am writing requesting assistance from the U.S. Army Corps of Engineers' in performing a multipurpose watershed project in West Maui, Hawaii. The West Maui Watersheds are a priority for the Department of Land and Natural Resources. Numerous forestry and aquatics projects have been funded in West Maui to address issues such as invasive species and coral reef health. This multipurpose watershed project will allow agencies to address issues together at the broader watershed level.

We strongly support the findings of the Reconnaissance Report to move the project to initiate the feasibility phase of the West Maui Watershed Project. The activities will include identification of all water resource problems, a plan for remedial actions that can be implemented by local, State, and Federal agencies, economic analysis, and a determination of continued Federal interest.

The State of Hawaii Department of Land and Natural Resources is prepared to be the primary non-federal sponsoring agency for the project and assist in the development of the watershed study and feasibility plan, based on costs and in-kind contributions to be agreed to within the feasibility Cost-Share Agreement and Project Management Plan currently under development. We understand this letter does not commit the State at this time to provide matching or other funds, due to the extreme fiscal situation that the State is facing. The project will also receive assistance from the State Department of Health's Clean Water Act Section 319(h) grant program.

We look forward to working with the Corps of Engineers on this important project. If you have any further questions please contact my staff point of contact Randall Kennedy at 808-587-0054.

Sincerely,

Laura H. Thielen
Chairperson

LINDA LINGLE
GOVERNOR OF HAWAII

CHIYOME L. FUKINO, M.D.
DIRECTOR OF HEALTH

STATE OF HAWAII
DEPARTMENT OF HEALTH
P.O. BOX 3378
HONOLULU, HAWAII 96801-3378

In reply, please refer to:
EMD / CWB

0802BAW.10

August 23, 2010

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LTC Douglas Guttormsen
District Engineer
US Army Corps of Engineers
Honolulu District
Building 230
Ft Shafter, HI 96858

Dear LTC Douglas Guttormsen:

I am writing in support of the U.S. Army Corps of Engineers' multipurpose watershed project investigation for West Maui, Hawaii. The West Maui Watersheds are a priority for the Department of Health Clean Water Programs. Numerous small polluted runoff control program projects have been funded in West Maui to address nonpoint source pollution issues. Although individual best management practices installed are successful, they are not able to impact the watershed to the point of improving water quality. This multipurpose watershed project will allow agencies to address issues together at the broader watershed level.

We strongly support the findings of the Reconnaissance Report to move the project to initiate the feasibility phase of the West Maui Watershed Project. The activities will include identification of all water resource problems, a plan for remedial actions that can be implemented by local, State, and Federal agencies, economic analysis, and a determination of continued Federal interest.

We understand that the State Department of Land and Natural Resources will be the primary non-federal sponsor for the project and we look forward to working together and providing project match funding from our Clean Water Act Section 319(h) grant program. If you have any questions please feel free to contact my staff, Ms. Lawana Collier at 1-808-586-4309.

Sincerely,

LAURENCE K. LAU
Deputy Director for Environmental Health

APPENDIX B
WEST MAUI WATERSHED RECONNAISSANCE STUDY, FINAL STAKEHOLDER COORDINATION REPORT

WEST MAUI WATERSHED RECONNAISSANCE STUDY

FINAL STAKEHOLDER COORDINATION REPORT

Photo by Stacy Langsdale

Prepared For:

U.S. Army Corps of Engineers
Honolulu Engineer District

Prepared By:

Group 70 International, Inc.
Honolulu, Hawai'i

August 2009

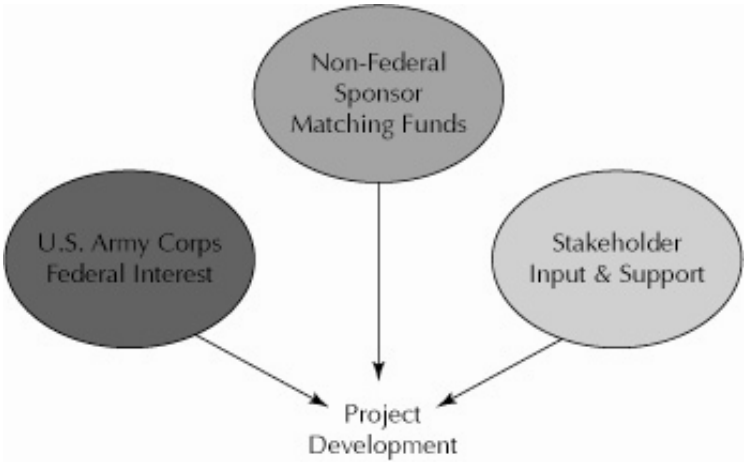
1.0 INTRODUCTION

In 2002 and 2003 the US Army Corps of Engineers (USACE) drafted ecosystem restoration project reports for Hāhākea, Honokahua, Honokōwai, Honolua and Mokupe'a watersheds. These studies were completed at the request of the State of Hawai'i Department of Land and Natural Resources (DLNR) Division of Forestry and Wildlife (DOFAW) as the non-federal sponsor. Funding was not designated for these specific projects; however, in 2007, Congress specifically authorized a Reconnaissance study of the West Maui Watershed. A map of the study area is included on page 3, *Figure 1.1*.

This purpose of the overall West Maui Watershed Reconnaissance Study is to:

- Confirm need for ecosystem restoration
- Determine if there is a federal interest
- Define scope, cost & schedule for Feasibility Study/Environmental Impact Statement (EIS)
- Gain non-federal sponsor(s) commitment

Stakeholder input is an essential part of the Reconnaissance Study project development. The USACE desires to address community identified issues and to collaborate with the community for optimal environmental outcomes. The figure at right shows the incorporation of community input into project development. Should the project progress, community partnerships for further project development and implementation are envisioned as essential.



Project Inputs

This stakeholder coordination report summarizes the stakeholder input received on the West Maui watersheds related to water and watershed health. A project kick-off meeting was held on November 13, 2008 at the Maui Arts and Cultural Center in Kahalui. A follow-on workshop was held on March 4, 2009 at the Lāhainā Civic Center. The workshop included an exercise in Shared Vision Planning which is described in section 4.0 of this report. Numerous interviews were conducted with various stakeholders; notes from the meetings, workshop and interviews are included in the report appendix.

This coordination report is organized into the following sections:

2.0 Problems, Opportunities and Data Gaps - presents the findings of the data gathering for this study with information divided into subcategories.

3.0 Existing Studies - summarizes relevant studies that were gathered during the stakeholder consultation.

4.0 Shared Vision Planning (SVP) – includes a description of SVP and the Influence Diagram exercise, and discusses the possible future use of SVP in the West Maui project.

5.0 Goals, Objectives, and Constraints – uses the problems and opportunities presented in previous sections to describe the desired positive change for the West Maui area.

APPENDIX
Notes from Community Meetings
Nov. 13, 2008 Stakeholder, Wailuku
March 4, 2009 Workshop, Lāhainā
Stakeholder Interviews/Misc Meeting Notes
Existing Studies Table

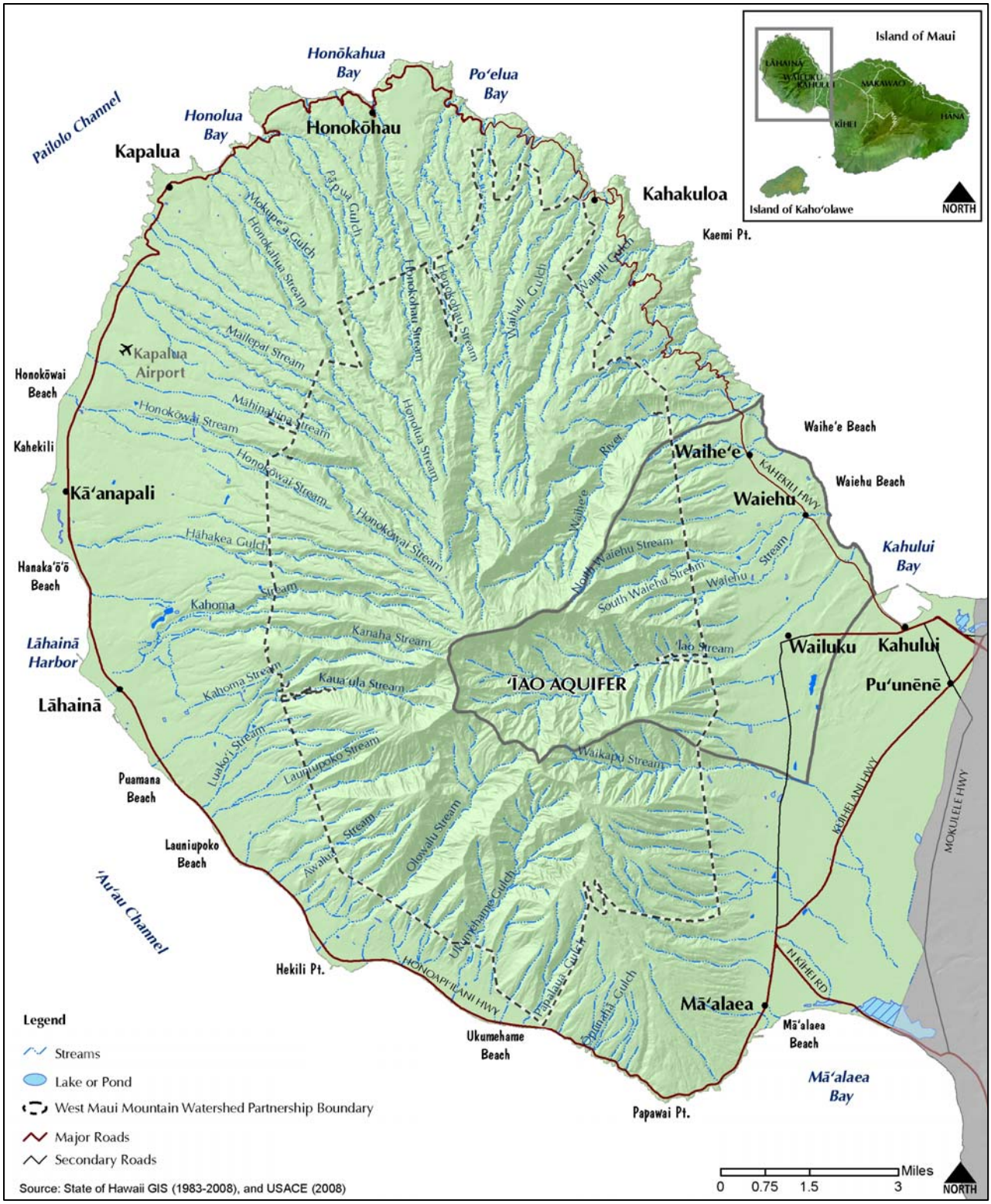


Figure 1.1 Map of the Study Area

2.0 PROBLEMS, OPPORTUNITIES AND DATA GAPS

The problems, opportunities and data gaps of the West Maui area are best understood in the context of land use history in West Maui and Hawai'i. The first human alterations to the lands in West Maui came with the arrival of Hawaiians who brought and created various systems for land management. The ahupua'a land division created a complex management system that involved relationships with the natural resources and people in various land divisions. Practices and protocols helped to protect and maintain the natural resources -- also cultural resources -- which the larger community utilized.

Later Western contact to the islands brought various changes to land use that were more extractive with resources for off island use. The plantation era included the planting and harvesting of crops like sugar cane and pineapple for export. Sugar cane requires large amounts of water and irrigation systems that were built during that era diverted and continue to divert large amounts of water from the natural stream courses. The large scale cultivation of agricultural lands, some on steeply sloped lands exposed large areas of soil, and erosion and sedimentation issues arose.

With the decline of the plantation era due to the economic conditions for agriculture in Hawai'i corresponded to an increase in tourism and awareness of Hawai'i as a tropical destination. The visitor industry began to grow with hotels and resorts being developed in West Maui. As more people "discovered" Hawai'i more people began to move permanently to various places in Hawai'i including West Maui. These increases in population have increased the impacts on infrastructure including water use, sewage disposal, and developed areas.

All parts of the watershed are interrelated. However, for discussion purposes, the subject areas are addressed in the following categories:

2.1 Stream Impacts
2.2 Groundwater Quality and Quantity
2.3 Watershed Degradation
2.4 Flooding/Sedimentation/Coral Reef/Nearshore/Waters
2.5 Other

In each category, issues/problems are discussed first.

Data gaps and opportunities follow because the data gaps often present opportunities for research and further understanding of watershed dynamics.

The **issues/problems in bold** are those with a **federal nexus**. The **data gaps/opportunities in bold** are the **major research questions** as determined by the participants at the March 4, 2009 stakeholder workshop.

ʻĪao Stream Diversion

2.1 STREAM IMPACTS

The changes in land use in West Maui have also brought changes in water demands. Where once the demand was mainly for agriculture, demands for development and instream flow have increased. Also, in West Maui, the stream flow also helps to recharge the groundwater which is one source of municipal potable water. For the ʻĪao area, the upper reaches of the streams gain water from the high level dike confined water; in the lower reaches, the streams loose water to the aquifer and contribute to recharge.

ʻĪao Stream Channel

Water in Hawaiʻi is a public trust resource, protected under the State constitution and Water Code, Hawaiʻi Revised Statutes Chapter 174C. Government agencies, including the State Water Commission, have a duty to protect and restore ecological uses, traditional and customary Hawaiian practices, recreation, and scenic values.

On the Wailuku side of West Maui, Hui o Nā Wai ʻEhā and Maui Tomorrow, represented by Earthjustice, petitioned the State Commission on Water Resource Management to halt excess agricultural water diversions and to restore the Waiheʻe, North & South Waiehu, ʻĪao, and Waikapu Streams, traditionally known as "Nā Wai ʻEhā" or "The Four Great Waters." In April 2009, a total of 34 million gallons per day (mgd) has been recommended for return to the streams[1]. With the return of water to the streams, there is an opportunity to study the effects on native species and traditional and customary rights for other West Maui streams where stream flow standards have not yet been set.

The State of Hawaiʻi Department of Health's 2004 List of Impaired Water Bodies included West Maui streams. ʻĪao Stream is listed as having a high priority. Honokōwai, Kahana, Kahoma and Waiheʻe streams are listed with medium and low priority.

Problems/Issues

- Need for instream flow standards, which are the minimum flows necessary to sustain various uses and are the primary tool to protect streams and the public uses dependent upon them.
- **Native Hawaiian traditional and customary practices**; not enough available water for cultural uses (kalo cultivation, native aquatic species, protocol for heiau, etc).
- Lack of or degraded stream habitat for native species; ʻopae ʻula serve as an indicator of system health.
- **Stream hardening/de-channelization compromises stream habitat.**
- Stream gauging stations funding being reduced and stations eliminated.

[1] "Plan could rejuvenate waters of Na Wai Eha", *Maui News*, April 12, 2009. Breakdown of proposed return of water: Waihee River 14 mgd, Waiehu Stream 3.5 mgd, ʻĪao Stream 13 mgd, and Waikapu Stream 4 mgd.

- Lack of stream maintenance (rubbish, vegetation, logs, etc) which affects flooding and stream habitat.
- **Water quality decreased by disease from invasive species (human health impacted – Section 303 (D) list).**
- Water diversions and water system date to the plantation era and before; most lack proper maintenance and are not efficient carriers of water.

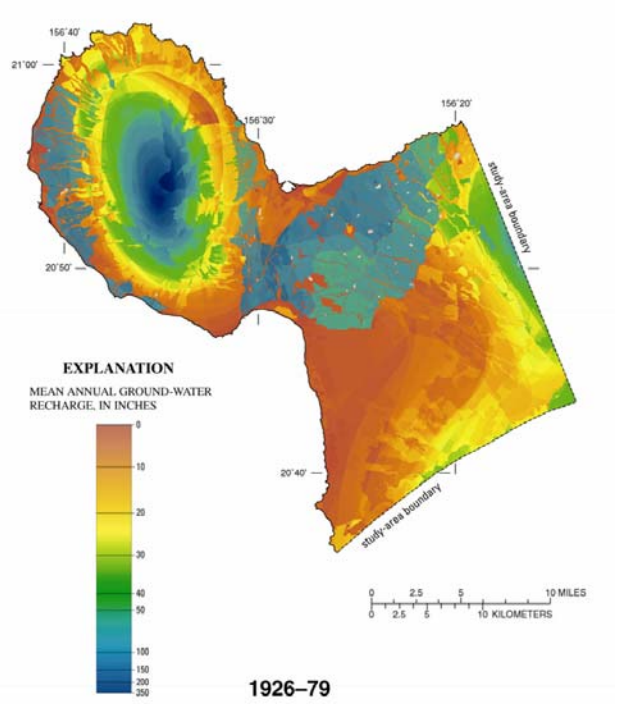
Opportunities / Data Gaps

- **Baseline stream data needed (flow, habitat, water quality, etc.)**
- Stream studies for setting of instream flow standards; studies done for Nā Wai ʻEhā but not for other West Maui streams.
- Long term monitoring of effects of stream restoration on native species
- Streamflow data for management decisions
- Collect historic data on rainfall and stream flow from the old sugar companies (i.e. water sampling)

2.2 GROUNDWATER QUANTITY AND QUALITY

Most of the public water supply in Maui is from a freshwater lens in the Wailuku area of the island. Because of population growth, groundwater withdrawals from wells in this area increased from less than 10 million gallons per day (mgd) during 1970 to about 23 mgd during 2006.[2] Decreasing agricultural land use and more efficient irrigation methods have also impacted the recharge of the aquifer system.[3] As noted above in the stream flow section, increased streamflow is predicted to provide a significant contribution to groundwater recharge.

Questions still remain on the sufficiency of the water supply to meet the population demands for Maui County. Draft water demand projections are provided on Department of Water Supply website (http://www.co.maui.hi.us/index.asp?nid=221).



USGS Study Data: Distribution of estimated mean recharge [3]

Problems

- **The amount of aquifer recharge has been declining while pumping has increased, and as a result chloride concentrations have increased in the** water pumped from wells.
- The sustainability of the water supply is in question, due to the relative nature of recharge and pumpage to meet population demands.
- Loss of wetlands has meant loss of recharge.
- **Quality of groundwater can be affected by activities in the well head areas.**
- Abandoned wells which can be a conduit for contaminates into the aquifer.
- **Injection wells/ reclamation (recycled water) infrastructure may affect the water supply -** 319 Clean Water Act.

Opportunities/Data Gaps

- **Inventory private wells for possible aquifer withdrawal locations.**
- **Gather data and establish protocol to determine future well placement locations**
- **Survey of abandoned wells for future capping.**
- Research the possible effects of salt water intrusion with climate change

[2] Gingerich, S.B., 2008, Ground-water availability in the Wailuku area, Maui, Hawai'i: U.S. Geological Survey Scientific Investigations Report 2008-5236, 95 p. [http://pubs.usgs.gov/sir/2008/5236/].

[3] Engott, John A., and Vana, Thomas T. 2007, Effects of agricultural land-use changes and rainfall on ground-water recharge in central and west Maui, Hawaii, 1926-2004: U.S. Geological Survey Scientific Investigations Report 2007-5103, 56 p. [http://pubs.usgs.gov/sir/2007/5103/].

2.3 WATERSHED DEGRADATION

Native Hawaiians referred to the upper reaches of the watershed as wao akua, or the area where the spirits or gods live. Wao akua was then and is now recognized as essential for replenishing the freshwater supply. The non-federal sponsor for the reconnaissance study DLNR, has been working to protect this area for many years. In November of 1998, the West Maui Mountains Watershed Partnership was formed. It consists of public and private land owners, currently eight including DLNR, who pool their resources to manage and protect the upper watershed for water recharge and conservation values.[4] Much has been accomplished over the past ten years by the Partnership and still much remains to be done.

A layered forest of native species has a greater ability to capture and retain moisture (such as rainfall and fog drip) when compared with non-native homogenous forest. The Partnership continues multiple efforts to remove and prevent the spread of invasive species.

Fire remains a pressing issue with the increased population in West Maui. Lands recovering from fires can experience an increase in the quantity of invasive species, and increased sedimentation to streams and nearshore waters during storm events. New recreational uses are also facilitating the movement of invasive species higher into the watershed.

Fire and the Effects of Fire

Problems

- Fires create areas where colonizing invasive weed species gain a foothold over native species. Debris from fires can clog streams during storm events and contribute to flooding problems. Post-fire erosion and sediments impair nearshore waters.
- Feral ungulates graze on native species (selectively over less "tasty "invasive species) and transport invasive weed species into the upper reaches of the watershed.
- Weed species management is challenging and costly in the extremely rugged terrain.
- **Predators (mongoose, feral cats, feral and domestic dogs) often threaten the survival of seabirds[5].**
- **Ecosystem restoration** needs funding resources and property access to be successful.

Feral Cattle and Effects of Feral Animals

[4] West Maui Mountains Watershed Partnership Website: www.westmauiwatershed.org
[5] *Birds vital to ecosystem being killed by pets and feral animals*, Maui News, December 5, 2008.

- Mauka-makai access is not always possible and can prevent native Hawaiian traditional and customary practices in the upper watershed.
- All-terrain vehicles can introduce and spread invasive species to mauka areas, increase the fire risk, encourage trespassing, and increase hiking and hunting along the new all-terrain vehicle trails in sensitive habitats

Example of an invasive species: Koster's Curse (Clidemia hirta)

Opportunities/Data Gaps

- **Conduct a cultural inventory to understand what the ecosystem used to be like and identify opportunities for restoration**
- Identify opportunities for reforestation and wetland restoration.
- Prioritize the impact of fire and other activities on the watershed to address the most crucial issues first.
- Quantify existing management benefits for restoration and conservation.
- Educate people on recreational impacts of watershed users.
- Prepare fire plans for all fire prone areas.

2.4 FLOODING/SEDIMENTATION/ & CORAL REEF/NEARSHORE WATERS

Flooding in West Maui

Major storm events bring flooding to many communities in West Maui, destroy personal property, restrict vehicular movement, and increase sediment deposition.

Causes of flooding are many. With decreasing amounts of agricultural use of lands in West Maui, more and more fields are vacant with exposed soil that is prone to flooding instead of recharge into the groundwater. The decline of agriculture also has meant decreased maintenance of water distribution systems. Sedimentation basins, streams, and other water management measures require maintenance and to function effectively.

Stream maintenance is the responsibility of individual property owners. However, there are varying levels of maintenance. Flooding issues can be especially acute when debris blocks the drainage inlets. One project of the West Maui Soil and Water Conservation District (WMSWCD) is an inventory of drainage inlets.

The WMSWCD also has a workplan to assist agricultural producers in conserve soil and water for agricultural production and to keep the coastal waters clean. One upcoming WMSWCD project is to develop a scope of work for a Section 319 Clean Water Act Watershed Plans and secure funding to create it.

Sediment deposition from overland runoff has a detrimental effect on the nearshore waters and coral reefs. Pollutants in runoff can also include fertilizers and nutrients which affect water quality.

The State of Hawai'i Department of Health's 2004 List of Impaired Water Bodies includes various West Maui beaches, parks and bays which are listed as low or medium priority.

USGS Photo of Sedimentation

Annual surveys of coral reefs have been conducted by The State of Hawaii Department of Land and Natural Resources Division of Aquatic Resources with the Coral Reef Assessment and Monitoring Program. Several areas have shown a rapid decline in coral cover. Honolua Bay coral cover decreased from 42% in 1994 to 9% percent in 2006. Similarly, in Kahekili, coral cover reduced from 55% to 33%. And, the most drastic

reduction was seen in Mā'alaea which decreased from an estimated 50% to 8% between 1995 and 2006.[6]

Human impacts are considered to have affected the reefs severely as the most impacted sites are where people are using the lands and ocean. The Puamana area which had slight increase in cover (from 3% to 8% between 1994 and 2006 is a more remote sites than the others.

An increase an invasive algae has been identified as a major contributing factor to coral reef decline. Algal blooms correspond to increases in the nutrient balance and lack of algal control by grazers (herbivores). DLNR is in the process of establishing a Herbivore Management Area (HEA) in Mā'alaea.

A workshop on Maui Algal Bloom was held in December 2008 and identified areas of understanding. The participants determined there is a need to act quickly given the rate of algal bloom growth and effects on coral reefs. Nutrient sources for invasive algae include land-based pollutant run off from agricultural and urban lands, and treated wastewater disposed via injection into groundwater.

Algal Bloom

Concern was expressed regarding the possible influx of freshwater into the nearshore waters. This needs further study as historically the systems functioned with streams that were not diverted. The stream losses in the lower reaches that recharge the groundwater may also minimize the volume of freshwater that reaches the ocean.

Problems

- **Nearshore water quality**
- **Algal bloom**
- **Coral reef impacts from agriculture and development**
- **Dam inspection and maintenance**
- Agricultural diversion and erosion measures upkeep and maintenance
- Drainage inlets maintenance
- Enforcement of grading and drainage standards including addressing loopholes in review process
- Ocean and land-based sources of marine debris
- Illegal dumping and enforcement
- Injection wells/ reclamation (recycled water) infrastructure may affect the nearhore waters.
- Restoration of streamflow with respect to nearshore water quality; concern that influxes of freshwater may impact coral reefs.

[6] Status of Maui's Coral Reef, State of Hawai'i Department of Land and Natural Resources Division of Aquatic Resources and Hawaii Coral Reef Initiative, 2006.

Opportunities / Data Gaps

- **Determine sources of pollution and prioritize erosion hot spots including an understanding the relationship between sedimentation and land use.**
- **Assess functioning of existing sedimentation basins.**
- **Analyze flood management including a comparison of channel direct flow (current design) vs. natural impoundment metered flows.**
- Study the effectiveness of desiltation projects vs. reforestation/buffers.
- **Natural Resource Conservation Service (NRCS) Watershed Protection and Flood Prevention Act (PL 83-566) –** NRCS implements the Watershed Protection and Flood Prevention Act with agencies and communities through three programs: Watershed Surveys and Planning, Watershed Protection and Flood Prevention Operations, and Watershed Rehabilitation.
- Identify drainage way ownership for increase enforcement of maintenance.
- Define **public education** initiative to reduce contamination load in Shoreline Management Area.
- Characterize public health issues from exposure to pathogens.
- Develop and research plan to characterize natural breakdown of pollutants.
- Determine if there is a need for beach remediation.
- Follow up on effectiveness of West Maui ownership manual BMPs and implementation barriers.
- Conduct a habitat characterization study of coral reefs.
- Assess impact of stream restoration with respect to nearshore water quality which may include mapping of groundwater intrusion and nutrient level monitoring at marine shore interface.

2.5 GENERAL

This section includes a number of issues that are not easily categorized and may affect many of the previously discussed subject areas. Climate change is one that received extensive discussion. Issues related to sea level rise, drought conditions, changes in vegetation and increased fire risk were brought up. Also, native Hawaiian rights, practices and unresolved land ownership issues were highlighted.

West Maui Mountains

Problems

- Climate change and impacts on the watershed.
- Land ownership/title
- Oversight/Transparency for enforcement of regulations to protect watershed health.
- **Integration of traditional knowledge and practice.**
- Need to improve and increase education and outreach.
- Lack of knowledge about other watershed efforts.
- Clear scientific data to inform and base standards upon.
- Proposed solutions need to be balanced with economic financial considerations.

Opportunities/Data Gaps

- **Communicate effectively to the community on climate change** (including having consensus on message, relevance to people's personal life and economics).
- Study climate change impacts on management strategies including droughts, changes in vegetation and increased fire risks.
- Build flexibility into plans for responding to climate change and look at post-climate change ecosystems.
- Locate clear data on the expected change with climate change.
- Integrate watershed master plan with other planning efforts and align with other sources of funding requirements; coordinate synergies, overlap and identification of information gaps.
- Create a coordinated inventory/survey like the US Fish and Wildlife Service Habitat Cover Program.
- Establish centralized records, data collection, monitoring, updating.

Lo'i Kalo

3.0 EXISTING STUDIES

Through the stakeholder consultation process, people were asked to provide names of the existing studies and studies that are available on West Maui. These references are included in the appendix as a table.

4.0 SHARED VISION PLANNING

This section was authored by Paul Kirshen, Battelle (this work was conducted as a UCOWR Fellow with Institute for Water Resources, USACE) and Stacy Langsdale (Institute for Water Resources, USACE).

Shared Vision Planning and Integrated Water Resources Management

Shared Vision Planning is part of the larger process of Integrated Water Resources Management (IWRM). As reported by Cardwell et al (2006), there are many definitions of IWRM. One of the most accepted is that of the Global Water Partnership (GWP, 2000) below.

> "IWRM is the (planning) process which promotes the coordinated development and management of water, land and related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems." (page 22).

IWRM can be applied at any scale. Its prominent, defining features are *integration* and *active stakeholder involvement*. Integration (i.e., "blending the right proportions...into a whole"; GWP 2000, page 23) may be of:

- Natural and human systems
- Freshwater and coastal zone management
- Land and water management
- Green Water and Blue Water
- Surface and ground water management
- Water supply and wastewater
- Quantity and Quality
- Upstream and downstream interests
- All stakeholders in planning and decision making
- Potential macro-economic effects of water developments
- The enabling environment, institutions, and the instruments for planning, policy formation, regulation, monitoring, and enforcement

Stakeholder involvement is necessary because stakeholders know the most about their own needs, because more creative and equitable solutions may result, less conflict may arise, and they may be in charge of implementation (Giupponi et al. 2006). Yet, even with the past research and rich literature on water resources planning that is directly applicable to IWRM, stakeholder involvement remains a challenge. This is despite the fact that the ability to substantively participate in water resources analysis has been multiplied and dispersed across stakeholder groups because of technology.

Stakeholder involvement can range from informing, consulting, involving, collaborating, to empowering (IAP2 2007). Recent research and experience has shown that active stakeholder

collaboration is the best approach. Participatory planning, and participatory decision making, and consensus-building are some methods to achieve this.

Shared Vision Planning offers a process to address some of the most challenging aspects of IWRM and moreover brings them all together - stakeholder participation, technical analysis, and support for decision making. It can also contribute to the stages of implementation and adaptive management.

As defined in the Shared Vision Planning Primer (Cardwell et al. 2009):

> "Shared Vision Planning (SVP) is a disciplined planning approach that incorporates traditional water resources planning methodologies, structured public participation, and the use of collaborative modeling in the creation of an integrated decision support tool." (page 1)

Within SVP the traditional planning process is organized around a computer model of the water resource system that is constructed with the participation of stakeholders. The collaboratively-built model is designed to support stakeholder dialogue with joint learning and discovery about both the water resource system and the perspectives and objectives of all stakeholders. This kind of dialogue increases the chance that mutually acceptable solutions will be developed. For water managers to successfully engage their stakeholders and publics in water resources decision making, the technical analysis that is the foundation of understanding the complexities of systems must itself be understandable to those same stakeholders and publics.

With the movement away from black box models and the general public becoming much more comfortable with technology, now the challenge is to change the way that water managers conduct planning; by allowing more people in early, and taking advantage of the accessibility and power of modern technology. The ideas and experiences behind Shared Vision Planning (and other collaborative modeling approaches) offer water managers a method to address these challenges.

SVP is built on three pillars: Traditional water resources planning, Structured public participation, and an Integrated computer model.

Pillar I: **Traditional Water Resources Planning.** The planning steps for SVP are closely related to the steps in the traditional planning process such as based on the Principles and Guidelines (1983) and related documents. The difference is the explicit emphasis of using teams (composed of participants from all interested parties) thoughout the analysis process, and secondly, the use of an integrated, transparent model of the system to support all steps of the traditional planning process.

Pillar II: **Structured Public Participation.** SVP involves stakeholders early and often in both the planning and the technical analysis. Rather than involving the entire public through open forums, SVP uses Circles of Influence to engage different stakeholders in varied formats, (and at different times) and levels of intensity. The Circles of Influence structure allows and encourages open communication throughout the engagement process. This openness helps to develop trust among the different parties and to foster respect for each others' interests and values.

Pillar III: **An Integrated Computer Model.** The central focus of a SVP process is the collaborative development and use of a computer model of the study area's water resources system. The model describes basic cause and effect relationships between different elements in the system to provide a description of what the future might look like under different

alternatives. Key features of the model include: Integration, Transparency, User-Friendliness, and Flexibility.

Throughout development, the model becomes a common avenue for stakeholders to develop a shared understanding of the water resource system and to debate alternatives. By characterizing the relationships between water management decisions and the various environmental, economic and social impacts of concern to stakeholders and decision-makers, the SVP model integrates the issues relevant to the decision.

The modeling portion of SVP is actually a form of a planning technique known as joint fact finding, in which "stakeholders with differing viewpoints and interests work together to develop data and information, analyze facts and forecasts, develop common assumptions and informed opinion, and, finally, use the information they have developed to reach decisions together" (page 376, Ehrmann and Stinson 1999). Joint fact finding invests the stakeholders in the decision making process so better, more durable, consensus based decisions may be found (Ehrmann and Stinson 1999). Ehrmann and Stinson (1999) also state that joint fact finding is particularly useful in "highly technical, science-intensive" (page 380) situations.

Generally a system model should be as simple as possible while still providing useful insights. It may be broader in scope but have less detail than conventional technical models. If needed, models of varying levels of detail may be used at different stages in the SVP process (see *Figure 4.1*). The use of interconnected different models can also help involve different groups of people in different parts of the IWRM decision process.

Although this discussion focuses on collaboration in analysis, part of IWRM must also be openness and accessibility of data. One advantage of today's modeling platforms (including systems dynamics tools such as Stella, PowerSim, Extend, VenSim; more water resource-specific tools such as HEC ResSim, Riverware, WEAP; or even spreadsheets such as Excel) is the ability to provide easy access to the underlying data. Indeed a function of the collaboratively-developed model in SVP is that the model becomes a single repository of the data (and assumptions and interconnections) that drives the analysis.

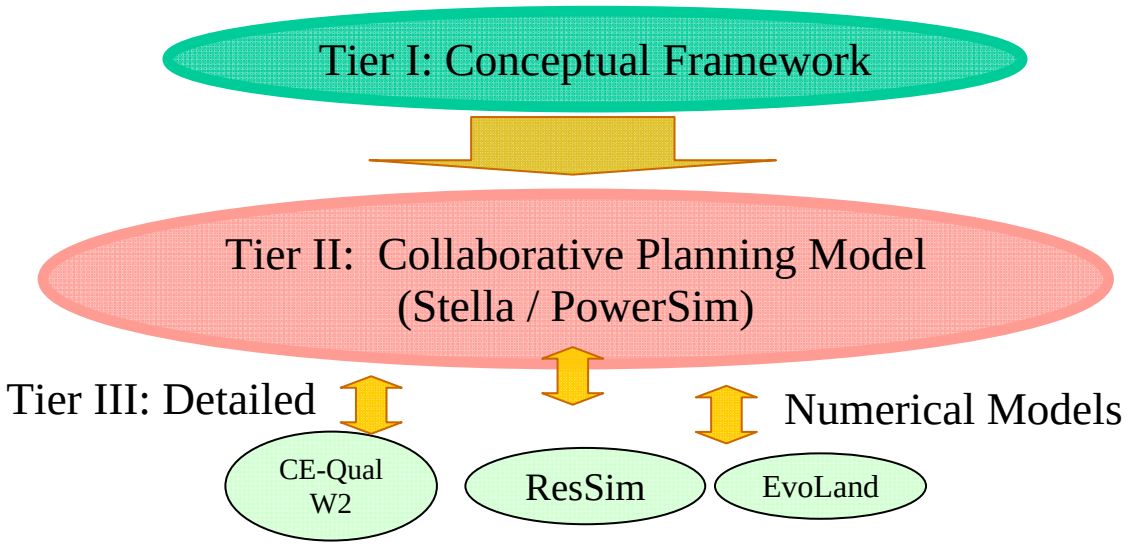


Figure 4.1. Models in SVP

One of the first steps in SVP is stakeholders working together to build influence diagrams.

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The March 2009 Workshop Activities

Development of Influence Diagrams for West Maui

Kirshen introduced the group exercise of developing Influence Diagrams. He began by reminding the participants that SVP is part of the larger process of IWRM and that Influence Diagrams, where the impacts or influences of each element of the socio-economic and biophysical system upon other elements are traced out, is an initial step in integrated assessment and in SVP. Creating Influence Diagrams is also a good participatory modeling introduction and can lead to some insights in management challenges and solutions early on in the IWRM process. Kirshen then worked through a simplified example of coral reef stresses and management issues to demonstrate the language and syntax of Influence Diagrams, the logical thought process used to develop them, and their value in identifying feedbacks.

To begin the group exercise, participants were divided into five, heterogeneous groups of five or six members each, by counting off around the room. Additionally, the leadership team each supported the groups by providing facilitation, note-taking, or coaching how to develop diagrams, when needed. Each group and their facilitator sat around large tables and were given large poster-sized sheets of paper and colored markers. All groups were instructed to build an Influence Diagrams of coral reef health in West Maui. The idea was not to focus on only one of the multiple key issues of concern. The health of the coral reefs is strongly linked to the health of the entire watershed, from the mountain top to the nearshore zone. The watershed study could capture and organize the wide range of stresses and management issues in West Maui. Thus, the exercise also provided a vehicle for validating the wide range of expertise represented by the participants.

Groups then shared their diagrams with other participants. Each group selected a "representative" who stayed in place. The remaining members of the group rotated to the next

group's diagram to view it, while the representative told the diagram's "story." At five-minute intervals, everyone was instructed to rotate to the next group, and this continued until they viewed all the diagrams. This is similar to the "world cafe" method. This process helped to highlight the similarities and differences between the diagrams.

A short time after the Workshop, one composite influence diagram was assembled by merging those from the five groups. Although there were differences between the diagrams, there were no conflicts, so this figure captures all the major issues that were documented in the Influence Diagrams exercise (*Figure 4.2*)

Reactions and Insights Generated from the Influence Diagrams Exercise

Next, we led a plenary discussion on insights gained from the Influence Diagrams building process, including differences and similarities in the diagrams, and any management or policy options captured in the diagrams. Below are the major insights that the participants felt came from the influence diagram building process.

- The more local stakeholders can manage the watershed and coral reef stresses with their own resources and skills without "outside" assistance, then the easier the management challenge will be.
- The community has to go beyond just lowering impacts on the coral reefs; it also has to take steps to support them.
- Transportation between the islands may stress local traditional values.
- The recognition that all human and ecosystem activities are all interconnected.
- By letting each group work independently, the end result of all the diagrams should capture most of the issues.
- There needs to be an emphasis on prevention of impacts.
- Unlike more developed islands like Oahu, Maui still has a chance to preserve its natural environment. This opportunity is enhanced by the stronger connection to the environment by Maui residents than Oahu residents.
- There is a strong connection between the health of the coastal zone and the reefs; e.g. healthy estuaries will result in healthy reefs.
- All the stresses on the reefs can not be blamed on the coastal rivers; if the coastal watersheds had less pollutants or released less pollutants into streams, then the reef problems would be less.
- The influence diagrams suggest the following policies might be useful:
    - More education of the public in general, policy makers, and recreational users
    - Better enforcement of existing laws
    - More emphasis on prevention
    - Ecotourism standards
    - Water quality goals
    - Increasing water retention in urban areas
    - Adaptative management
    - Sustainable land management
    - Adopting more traditional policies and approaches

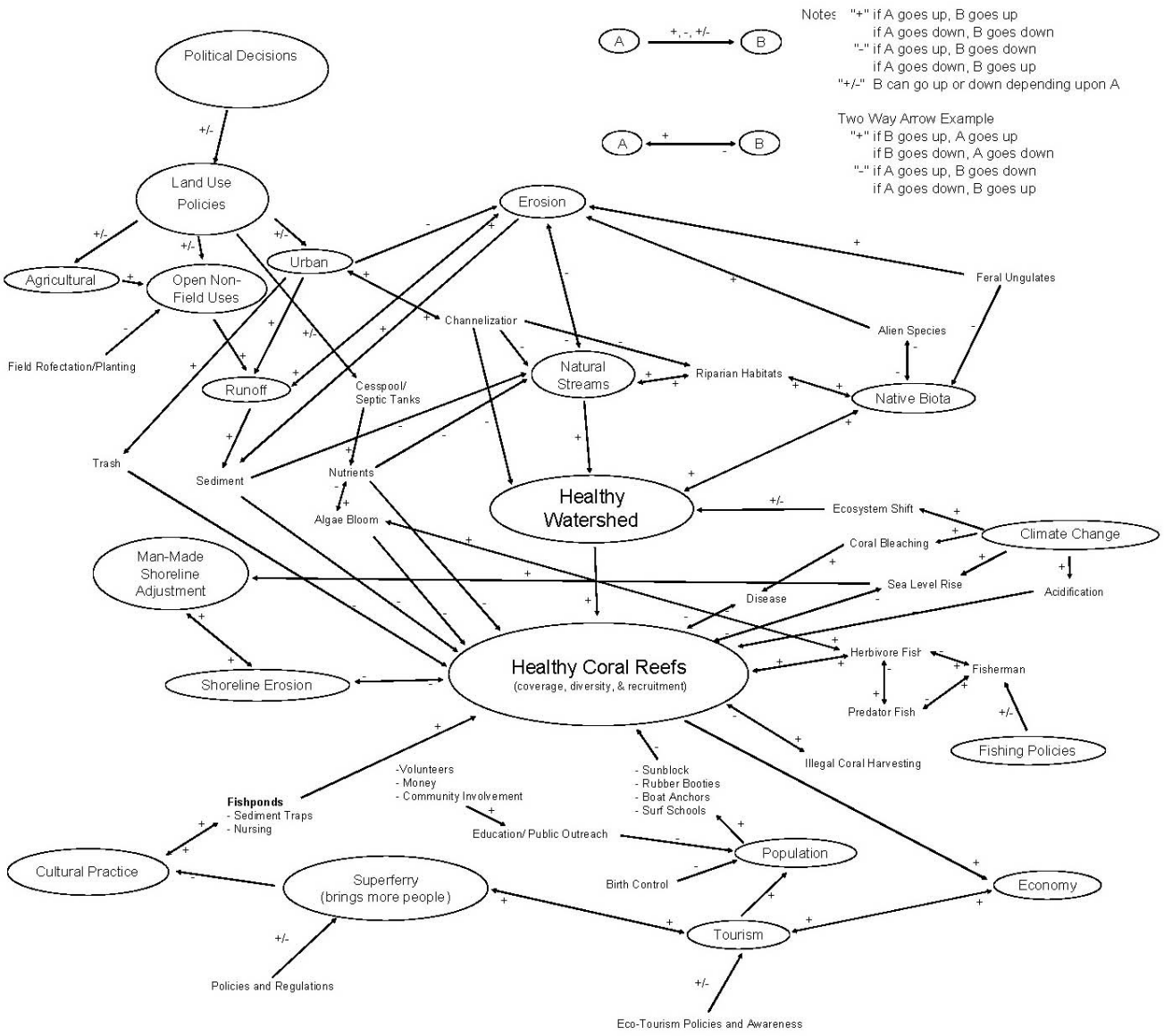


Figure 4.2 Composite of Influence Diagrams (by USACE Justin Goo)

Recommendations/Reflections on the use of Influence Diagrams as a first step in collaborative modeling.

On applying SVP for future project phases

For the last session of the day, Langsdale presented an introduction of SVP modeling to show how it could be used, using an example from a completed collaborative modeling initiative on climate change and water resources conducted in British Columbia, Canada. An SVP model should be integrated, transparent, user-friendly, relevant, and flexible. Typically used for policy level support, it is typically less detailed than conventional numerical models, but more specific than a simple conceptual framework. The level of detail in the model should be defined by the specific purpose of the model. Given that participants were quite tired, it appeared that participants could not fully grasp the steps or significance of the process. Furthermore, because uncertainty remained about whether this project would move forward to a feasibility study, and if so, what the scope of that study would be, it was difficult for them to imagine what role modeling could have for the region. Therefore, the participants were not ready to judge if they were in favor of initiating a complete SVP process. The participants stated again they did see the advantages of using influence diagrams and associated modeling. However, they did express some reservations about getting held back by a long modeling exercise.

On the benefits of the Influence Diagrams activity

Each Influence Diagrams group was assembled randomly. The process of working together brought people together who might not normally interact. It was also enjoyable to the participants as Influence Diagrams construction let them be creative and not bound by the more formal structure typical of models or workshops. Given that the structure of most Influence Diagrams were the same, there also was the promotion of consensus building and shared values.

The meeting notes from the March 4, 2009 Workshop are found in the Appendix.

Other input on SVP and Influence Diagrams (post-workshop):

1) The World Café (where groups rotate and a representative explains the group's work) was well received and has been duplicated at other workshops subsequently as a way of sharing small group outcomes.

(2) It is critical to have this exercise be a part of a broader stakeholder involvement strategy - i.e. first spending time on developing goals and objectives following more of the styles of tools within community planning (i.e. exercises in drawing your future view, discussion the verbiage, etc) to help add more context to the exercise. And there may be adjustment of goals and objectives based on the exercise following more of the styles of community planning.

(3) The process would benefit from adjusting it to the cultural and communication style unique to Hawaii; the smaller focus groups do provide a comfortable "talk story" format.

5.0 GOALS, OBJECTIVES AND CONSTRAINTS

The overall purpose of the West Maui Watershed Reconnaissance Study includes the confirmation of the need for ecosystem restoration and determination of a federal interest. Given the issues and problems of the watershed, clearly there is a need for ecosystem restoration. Based on the stakeholder input in each of the previous categories, there was a federal nexus found for several issues and problems (indicated below in bold).

This final section of the report summarizes and integrates the issues and opportunities into goals, objectives and constraints for possible follow-on efforts. Possible measures for implementing the objectives are also listed.

Goals

One of the overarching goals from the stakeholder input was the need for integration of traditional knowledge and practices. In Hawai'i, natural resources are cultural resources and the use and care are intertwined. Past and current cultural practices can provide the framework future restoration projects. By beginning with an ahupua'a approach will provide an appropriate local perspective and capture the interrelatedness of the resources for achieving ecosystem restoration.

Objectives

The water and related land resource problems and opportunities identified in this study have been summarized below as specific planning objectives. These may provide focus for the formulation of USACE alternatives. These planning objectives represent desired positive changes and are specified as *achievable and specific in location* (but are not be stated in terms of specific measures or level of output). Measures suggested by stakeholders follow at the end of this section.

- **Increase 'Īao aquifer recharge to help meet water demands for humans and riparian habitat.**
- **Increase the restoration of ecosystem functionality in the mauka conservation areas that supports both the ability to capture water and provides habitat conditions for native species.**
- **Reduce stormwater runoff from agricultural lands including lands that are fallow.**
- **Reduce the coral cover decline in West Maui coral reef ecosystem areas.**

Constraints

The USACE defines constraints as restrictions that should not be violated with any future efforts.

- **NRCS P.L. 83-566 – Watershed Protection and Flood Prevention Act**
- **Plantation era ditch systems may begin being considered historic and making changes to them may become more challenging**
- **Clean Water Act Section 319 funding – may want to be consistent in process and terminology to avoid duplicative efforts in the West Maui region**
- **Clean Water Act Section 303 (D) list (including total maximum daily load (TMDL)**
- **DLNR Mā'alaea Herbivore Management Area**
- **State Water Code HRS Chapter 174(C)**

Measures
Management measures may address planning objectives. The list below is not a comprehensive list but rather captures the measures suggested by stakeholders during the consultation process. These are presented based on categories.

Stream Impacts/Groundwater
- Increase mauka – makai stream flow. (A 2008 USGS study, Ground-Water Availability in the Wailuku Area, Maui, Hawai'i, indicates that increased stream flow can significantly decrease the aquifer salinity issues.)
- Redesign the Army Corps 'Īao Stream Project / remove channelization.
- Install additional stream gauges for monitoring flow and creating management protocol.
- Construct large reservoirs for storm water events.
- Redesign of diversion to allow base flow and divert water when flow is above base flow.
- Identify of prohibited activities within the well-head area.
- Cap abandoned wells to prevent aquifer contamination.
- Remove cement floors in streams for recharge into groundwater (especially 'Īao).
- Research potable/non potable for waste water reuse (policies that restrict use may need to change).

Watershed Degradation
- Construct fire breaks and fire protection plans for fire prone areas.
- Develop a facility(s) for weed control/biological control research.
- Conduct a paleo-ecological analysis to determine the species that used to provide habitat throughout time.
- Conduct community outreach on biological control.

Flooding/Sedimentation
- Implement riparian buffers.
- Use best management practices for agriculture (minimize sedimentation and water quality issues).
- Implement management practices to further reduce loads from ag & landscape sources.
- Reduce erosion from roads, agricultural lands, development, & conservation lands.
- Construct a dirt biking facility to reduce the impacts from this use in the watersheds.
- Construct or restore sediment catchment, wetland, and lo'i kalo for sediment capture.

Other Coral Reef/Nearshore Waters
- Remove algae from impacted reefs and beaches in bloom areas.
- Eliminate cesspools within coastal zone Special Management Areas.
- Reuse wastewater instead of using injection wells.
- Implement more and larger marine protected areas.

General
- Talk with kūpuna for historical reference and mapping.

APPENDIX

Notes from Community Meetings
Nov. 13, 2008 Stakeholder, Wailuku
March 4, 2009 Workshop, Lāhainā
Stakeholder Interviews/Misc Meeting Notes
Existing Studies Table

U.S. Army Corps of Engineers -- West Maui Watershed Study
Stakeholder Kick-off Meeting

Location: Maui Arts and Cultural Center Alexa Higashi Room
Time: 3-5 pm
Date: November 13, 2008

Introductions and Presentation

Cindy Barger welcomed attendees and had everyone introduce themselves. She then presented a PowerPoint presentation on the US Army Corps of Engineers environmental initiatives related to the West Maui Watershed Study and reviewed the overall Army Corps project process. The presentation will / is be available at http://www.poh.usace.army.mil/CW/CWProjects.htm#HIMa
In addition to the US Army Corps Projects listed in the presentation, there is also a project for with Friends of Moku`ula to restore that area.

She noted that all watershed related issues and concerns are being gathered at this time in the study. Ultimately there may be multiple agencies with solutions to the issues. The West Maui Watershed Study is in the Reconnaissance Phase the earliest project phase and prior to any feasibility analysis. The Army Corps will continue along the process toward possible project(s) if there is a demonstrated Federal interest.

Project Prioritization Process

- Army Corps Reconnaissance is the initial prioritization to determine federal interest
- Prioritization can change later
- If a major data gap is identified, may be able to address earlier in corps process
- Need to show federal interest for future funding
- Target for future funding and data gathering now

Non-Federal sponsors must be a government or non government agency (not private landowners). The non-federal sponsor may be responsible for matching funds (can be in-kind resources).

The Army Corps has similar watershed studies in Chesapeake Bay, Great Lakes Region and the Los Angeles area. Links to examples of similar types of the Army Corps projects were sent to meeting participants on November 17, 2008. The links provided are:

- Urban restoration project in California where the Corps and the non-federal sponsor removed a concrete channel to restore the natural stream channel. http://calabasas.granicus.com/MediaPlayer.php?view_id=21&clip_id=1727
- A small dam removal on the Sisquoc in California removed for fish passage that Jill Komoto of Malama Kai worked with: http://www.stoeckerecological.com/pr_horse_creek_damolition_video_project.html
- The Los Angeles District has been very progressive in watershed plans with ecosystem restoration goals. Attached is a link to their project lists. You can click on any of the watershed studies to get a concept of what they covered in their studies. Honolulu District is working closely with Los Angelese District to gain from their experiences. http://www.spl.usace.army.mil/cms/index.php?option=com_content&task=category&sectionid=5&id=14&Itemid=71
- For Honolulu District - Ala Wai Watershed is our main other watershed project. Attached are the links to the Ala Wai Watershed reconnaissance study. Because of it's size it was separated into sections. http://www.poh.usace.army.mil/CW/CWProjects.htm#HIOa

http://www.poh.usace.army.mil/CW/reports/R-HIOa-20030700IR2-Ala%20.pdf

http://www.poh.usace.army.mil/CW/reports/R-HIOa-20030700IR3-Ala%20.pdf

http://www.poh.usace.army.mil/CW/reports/R-HIOa-20030700IR0-Ala%20.pdf

Description of the Process

This is beginning of a year long project. Two parts are currently underway – creation of a map book and stakeholder consultation process which will result in a study. The group was asked to think about additional desired outcomes e.g. lit review, modeling, community process, etc.

Next Steps: Email / phone contact with stakeholders and information gathering. Also, future meetings to discuss problems and opportunities at other locations and at different times

Meeting attendees were asked to submit:

- Further Watershed Concerns, Issues and Opportunities
- Known / Available Watershed Studies
- Names of groups and individuals to include in the process

Jeff Overton of Group 70 International facilitated input from the group. The issues, concerns, and suggestions are summarized below and have been grouped by the various issues.

WATER / WASTEWATER SYSTEMS

Wastewater Infrastructure

- Priority for Maui County (over water infrastructure)
- Enforcement concerns
- Funding is a constraint; projects are funded by sewer users - including reuse projects

Reuse Wastewater

- Instead of using injection wells – for example possible for West Maui Waste Water Treatment Plant.

Aquifer recharge

- An issue throughout study area with many changes affecting the watersheds.
- Basal lens- salt water interaction is occurring.

Water Systems: Dam, Reservoirs and Irrigation Systems

- DLNR-have not yet looked at dams and reservoirs yet -- What are threats?
- Issue for both public and privately owned systems
- Irrigation ditches and reservoirs need an assessment

Diversions and Terraces

- Check as lands become idle
- Inspect conditions on all lands, not just MLP lands

Water Banking

- Some water previously used for agricultural irrigation is no longer being used, but is not being made available for other uses. Perhaps it being saved for development?

Abandoned Wells

- Need to be identified and capped
- Can be sources of contamination

Water Storage
- Could build large reservoirs to hold water from storm events

3rd Year of Drought - not enough water in streams for all uses.

County Water Use and Development Plan (WUDP)
- Addresses issues from County perspective
- County working with DOH Wellhead protection program (underway) which provides data on land uses and possible contaminants at the wellhead area.

STREAMS

Stream Diversions
- The benefits of stream restoration are many:
- Restoration of Stream habitat
- Aquifer recharge
- Water for kuleana parcels and other farming

Stream Flow Standards
- Stream flow standards need to be set by CWRM
- Lacking research to set scientific ally based stream flow standards
- USGS Data/Studies done to support effort for Na Wai Eha stream flow standards

`Iao Stream
- Community and others are seeking stream restoration
- Channelization is an issue and barrier to stream restoration (CWRM)
- Army Corps project is pending restoration of stream flow.
- Both projects need water and stream restoration
- The US Army Corps in the Pacific Northwest has removed dams and restored streams. Removal of channelization is a possibility.

ECOSYTEM PROTECTION / RESTORATION

Fire
- Affects urban, agriculture and forest areas –especially the urban/forest interface
- When drought, the risk is everywhere; the southern portion of W. Maui is more susceptible and SW portion of W. Maui is the most susceptible to fire.
- Limited means to address
- Soil erosion/nutrient discharge related issues
- Debris from fires can acerbate flood issues
- Could be driver for reforestation, and increased capacity to engage in fire protection prevention, and post mitigation measures

Feral Ungulates / Invasive Species
- Examples – goats, pigs, deer, weeds (and motorcycles)
- The West Maui Mountains Watershed Partnership (WMMWP) is working in the conservation area.
- More funding is needed for fencing
- Rare Species need to be protected; fire is an issue

Invasive Species Management
- Weeds are detrimental to the forest's ability to recharge and retain water
- WMMWP works to remove, preserve and protect the existing forest and native vegetation
- Threat is weeds such as Clidemia hirta, strawberry guava, etc.
- Biological control has had a an unfair reputation and can be used to target weed species

Ecosystem Restoration
- Important to restore the functionality of the ecosystem such as nutrient control, management of invasive species, etc.
- Functions are what matters
- Restoration to past condition may not be as relevant as how project address future conditions

Restoration Opportunities
- Need an analysis of opportunities for reforestation on public and private lands
- Also for stream and wetland restoration

FLOODING/SEDIMENTATION/NEARSHORE WATERS

Water quality improvement projects (many implemented), however, implementation has slowed due to lack of funding. Ha`akea Gulch does not have a retention basin. However, it is on the West Maui Soil & Water Conservation District priority list.

Consider the use of the EPA nine elements for watershed-based plans

Effectiveness and Benefits of Desiltation Projects vs. Reforestation
- Reforestation should be considered as tool to retain soil
- Riparian zones can be used to increase recharge
- Some conservation lands are vacant
- And with increasingly vacant ag lands, need to look at having a ground cover

Drainage Inlets
- Culverts, often in flood path, fill with debris, and the blockage creates problems
- Example: Kahana drainage- neighbors throwing yard waste in- flooding
- Need to identify who is responsible for the culverts (varies)
- Maintenance schedule for clearing and cleaning is needed especially after storm events

Nearshore Water Quality
- Issues need to be attributing to specific sources to aid in management
- Sources need to be quantified with scientific data – i.e. Load
- True for both Point and Nonpoint sources
- Coastal discharge is affected by the lack of aquifer recharge

MULTIPLE CATEGORY ISSUES

Development
- Issues as it increases in flood plains
- Impacts watershed

What is the carbon footprint?
- The forest could be used for carbon emissions offset

Climate Change
- Army Corps has been directed to take climate change into account in all studies; however, no specific Army Corps guidance issued
- Each project does look at the 50-year alternative without project
- Pacific Disaster Center Modeling might be useful
- Need models for local conditions

Land Ownership/Title
- Ownership of Land – Need to know to determine responsibility
- Who has clear land title? There are conflicting claims

Traditional knowledge
- Needs to be integrated
- Bring in cultural practitioners

Oversight/Transparency for regulation enforcement
- Ability to monitor locally

PROCESS SUGGESTIONS

Capture Efforts of Other Organizations in the Watershed
- Need to identify existing efforts and study
- Important not to duplicate work
- Example is West Maui Conservation Project Mapping (DOH)
- Can we link programs to level of effectiveness?

Community Representation
- Need more community involvement / meetings
- Early evening meetings better for community participation

Where will data go to/ be used?
- To be used to see how to address problems whether federal or non federal project/solution
- Example could be to provide knowledge and projects to non-Army agencies/community
- Water resource management focus
- Cindy to provide links to national projects that are similar to this project

West Maui Watershed Reconnaissance Study

Wednesday, March 4, 2009
WORKSHOP MEETING NOTES

Shirley Kaha`i opened the meeting with pule, and Cindy Barger then welcomed everyone and facilitated group introductions.

PROJECT OVERVIEW

Cindy reviewed the agenda and explained the US Army Corps of Engineers (USACE) planning process and the purpose of the West Maui Watershed Reconnaissance Study which is to:

- Confirm there is a need for watershed based ecosystem restoration within West Maui.
- Determine there is a federal interest for watershed based ecosystem restoration in West Maui and that there are Corps programs that can help address the project needs.
- Define the scope, cost and schedule for the Feasibility Study/EIS and confirm commitment from the non-federal sponsor(s) (currently Division of Forestry and Wildlife (DoFAW).

Cindy highlighted the Ala Wai Watershed project as an example of Army Corps ecosystem restoration in Hawai'i.

She showed images of various restoration project (USACE and non-USACE) to provide ideas for West Maui restoration efforts.

Cindy explained the goals for the day's workshop:

- Update Stakeholders on the work completed to date for the Reconnaissance Study
- Seek Stakeholder input on defining values and priorities for objectives of a watershed-based ecosystem restoration within West Maui.
- Seek Stakeholder input on Shared Vision Planning Process to determine if this process would be of interest for the Feasibility Study/EIS.

And, Cindy explained how stakeholder input will be in project development along with the determination of federal interest and non-federal sponsor matching funds.

Cami Kloster reviewed the **West Maui Watershed Reconnaissance Study Issues List** compiled from the first stakeholder meeting (November 2008) and follow-on interviews. The initial list was presented in the PowerPoint presentation and the revised Issues List with workshop input is attached at the end of the notes.

The possible **Research Questions** formulated to date were also presented to workshop participants for input. A new category was added for Climate Change based on input. The Research Questions (with workshop participant additions) are attached at the end of the notes.

Short Break

SHARED VISION PROCESS

Stacy Langsdale presented a PowerPoint on the USACE Shared Vision Process. The three elements of the Shared Vision process are:

- traditional water resources planning
- structured public participation
- collaborative computer modeling

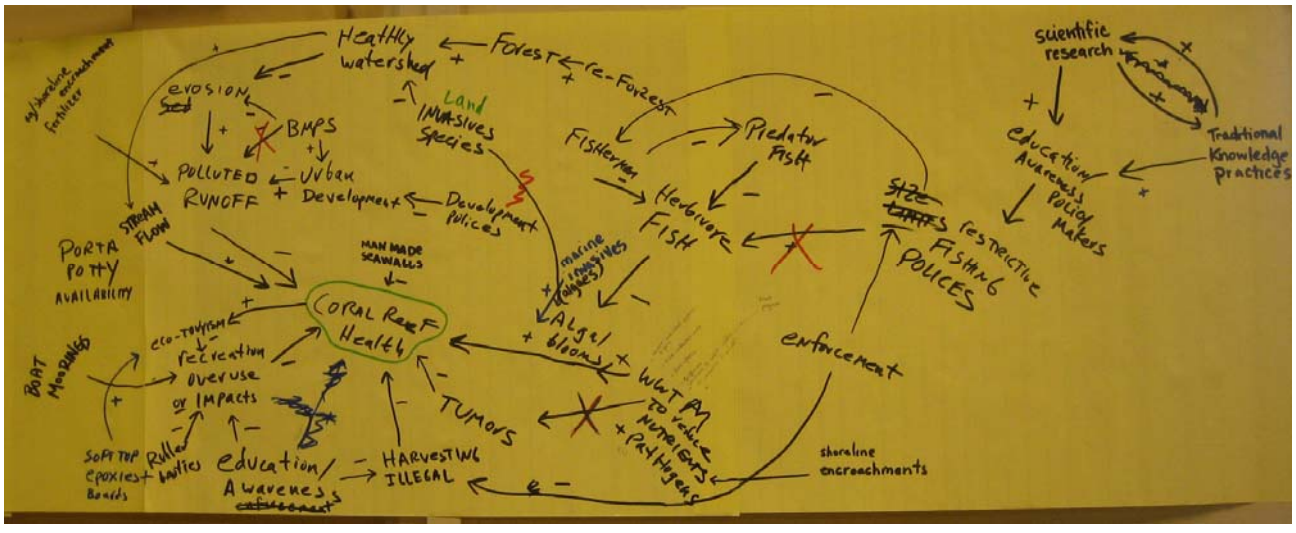
Paul Kirshen lead a brief discussion on the use and value of Influence Diagrams. In Influence Diagrams, the impacts or influences of elements of complex socio-economic and biophysical systems upon each other are traced out.

They are an initial step in Shared Vision Planning, provide practice in participatory modeling and also provide some insights into management challenges and solutions. The attendees were divided into five groups of 5-6 people and each group created an Influence Diagram.

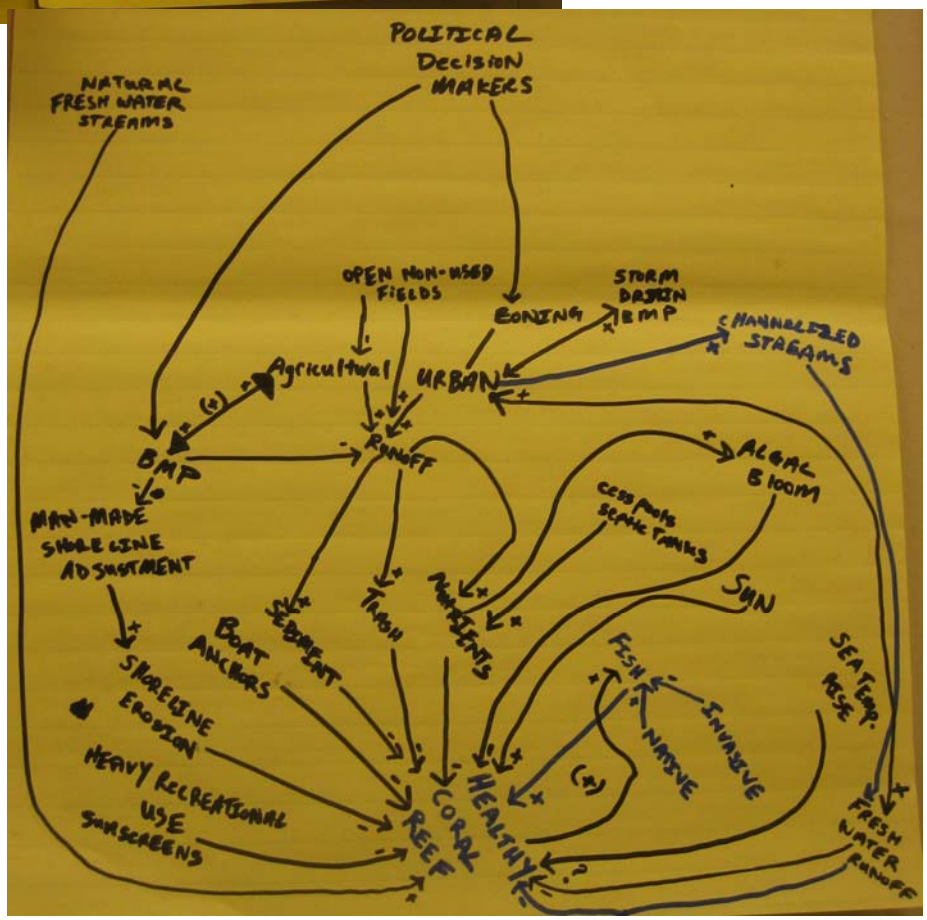
Lunch Break

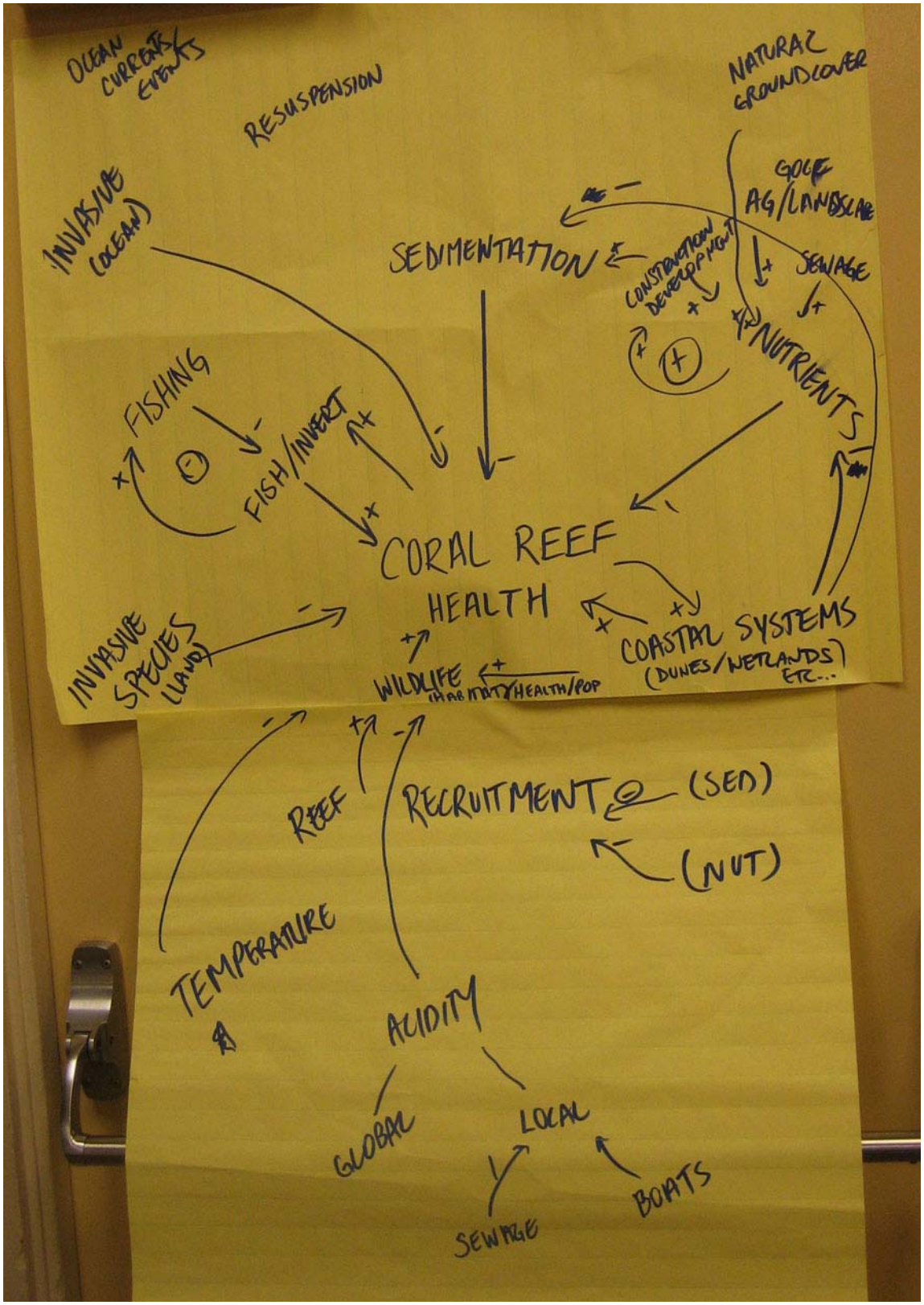
One person from each group stayed with their group's influence diagram to explain it to the rotating group members. Each team could see other versions of the influence diagrams.

Here are some photographs of the influence diagrams produced by each of the five small groups:




WQ
BP
EDUCATION/
OUTREACH/
PUBLIC AWARE
- Volunteers
- $
- Involvement
INVASIVE/NUISANCE
SPECIES
- UNGULATES
- ALGAE
- FIRE
STREAMS
- Wetlands
- Regulatory/Policy
Sediment/Nutrients
FISH/FISHING
CORAL REEF
AREA
RECREATION
BIG OOPS
Quarantine/Prevention
Screening
Policy, regs, laws
MPA
Habitat
restoration
Protection
TOURISM
ECONOMY
TEK
Cultural Practice
- release
- Malama
ENFORCEMENT
Climate
Change
- coral bleaching
- disease
- ocean acidification
- SLR/tidal flux
- ecosystem shifts
- beach renourishment
Population
-USE
- Pollution
- Fishing
- Sunblock
- birth control
Fish Ponds
Green/clean Energy
WATER
USE/
CONSUMPTION
SURF
Schools


POLITICAL
DECISION
MAKERS
NATURAL
FRESH WATER
STREAMS
OPEN NON-USED
FIELDS
ZONING
STORM
DRAIN
BMP
CHANNELIZED
STREAMS
Agricultural
URBAN
(0)
BMP
RUNOFF
ALGAL
BLOOM
CESS POOLS
SEPTIC TANKS
MAN-MADE
SHORELINE
ADJUSTMENT
SYN
TRASH
NUTRIENTS
SEDIMENT
BOAT
ANCHORS
SHORELINE
EROSION
FISH
NATIVE
INVASIVE
SEA TEMP.
RISE
HEAVY RECREATIONAL
USE
SUNSCREENS
CORAL
REEF
HEALTHY
FRESH
WATER
RUNOFF


OCEAN CURRENTS/ EVENTS
RESUSPENSION
NATURAL GROUNDCOVER
INVASIVE (OCEAN)
GOLF AG/LANDSCAPE
SEDIMENTATION
CONSTRUCTION/ DEVELOPMENT
SEWAGE
NUTRIENTS
FISHING
FISH/INVERT
CORAL REEF HEALTH
INVASIVE SPECIES (LAND)
WILDLIFE (HABITAT/HEALTH/POP
COASTAL SYSTEMS (DUNES/WETLANDS ETC...
REEF
RECRUITMENT
(SED)
(NUT)
TEMPERATURE
ACIDITY
GLOBAL
LOCAL
SEWAGE
BOATS

The comments on the Influence Diagram exercise were:

- Influence diagrams make interconnections clearer (e.g. land- water connections) and can include connection to outside effects on ecosystem (e.g. Superferry)
- Diagrams show different individual perspectives but together present an inclusive view
- Can get focused on negatives and want to include positives as well
- The ahupua`a influence diagram first considered what supports the system and considered local impacts
- People "flew at different levels"
- One group focused on prevention
- Difference between O`ahu and Maui participant focus (on Maui there are still things to protect; in contrast on O`ahu too overwhelmed and less focused on natural resources.)

REVISTING OF ISSUES & RESEARCH QUESTIONS

After reviewing the influence diagrams, the group revisited the issues and research questions.

- Issues with a potential ***federal nexus*** were marked. These are in **bold** on the attached list.
- ***Major research questions*** as determined by the group in each category were marked and are in **bold** on the attached list.

Break

SHARED VISION PROCESS & MODELING

Stacy Langsdale shared a presentation on the Shared Vision Process and modeling in Okanagan, British Columbia.

In the Shared Vision Process, influence diagrams are the first step in creating a user-friendly model for understanding possible impacts of management in the watershed.

CLOSING

Cindy asked the group for their thoughts on the process and possible integration with next steps.

Comments were:

- Would like to have an approach that relates spatially (e.g. mapping)
- Preference for an ahupua`a vs. watershed study
  - to capture the entirety of the relationships
  - focus on what works in the system
  - integration of cultural knowledge
- Model to support decision making process but not bog down
- Critical for stakeholder assessment and development of shared values
- Could have 2-3 representative watersheds for the distinct geographic regions and then replicate out from those projects.
- Proposed Next Step: Conduct a survey inventory of what types of studies/projects are planned or ongoing to gain a fuller understanding of projects/funding and potentials for collaboration or new projects in the watersheds / ahupuaʻa.

Additional Comments or Suggestions should be sent to Cindy or Cami via email.

Mahalo to everyone for their time and participation!

West Maui Watershed Reconnaissance Study
ISSUES

Note: Issues in bold are those with a possible federal interest

STREAM IMPACTS

- Instream flow standards
- Stream Habitat
- **Stream hardening/de-channelization**
- Water diversions and system maintenance
- **Traditional and customary practices (T & C)**
- Stream maintenance (rubbish, vegetation, logs, etc)
- **Water quality decreased by disease from invasive species (human health)** 303 D**.**
- `Opae `ula serve as an Indicator of system health

GROUNDWATER QUANTITY AND QUALITY

- **Aquifer recharge/quantity**
- Abandoned wells
- Water supply
- **Injection wells/ reclamation (recycled water) infrastructure -** 319 Clean Water Act
- **Quality of groundwater (also as connection to marine environment)**
- Overpumping of the sustainable yield of the aquifer
- Identification of prohibited activities within the well-head area

WATERSHED DEGRADATION

- Fire
- Feral ungulates
- Weed species management
- **Makai predators of endangered species**
- **Ecosystem restoration** (Funding, access, etc)
- Mauka makai access
- All-terrain vehicles
    - Rise of invasive species intro
    - Increase Fire risk
    - Trespassing
    - Hiking and Hunting, etc in sensitive habitats
- Illegal dumping everywhere
- Upkeep and maintenance of agricultural diversion and erosion measures
- Enforcement of illegal dumping
- Look for ways to meet stimulus fund requirements)

West Maui Watershed Reconnaissance Study
ISSUES (continued)

Note: Issues in bold are those with a possible federal interest

FLOODING/SEDIMENTATION/CORAL REEFS AND NEARSHORE WATERS

- Maintenance of drainage inlets
- **Nearshore water quality**
- **NRCS P.L. 83-566 – Watershed Protection and Flood Prevention Act**
- **Algal bloom**
- **Coral reef impacts from agriculture and development***
- **Dam inspection and maintenance**
- Land based sources of marine debris
- Ocean sources of marine debris
- Enforcement of grading and drainage standards
    - Address loopholes in review process
- Evaluation of and improvement of standards

GENERAL

- Climate change
- Land ownership/title
- Oversight/Transparency for enforcement
- **Integration of traditional knowledge and practice**
- Improve education and outreach
- Targeting cultural groups that may not be aware of issues/impacts
- Integration of master plan of watershed with all other plans
- In alignment with other sources of funding requirements
- Clear scientific data to inform and base standards upon
- Proposed solutions balanced with economic financial considerations

West Maui Watershed Reconnaissance Study
RESEARCH QUESTIONS

Note: In bold are the major questions per workshop participant input

STREAM IMPACTS

- **Baseline stream data needed (flow, habitat, water quality, etc.)**
- Stream studies for setting of instream flow standards (Maui County Department of Water Supply / USGS starting to collect data) 4-year project (Nā Wai `Eha stream studies finished but other streams need study)
- Long term monitoring of effects of stream restoration on native species
- Streamflow data for management decisions
- Water quality monitoring data for baseline conditions
- Restoration of streams with respect to nearshore water quality
- Talk to old sugar companies to collect historic data on rainfall and stream flow (need to be creative in looking for data sources (i.e. water sampling)

GROUNDWATER QUANTITY AND QUALITY

- **Data to provide future well placement locations**
- **Survey of abandoned wells**
- **Inventory private wells**
- Nutrient level monitoring at marine shore interface
- What could be the salt water intrusion with climate change and other unknowns?
- Map out groundwater intrusions in marine areas (Craig Glenn @ UH funded work)
- Loss of wetlands → Loss of Recharge. Where are recharge areas?
- Is there enough drinking water for the population? (CWRM has projected population and water use estimates.)
- Talk with kūpuna for historical reference and mapping

Suggested Solutions:

- Remove cement floors in streams for recharge into groundwater (especially `Īao)
- Research potable/non potable for waste water reuse (policies that restrict use may need to change)

WATERSHED DEGRADATION

- **Cultural inventory to understand what the system used to look like and opportunities for restoration**
- Where are the opportunities for reforestation and wetland restoration?
- Contribution of fire and other impact activities to degradation-prioritization of what to address first
- Benefits of existing management practices to restoration and conservation

RESEARCH QUESTIONS (continued)

Note: In bold are the major questions per workshop participant input

FLOODING/SEDIMENTATION

- **What are the sources of pollution? Prioritize erosion hot spots**
- **How well are existing sedimentation basins functioning? (Pilot study data)**
- **Flooding management including channel direct flow (current design) vs. natural impoundment metered flows**
- What is the relationship between sedimentation and land use?
- Effectiveness of desiltation projects vs. reforestation/buffers
- Identification and ownership of drainage ways

CORAL REEF AND NEARSHORE WATERS

- Define **public education** initiative to reduce contamination load in SMA
- Characterize public health issues from exposure to pathogens
- Develop and research plan to characterize natural breakdown of pollutants
- Is there a need for beach remediation?
- West Maui ownership manual follow up: measures implemented? BMPs effective?
- Habitat characterization study of coral reefs
- What is human activity impact on coral reefs?
- Impact of stream restoration with respect to nearshore water quality (need to consider historical context of water into the ocean).

CLIMATE CHANGE

- **Relaying info effectively to community on climate change** (including having consensus on message, relevance to people's personal life and economics)
- Climate change impacts on management strategies
- Change in extreme high tides impairing turtle nesting
- Healthy reefs could grow 1 meter in 100 years
- Need clear data on the expected change with climate change (balanced perspective)
- Look at Zoe's climate change analysis
- Chris Oestrander (SOEST - What data does Maui need? Create a shared access site (Hawaii NOS)
- Hawaii Institute for Marine Biology - Ocean acidity analysis
- Plan for climate change hydrology
    - Droughts
    - What could be change in vegetation and increase fire risk?
- Build flexibility into plans to deal with climate change
- Look at post-climate change ecosystems

OTHER

- What are the interactions between the problems (and synergies of project/outcomes)
- What is the projected population growth? Growth in tourism? What is the sustainable population for Maui?
- Public and private efforts: Coordinate synergies, overlap and identification of information gaps
- Inventory/survey such as FWS Habitat Cover Program
- Establish centralized records, data collection, monitoring, updating
    - How to prioritize a plan of action (low hanging fruit?)
    - Incorporate timelines to actions / changes

POLICY-RELATED

- Restricted fishing
- BMPs
- Wastewater management
- Enforcement of existing policies
- Education
- Recreational users
- Prevention/quarantine
- Standards for ecotourism
- Water quality goals/benchmarks
- Protect watershed ahupuaʻa system
- Mālama ʻāina

MEETING ATTENDEES

Name	Organization
Bob Graybosch	Nāpili Bay Foundation
Cami Kloster	Group 70 International
Cheryl Okuma	Maui County Department Environmental Management
Christopher Brosius	West Maui Mountains Watershed Partnership
Cindy Barger	U.S. Army Corps of Engineers, Honolulu District
Darla White	DLNR Division of Aquatic Resources
Edna Manzano	Maui County Department of Water Supply
Eve Clute	Lahaina News
Glenn Shishido	DLNR Division of Forestry and Wildlife
Hudson Slay	Department of Health, Clean Water Branch
Ian Swezey	West Maui Soil and Water Conservation District
Jeff Overton	Group 70 International
Jeff Rebugio	Kā‘anapali Land Management Company
Joe Krueger	Maui County Department of Public Works
John Astilla	West Maui Soil & Water Conservation District
John Duey	Hui o Nā Wai ‘Ehā
Kahu Kapaku	Save Honolua
Kūhea Paracuelles	Mayor’s Office, County of Maui
Liz Foote	Coral Reef Alliance and Project S.E.A.-Link
Megan Webster	Maui Land & Pineapple Company
Meghan Dailer	University of Hawaii
Michael F. Wong	U.S. Army Corps of Engineers (USACE), Honolulu District
Paul Kirshen	USACE Institute for Water Resources/Tufts University
Paula Levin	U.S. Fish and Wildlife Services
Randall W. Kennedy	DLNR Division of Forestry and Wildlife
Risa Minato	Hawaii Coral Reef Initiative
Risa Oram	Land Based Pollution Threats to Coral Reefs LAS
Rory Frampton	Mākila Land Company
Russell Sparks	DLNR Division of Aquatic Resources
Shirley Ann Kaha‘i	Friends of Moku‘ula Inc
Skippy Hau	DLNR Division of Aquatic Resources
Stacy Longsdale	USACE Institute for Water Resources
Tamara Paltin	Save Honolua
Torrie Nohara	DLNR, Na Ala Hele
Wendy Wiltse	U.S. Environmental Protection Agency
Wes Nohara	West Maui Soil & Water Conservation District

U.S. Army Corps of Engineers Pacific
West Maui Watershed Study Interview Datasheet

Date:	**October 20, 2008**
Name of Interviewee:	**Kapua Sproat**
Organization/Association:	**Earthjustice**
Email Address:	ksproat@earthjustice.org
Interviewer:	Cami Kloster

Questions:

1) ***What do you and your organization see as the major environmental and other concerns for the West Maui watersheds?***

A) Stream Dewatering and Diversions
   a. Decreasing groundwater levels and increasing chloride levels
   b. Not enough water available for cultural uses (kalo cultivation, native aquatic species, protocol for heiau, etc)
   c. Funding for Stream gauging stations being reduced and stations being eliminated
   d. Lack of scientifically-based interim instream flow standards (IIFS)

B) Stream Hardening and Channelization
   a. Low flow is not conducive to habitat due to concrete channels with insufficient low-flow corridors

C) Groundwater Development and Well Placement
   a. Sustainable yield calculations need review (proposed revisions through County WUDP?)
   b. No requirements for ideal new well placement

D) Inadequate Watershed Management
   a. Ukumehame range contamination
   b. Lack of action by landowners in Nā Wai ʻEhā

E) Water Quality of Nearshore Waters
   a. Contamination from pineapple, sugar, and macadamia nut cultivation, especially pesticide contamination
   b. TMDL's have been set for south Maui
   c. DOH is looking at classes and beneficial uses

F) Hawaiian Rights
   a. Access to mauka and makai areas for gathering
      i. Limu and fish availability has declined with less freshwater flowing to the ocean, and increased levels of contamination.
      ii. Fishpond productivity have also declined for the above reasons

G) Development
   a. Lack of adequate water sources and supply
   b. Lack of riparian corridors with appropriate setbacks

H) Water Purveying Systems Infrastructure
   a. Surface water ditch systems very inefficient due to old design and lack of upkeep

2) What opportunities do you see for the West Maui watersheds?

Mauka to makai stream restoration (multiple reasons listed above)
Vegetated riparian corridors to protect stream habitat
Watershed restoration to protect and improve water quality and habitat
Improve ditch and shaft infrastructure to decrease water losses
Remove channelization in ʻĪao Stream

3) Do you have or know of data or studies done for the West Maui area? Can you provide them to us electronically?

USGS for relevant studies
Scott Fisher for PhD research on watershed issues
Carl Freedman's work for the County of Maui

4) Other people you recommend us talking to/inviting to our meetings?

- Scott Fisher – Waiheʻe Land Trust
- Carl Freedman – Haiku Design and Analysis (working on the Maui County Water Use and Development Plan)
- David Penn – State Department of Health
- Kaeo Duarte – Kamehameha Schools (land owner)
- Delwyn Oki and Matt Wong – USGS (has conducted research in watershed on Central Maui 3D model and ground / surface water interactions)
- Skippy Hau – DLNR DAR
- Chris Brosius – West Maui Mountains Watershed Partnership
- Randy Bartlett – Puʻu Kukui Watershed Manager for Maui Land and Pineapple
- Rose Marie and John Duey – Hui o Nā Wai ʻEhā

U.S. Army Corps of Engineers Pacific
West Maui Watershed Study Interview Datasheet

Date:	**January 15, 2008**
Name of Interviewee:	**Delwyn Oki**
Organization/Association:	**US Geological Survey**
Email Address:	dsoki@usgs.gov
Interviewer:	Cami Kloster

Questions:

1) ***What do you and your organization see as the major environmental and other concerns for the West Maui watersheds?***

Water availability is the main USGS issue for the West Maui watershed study area. The Nā Wai ʻEhā surface & ground contested case is on-going. The similar issues are may arise in the future for the Lāhainā. Groundwater will always be an issue especially with ʻĪao aquifer and salinity

ʻĪao stream in particular has flooding issues because of the challenges in removing the volume of water during storm events.

There is the need to restore habitat for native species and provide water for taro growers.

Lot of motorized dirt bikers eroding hillside deeply rutting hills and landowners are concerned. Has seen first hand on the Nā Wai ʻEhā area. See YouTube video: http://www.youtube.com/watch?v=Is_iGzHzKls

What opportunities do you see for the West Maui watersheds?

- *Long-term monitoring of flow restoration effects on the native stream species*. (Based on precedents, it is likely that some water will be restored. The question is how much). Will fish come back to the restored habitat? Monitoring may be a DLRN Division of Aquatic Resources function.
- *Streamflow data*. If is difficult to make management decisions with out data on stream water management. Need to continue existing gage sites and possibly expand sites. With each State budget cut, the number of stream gages are reduced.
- *Long-term water use and taro cultivation* that relate water use and production. Existing studies are short term (see below).
- Opportunities to study nearhore areas and the interaction with the entire watershed.

2) ***Do you have or know of data or studies done for the West Maui area? Can you provide them to us electronically?***

a) Na Wai ʻEha – on-going study, winding down, report due within a year. Will have some reconnaissance stream data.

b) Groundwater modeling West Maui and Haleakala (final layout so nearly pau). Due out in the next month or two. Mostly on groundwater and some surface water issues. Also addresses stream gains and losses. http://hi.water.usgs.gov/iao/iao_tab.htm

c) Lāhainā area study by Steve Gingrich – stream gains and losses. Stream measurements with some data available online. http://hi.water.usgs.gov/lahaina/lahaina_tab.htm & http://hi.water.usgs.gov/studies/project_lahaina.html

d) Kaʻaula Stream, and other streams – still a couple years until completion

e) Effects of Agricultural Land-Use Changes and Rainfall Ground-Water Recharge in Central and West Maui, 1925-2006. Engott, 2007. http://pubs.usgs.gov/sir/2007/5103/sir2007-5103.pdf

f) Water Use in Wetland Taro Cultivation in Hawaiʻi. Gingrich, USGS, 2007. http://pubs.usgs.gov/of/2007/1157/of2007-1157.pdf One site in Waiheʻe.

g) Trends in Streamflow Characteristics at Long-Term Gaging Stations in Hawaiʻi. USGS, Delwyn Oki, 2004. 2004-5080. http://pubs.usgs.gov/sir/2004/5080/pdf/sir20045080.pdf

Older Reports

h) Preliminary Report on the Resources of the Wailuku Area – USGS for the State 1970 by Yamanaga and Huxel C-61 State series good background info. Not sure if available online. Available at library …or Xerox at Oki's office.

i) Sterns and MacDonald Geology and Groundwater of Maui 194x. (Bulletin 7)

j) Souza, W.R., 1981, Ground-water status report, Lahaina District, Maui, Hawaii, 1980: U.S. Geological Survey Open-File Report 81-549, 2 sheets.

k) John Ford report for contested case on native stream fauna with surveys of streams and larval drift collection of oʻopu. (Delwyn to provide via ftp site.)

l) DAR – periodic surveys of stream including Nā Wai ʻEhā (2008). May be available online.

Professor Eric Benbow University of Dayton brought a group of students in summer 2007. He works is on freshwater native species and has testified at the contested case as an expert witness. One student is continuing work on invertebrates.

U.S. Army Corps of Engineers Pacific
West Maui Watershed Study Interview Datasheet

Date:	**November 6, 2008**
Name of Interviewee:	**Chris Brosius**
Organization/Association:	**West Maui Mountains Watershed Partnership**
Email Address:	brosius@hawaii.edu
Interviewer:	Cami Kloster

Questions:

1) ***What do you and your organization see as the major environmental and other concerns for the West Maui watersheds?***

West Maui Mountains Watershed Partnership (WMMWP)'s goal is to improve water quality Within its boundary, WMMWP can facilitate conducting programs in forest reserve – that support healthy ecosystems for the benefit of water quality.

WMMWP Management Plan & Mission
Protect and preserve forest reserve for the benefit of native Hawaiian forest which is the best means for collecting precipitation, and released into streams and aquifers while protecting rare fauna and flora. The plan is 10 years old but still relevant as the fundamentals of plan have not yet been fully realized.

The primary WMMWP programs protect the ecosystems from the onslaught of weeds, feral ungulates (goats, cattle, pigs, etc.), and forest pathogens (such as 'ōhia rust). Primary task is building ungulate exclusion fences. (*Note: Rodents – not yet on the radar – further down the line. Sometimes pesticides used to reduce seed predation & and native forest bird predation.*) Secondary task is feral ungulate removal to stabilize native ecosystem.

WMMWP is just starting to address weed species problems and will expanding into more weed control – mapping and detection work using remote sensing to find plants and target. The technology is coming – two types of hyperspectral technology that may be utilized with computer programs to locate invasives are:

1) Resource Mapping (Kaua'i: Steven Ambigis) – uses visible band high resolution technology to take ultra high resolution photos in which species can be identified
2) Carnegie Airborne Observatory (Greg Asner) – uses high resolution photos and satellite imagery with visible bands to identify species based on transpiration rate, chemical composition, and other factors.

Weeds control can be done manually in some areas, but for control in difficult terrain and for broader reach, additional resources are needed for biological control to pursue to control worst invasive species. Two things are needed – one is greater support and assistance for community information outreach for obtaining approval. The second is facilities suitable for experiments. These facilities have been estimated to cost about $13 million but would serve the entire state. Strawberry guava is one of the species that needs

addressing. Major biological control and WMMWP herbicide/manual control targets include: *Psidium cattleianum, Clidemia hirta, Tibouchina herbacea*, and *Miconia calvescens* (not yet established in WMMWP). Additional WMMWP herbicide/manual control targets include: *Cortaderia jubata, Rubus argutus*, and *Cyanthea cooperi* (Australian Tree Fern).

Dirt bikes have become an issue. In Waiʻehu they are trying to limit dirt bike access because of disturbance issues (scars and erosion) which increase invasive species and feral ungulates access and further their distribution. Outreach and education are needed to address this increasing problem.

Fire Protection – The Lāhainā low lowlands out side of forest reserve can be impacted by fire which then spreads up into the forest reserve. Fire as an issue has regional implications related to flooding and water quality. Barren land scorched by fire changes ecosystem, which changes the lands water absorption potential, and affects post storm sedimentation and nutrient loading to near shore waters. A Fire Plan would be helpful. Currently there is a fire response map that shows the coordinated responsibilities of DLNR and County of Maui on the island. The plan could provide more information on response and infrastructure assessment.

What opportunities do you see for the West Maui watersheds?

WMMWP could support projects in the Forest Reserve that benefit water quality. Also, projects that reforest and restore fire prone areas and provide fire breaks could be supported.

Relationships: WMMWP partners in forest reserve are also major players in lowlands as most own whole ahupuaʻa. Chris' relationship in uplands can be applicable to landowners to areas below.

Agricultural areas: There are opportunities to increase buffer zones and riparian belts to benefit stream and nearshore waters. In addition to buffer areas, BMPs for agricultural practices would help to decrease sedimentation with outreach on the practices on available.

Sedimentation Monitoring Tool: In development is a monitoring system that has wireless sensor network to locate the sedimentation loading from use areas – e.g. conservation, ag, urban. System is in trial phase (contact - Ken Kaneshiro EPSCOR – UH Center for Conservation Training). WMWMP could help with this.

2) Do you have or know of data or studies done for the West Maui area? Can you provide them to us electronically?

a) WMMWP monitoring programs has transects up and down the mountain sides to track absence, presence and number of ungulates; quantification of area within the transect that has been disturbed by pigs. The number of transects could be expanded.

b) Additional information on invasive species (weed species) beyond the State data.

c) There may be old plantation data on stream flow. Also, USGS gauge stations (handful).

d) DAR Watershed Atlas – West Maui is available

3) Other people you recommend us talking to/inviting to our meetings?

- Partnership members (especially active ones) are:
    - Nature Conservancy – Mark White
    - Maui Land and Pine – Randy Barlett (historical perspective)
    - State of Hawai'i – John Cummings. Branch Manager Maui DOFAW

U.S. Army Corps of Engineers Pacific
West Maui Watershed Study Interview Datasheet

Date:	**January 6, 2008**
Name of Interviewee:	**Jonathan Scheuer**
Organization/Association:	**Office of Hawaiian Affairs**
Email Address:	jonathans@oha.org
Interviewer:	Cami Kloster

Questions:

1) ***What do you and your organization see as the major environmental and other concerns for the West Maui watersheds?***

Watershed Degradation
Lack of funding for watershed management is because there is no connection between water and protection of water resources – and water is free (only cost is cost of electricity for pumping but not for maintenance of the watershed. Ecosystem services are not quantitatively valued.

Water Distribution and Use
- Who is the water use by and for what?
- Water is diverted but what is left behind?
- Nā Wai ʻEhā (ʻĪao, Waikapū, Waiheʻe, Waiʻehu Streams) – goal is year-round stream flow from the summit to the ocean for the major streams.

Ceded Lands* and Land Rights
Some lands are ceded lands (NARS lands for example).
**Ceded lands are lands which belonged to the Kingdom of Hawaiʻi, the ownership of which was illegally claimed at the overthrow and which were later "ceded" by the Republic of Hawaiʻi to the United States at the time of annexation. These lands include most forested watersheds lands, airports, harbors and all submerged lands.*

In Native Hawaiian culture there is not a differentiation between cultural and biological significance of lands.

The true owners and beneficiaries (Native Hawaiians) receive little benefit from these lands and do not have a say over their control and management. This is relevant because the best outcomes in ecosystem management are with an engaged and supportive community who has some say over the future of the watersheds and partakes of some benefits. The structure of the system does not currently allow for this.

Title is questioned for many of the lands and there are various types of claims to the lands. However, the claims on traditional and customary rights are undisputed. This overlies on every landholding. Kuleana right are different and also have other issues.

Global Warming
This was the focus for this year's Hawaii Conservation Alliance conference. Perhaps beyond scope of study but need to be aware. Chip Fletcher has done work on effects on coastal areas.

The rainfall on Maui and across the Hawaiian Islands is dependent on an inversion layer/cloud layer, the elevation of which depends on the temperature of the surrounding ocean and land. With global warming and higher temperatures, the clouds may rise and that decreases the occurrence of clouds which in turn can decrease rainfall. The drying of the forest leads to increased fire risk, and decreased recharge/sustainable yield. This is significant long term issue.

2) What opportunities do you see for the West Maui watersheds?

ʻĪao Stream
Could renaturalize the stream basin but there is a bureaucratic Catch-22. Some say why restore water when there are plans to channelize the stream? And, why restore the stream channel when there is not water?

Water Storage
There are peak and base flows – with base flow being the most in demand for habitat, ag and municipal uses. One advantage on Maui for possible storage is that the isthmus has an area for massive reservoirs. Idea is to take the peak (or high) flow and store the water for use during lower base flow periods. Storage concept could also have a synergy with alternative energy to even out the power supply through water storage.

What about a having the Army Corps Strategic Vision Process for ʻĪao?

Timeline issues: contested case schedule – the Decision and Order (D&O) will soon be available and then the team will be focused on responding to the D&O (right now most are working 50+ hour weeks already).

To work in Hawaiʻi, there needs to be an understanding of the role of culture in watershed processes and management. What is the role of culture? Culture can be seen as lenses to see things in different ways. For example, looking at ʻŌhiʻa tree through different lenses:

- Biologist - common and important tree for ecological functioning.
- Entomologist – home to a rare insect
- Hawaiians – kino lau (form) of god, source for lei making, medicine, and a particular tree might have a deep meaning given its location.

While an ʻohia has all roles simultaneously, there are barriers that prevent people to see it in all ways. Having an understanding of the Hawaiian perspective and respect for it is something that people from outside the Hawaiʻi rarely, if ever, get this quickly.
An outside model could work if there were a broadly shared understanding for ʻōhiʻa, water, etc.

The USGS had a graduate student in social sciences/dispute resolution who proposed a similar thing. It didn't work out; in brief, everyone would rather fight than work together.

In general, working in Hawai'i:

Highly charged community environments over water resources.
Very low trust around stream and watershed issues.

Also, requesting community participation costs the community time. Need to have a clear payback to the community for their participation. If it is a model, they need to agree that they desire to have and use it.

3) ***Do you have or know of data or studies done for the West Maui area? Can you provide them to us electronically?***

Water Use in Wetland Taro Cultivation in Hawai'i. USGS, 2007.
http://pubs.usgs.gov/of/2007/1157/of2007-1157.pdf

4) ***Other people you recommend us talking to/inviting to our meetings?***

Ken Kawahara @ State Commission on Water Resource Management
(Head of CWRM – he may select someone to participate in the project.)
County of Maui – Kuhea, Mayor's environmental coordinator
County of Maui – representative from the Department of Water Supply
County of Maui – representative from Department of Planning

U.S. Army Corps of Engineers Pacific
West Maui Watershed Study Interview Datasheet

Date:	**January 16, 2008**
Name of Interviewee:	**Scott Fisher**
Organization/Association:	**Maui Coastal Land Trust**
Email Address:	scott@mauicoastallandtrust.org / (808) 357-7739
Interviewer:	Cami Kloster

Questions:

1) ***What do you and your organization see as the major environmental and other concerns for the West Maui watersheds?***

Scott works in wetland restoration for a 27-acre discharge wetland at the bottom of the watershed. http://www.mauicoastallandtrust.org/waihee.php Restoration is contingent on getting water to the bottom of the watershed. The once 27 acres wetland is now about 5 to 7 acres. The wetland is part of the larger 250 acre Waihe'e Coastal Dunes and Wetlands refuge. More **consistent water**, would benefit the target species. High quality wetlands are habitat for seven **Hawaiian water birds** with four having been seen on Maui– Hawaiian goose (nēnē), Hawaiian Duck (koloa maoli), Hawaiian stilt ('a'o), Hawaiian coot ('alae ke'ke'o). The overall integrity of the system relies on water. The birds can subsist with water but will not thrive. Other species include Blackburn moth, endangered plants (creeping naupaka), monk seals, turtles (which nest on the beach). Also, need to remove **invasive species for wetland restoration.**

Need to have **water equity** through out watershed, and not have all the water taken at the higher points of the watershed. There needs to be some flow into ocean. All native Hawaiian fish and some mollusks require connection to the ocean.

Ecological integrity from summit to ocean. Need to preserve and protect the ecological integrity from the nearshore waters to the summit of makawai.

Terms of broader watershed, **encroachment of invasive species** is a huge problem. Ungulates in watershed are mainly pigs, some goats and possible deer. These invasives are responsible for the spread of avian malaria which effects in bird population.

Critical for wetland restoration to have **regional level planning and landscape planning** for West Maui projects. Most projects are small projects (except for the Nature Conservancy and West Maui Mountains Watershed Partnership (WMMWP)). Collaboration is needed – for example, erosion is upper elevation affects the lower regions. WMMWP does collaborate in planning for the upper areas and identifies the most critical issues to be addressed. It is important to start with the interface between the really good and really bad -- and extend out from the good.

Erosion from motor bikes and off road use. Ungulates exploit the trails made by dirt bikes. With the trails they are able to reach higher elevations (than without the trails) and carry invasive species from their digestive tracks in their fur which are then established in these higher elevations. Pig hunters also chase the pigs higher along these

trails and then controls must be used at high elevations as well. Also, pigs bring avian malaria from the wallows because they are moving up which impacts bird species.

Predators (mongoose, feral cats, feral and domestic dogs) of endangered species. One of the keystone species at lower elevations was pelagic species (seabirds) in the sand dunes. Soils are young in Hawai'i and have not weathered so that the minerals are still locked up. Seabirds bring nutrient transfer from ocean to land through guano. At lower elevations, with removal of pelagic birds, there has been a loss of nutrient transfer which has allowed invasive species to become established. Native species are phosphate limited and when removed for development or agriculture, they don't return because they are out-competed by invasive (non-phosphate dependent) species. Pelagic seabirds, can't get a toe hold on main Hawaiian Islands due to low on water conditions and predators (trapping effort still not happening).

WWC – Wailuku Water Company utilizes water sources that are public water source (supposedly just a delivery role) but treats the water like a private asset.

Water quality as an issue for the wetland restoration remains to be seen. Ideally, if Waihe'e and Spreckles ditches (that divert water from the wetland) were deleted, the water would be sufficient to fill up wetlands. Natural system would have filtered it before it reaches the wetland. There is a 2.5 mgd application for water from Waihe'e stream. Any pesticides and fertilizers will catch at bottom of watershed. This is not a concern yet because there are minimal amounts of agriculture. As urbanization increases water quality could be a problem. At this time the refuge has good relations with neighbors and most people support the effort.

2) What opportunities do you see for the West Maui watersheds?

Paleo-ecological analysis examines cores for pollen and seeds to understand what the pre-human environment was like. Core sampling works well in wetlands which are repositories for pollen and seeds. The sampling results could provide assembly rules to understand the spatial arrangements of species. And, the results would be helpful for management and restoration efforts by providing insight into how the environment might be restored.

Provide **recreational activities** for dirt bikes outside of the watershed area. A high quality race track on the plains could reduce the impact of vehicles in the mountains (see above issues with dirt bikes).

The Army Corps could help with **fence construction** to limit the impacts of ungulates in the watershed.

Maui Coastal Land Trust (MCLT) has bee in existence since 2001 (eight years) and owns the refuge. MCLT has a staff of 6 persons.

Modeling of the wetland / watershed system could have multiple applications. One is for day to day management strategy – another is to use for funder to show that if predators were eliminated, could expect x result. Might help to increase potential funding!

3) ***Do you have or know of data or studies done for the West Maui area? Can you provide them to us electronically?***

Lucienne de Naie – has all studies ever done for the area.
Scott has archaeological reports on refuge.

4) ***Other people you recommend us talking to/inviting to our meetings?***

- Professors at UH Department of Natural Resources and Environmental Management including Dr. Greg Bruland (Water Quality Testing)
- For Ecological Restoration – David Burney Paleo-ecologist on Kaua'i and on O'ahu Steve Athens with International Archaeological Research Institute, Inc.
- Delwyn Oki of USGS
- Friends of Moku'ula
- Landowners near the Waihe'e refuge (at coast small landholdings, then large landowners in hundreds of acres, then Wailuku Ag, then State as you move up through the watershed).
    - John Verell, Frank Silha is manager
    - Patricia Bragg (health crusader!) 500 acres,
    - Bethel Brothers, Kūpuna Ranch and land mauka of highway.
- Traditional Hawaiian User – Diannah Goo, 268-4248 (74 years old) good sense of water use. Have Scott call her and see about interest. Volunteers 20-30 hours/week.

U.S. Army Corps of Engineers Pacific
West Maui Watershed Study Interview Datasheet

Date:	**February 19, 2009**
Name of Interviewee:	**Skippy Hau**
Organization/Association:	**State Department of Land and Natural Resources – Division of Aquatic Resources**
Email Address:	Skippy.Hau@hawaii.gov
Interviewer:	Cami Kloster

Questions:

1) ***What do you and your organization see as the major environmental and other concerns for the West Maui watersheds?***

Algal Blooms

- Algae blooms are smothering the reefs. Algae have switched from green to red.
- Major blooms in '89 and '91.
- Preliminary surveys and monitoring are for 10 years. Coral heads from the '90s are not there any more. Some relief with the UH Botany Super Sucker.
- Water is becoming much warmer and monitoring shows an increase in CO^2; the fear is that these are perfect conditions for introduced algal bloom.
- Genetic studies are being conducted to show how algal spread and the genetic relationships over a 50-year time period.
- A Herbivore Enhancement Area (HEA) hearing in Māʻalaea was held with a public meeting over a year before it. Trying to involve fisherman and have certain fish left to graze.

Streams

- People need to understand stream habitat from mauka to makai.
- Preliminary DAR surveys done of Nā Wai ʻEhā but since so much water is diverted, the surveys are only preliminary. Also issues with channelized streams.
- Kahoma Stream (Lāhainā) by Cannery Mall is channelization, land slide, debris basin,
- Honokōwai (ʻŌpae above the diversion) 15 years ago.
- EPA/Department of Health produced the West Maui Watershed Owners Manual with instructions about how to behave in a developed watershed. People who worked on it include Wes Nohara, Neal Fujiwara, Soil Conservation Service and Wendy Wiltse, EPA.

General

- Need more awareness; people want to use ahupua'a but you need permission. In the past, someone was monitoring uses and involved with the community.
- People who live in the ahupua'a know much.
- Families remember that they did have water with property. People have relatives are buried up on the valleys. Documentation not easily shared.

2) What opportunities do you see for the West Maui watersheds?

- Streamflow restoration for estuaries (to capture the water), riparian vegetation for greater stability in the ecosystem. Plants and wildlife will also be available.
- Cultural resources
- Remove/change channelization for habitat restoration; low flow channel ('Īao channel low flow moves from one side to the other without any transition.)
- Allow springs to flow to the ocean
- Have County of Maui as sponsor for 'Īao stream project
- Happy Valley has a 20 foot drop in concrete and needs water flow.
- USGS – gains and losses in streamflow studies

3) Do you have or know of data or studies done for the West Maui area? Can you provide them to us electronically?

- USGS Mike Field - research on currents and reefs and where the coral go to spawn
- Hawaii Coral Reef Initiative - Celia Smith and her group on identification and crustal coralline algae ('opihi feed on crustal coralline algae and create "concreting of reef" which is what makes the reef solid).

Celia Smith
February 20, 2009

Is a marine botanist who has had experience in West Maui.
Held a detailed workshop on algal bloom in April / May

500 native algaes in Hawaii
5-6 invasives that bloom and create problems

Maui has had a problem for 20 years with algal blooms; in some places seasonal, other places persistent. Macro algae float like a billowing mass and become a rotting mass like kelp forest.

No one from County or State has algal expertise
Indicator of ecosystem decline from poor management
County injection wells less than a mile away - in vicinity of blooms.

NOAA funding (from ecohab branch) for 4 years includes characterization of benthic community
Research Question: Biological factor? Or nutrient issue?

Land-based pollution,
11 mgd of effluent into three wells (primary or secondary??).
Maui (and Hawaii) basaltic at core with some limestone caps

Injection wells are about 200 feet deep; USGS has mapped the plume.
Temperature of effluent is warmer than seawater and buoyancy of freshwater plume into cold saltwater.
Comparison with wells on the Mainland; tropical issues because nutrient goes into tropical ocean.

It may take 100 years for water to cycle out to the coast through groundwater movement.
By comparison, injection wells water flows in a 3-year time frame (due to pressurized flow?)

Algae standard growth unit – doubles in two days in plume.
Plume comes into the ocean where sand substrate – rocks is where the algal bloom lives nearby.

If injection wells – if leaking through cracked pipes. Bacteria might be coming in. Pathogens into the coastal environment. Mertha infections of researchers. Public health concerns.

December 9-10 in Honolulu science-based community with County staff workshop.
Set of consensus statements that the scientific community and county has signed off.

NOAA representative, Dave Kidwell (sp?) found funding for a stakeholder workshop funded on Maui. April target for the workshop – invitees will include tourist industry and ag owners, county long range planning and waste water treatment. Will be at a level and pace that non-scientists can understand.

For Maui – not as much cynicism as Oahu. Community is ready even though polarized.
Ahupuaÿa – themes will hopefully resonate especially the Native Hawaiian community.

Many activities essential to helping the ecosystem.

Maui Community College is not a Mänoa research institution. Celia is creating an advisory group to mayor to provide more science to policy on Maui.

Oahu discharges are in deep water (Makaupu, Ewa) and fewer plants at the depth.
More dilution and lower temperatures than Maui.
Ocean cooling water discharges on Oahu will be release at shallow depths and may have issues.

Other factors that contribute to the algal blooms: land use, pristine ecosystem can have issues.
Proportion of contributions varies around the island…
Use of fertilizers, sewage, septic tanks can increase nutrients.
Currently small project to map cesspools and septic tanks.

Coral Reef Initiative – wants to poll people on Maui to understand the desire for change.
Are people on Maui willing to pay more money for effluent treatment?

An economic valuation conducted in 2002 was the cost of algal blooms = $20M / year of lost revenue (included differences in similar condo sales in locales with and without algal blooms)

LESSONS LEARNED
Group depends on approach. Need input from elements who are not drawn to forum format.
Need to have a presence on island – Oÿahu is not there.
Found a house that acts a laboratory to work in community; people see commitment.
Identify local conduits in the community for the projects.

U.S. Army Corps of Engineers Pacific
West Maui Watershed Study Meeting Notes

Date:	**March 5, 2009**
Attendees:	USACE Honolulu - Cindy Barger USACE IWR Fellows - Stacy Langsdale, Paul Kirshen Save Honolua Bay Coalition - Wayne Cochran, Elle Cochran, Isao Nakagawa, Glenn Kamaka
Organization/Association:	**Save Honolua Bay Coalition**

1. ***USACE representatives met with representatives of Save Honolua Bay Coalition to seek their input on issues and concerns for the West Maui Watershed Restoration Study. Issues identified were:***
   - Fertilizer use from golf courses.
     - The release of contaminants from the golf courses into the ocean are really bad after large rain events.
     - Average golf course uses a ton of fertilizer a day.
   - Lack of enforcement. Enforcement for DLNR and the Division of Conservation and Resources Enforcement (DoCARE) program is under funded.
   - Reef cover in Honolua has declined from 42% cover in 1995 to 9% cover in 2005 (Based on State DAR report).
     - In 2006 storms, runoff increased. The reduction in freshwater in the streams due to irrigation withdrawals is impairing the circulation in the bay to get sediment off the reef.
   - Relic contaminants from pesticide and herbicide use is entering the system with increased erosion.
     - Original fields retained sediment through terraces. Development has removed the terraced agricultural fields and increased surface runoff. The flatter development increases runoff to the stream.
     - The pineapple fields used black plastic to reduce weeds around the pineapples. The black plastic was tilled into the soil after harvest. This plastic is now getting into the bay through development and erosion. Plastic impacts coral reefs and sea turtles.
     - Turtles are developing tumors linked to pesticides and herbicides.
   - Increase restricted access especially at La Perouse Bay.
   - Malo Wharf - seen recovery of the reef after Hurricane Iniki went through. The reef can recover if sediment is removed.
   - Fishing has significantly decreased with the decline of the coral reefs.
   - Launuipoko - solid coral reef cover 20-30 years ago.
     - Lawsuit occurred (Terry Teabo?) based on tractor activity in the mountains that resulted in downstream damages to the reef.
     - The Launuipoko canal will also impair the reef by changing freshwater introduction and increasing sediment introduction (concrete channel). It is currently stopped by the County.
   - Sargassum seaweed. It was plentiful 40 years ago and is now all gone. Can it be reestablished? It provides habitat for small fish.
     - 1969 saw a major decline in seaweed. Correlates to plantation use of talone and diloitin herbicides.
     - Sargassum used to be 5' tall and occurred at depths of 6' in bay.

    - Sargassum beds could be found all around Maui in the 60s.
    - Last year found some ogo (salad seaweed) but most gone or overtaken by hypnea.
    - When sargassum left then the coral started to die off next to the surfing area in Honolua. 3-4' corals with lots of color (orange, red, green) now you don't see the diversity. Also no new growth.
    - Shoreline was slimy with the sargassum and coral. As the plankton and seaweed declined see change in species distribution - now mainly see just octopus and sea urchins (the short pinned urchins).
- Pollutants - trace nickel found in Honolua Bay.
- Public Health - staff and flesh eating bacteria has increased in West Maui. It is now the highest in the State.
    - Sources: Dead pigs are being thrown into the stream from the cliffs above by hunters.
    - Sources: no bathroom facilities at Honolua Bay and other recreational areas.
    - Big sewage spills and injection wells. Could photovoltaic treatment of sewage be used instead of injection wells and current method?
- Groundwater - increasing brackish water in wells. Cochran's well hit brackish water at 40' in Honolua Valley. Neighbor's well went to 120'feet. Need to understand what is going on with groundwater.
- Honokawai - pineapple stench reported in the Lahaina News on 4 March 2009.
    - Vector for bugs
    - Hapalua to Kanopili have problems with the sour beetle
    - Burning of the fields was stopped 35 years ago.
- Ocean as an Ice-box: 60 years ago people used the ocean as their icebox to get fish. Then people started using the ocean as a dumping ground and decline has occurred.
- Kahalui Harbor - in the 60s with the use of DDT significant decline in seaweeds. Seabirds almost completely disappeared.
    - Significant fish decline with DDT also. Jack Travelle, Olua, Popio and Bigeye Scab all declined but slowly coming back.
- Sea turtles - turtles will eat the red algae. Seeing more of a decline in other species than turtles.
- Instream flows - not enough water in the stream. Need the fresh water introduction at the right times of year and in the right amoutns for native algae growth that the mullet feeds on.
    - Opii/hele-wai (fresh water mollusk) - don't see them now because of the loss of instream flows
    - Irrigation should be relooked at to reuse water in the field rather than diverting the streams to the fields.
    - Catchment basins are in need of maintenance - a lot of water lost that could be in the streams.
    - 30 years ago the Hana streams ran all the time. There was always a low flow of water in it.
    - Taro patches were throughout the study area. Taro needs cold clear fresh water to grow so ancient records are proof of what the quality of the water should be and proof there used to be more consistent flows.

- Water supply - current land use and management is reducing the aquifer. Need to find a way to fill up the aquifer again.
- Channelized streams - Kahoma, Honolowai Streams. Channelization is an issue for sediment. Pigs are right above the channelized areas so more sediment introduction.
- Mahamahena Tunnel – there is an old tunnel in the mountains that is about 100 years old. It is leaking.
- Honokohau - 15 years ago a there was a report that there is 700 gallons lost from when the water enter enters ditch #1 to when it exits because of degrading infrastructure.
    - Big debris issues.
- Honokowai - 4M gallon reservoir. It was suppose to be an equal % of river and well water. It is now mostly well water supplied in the summer.
- Wailea - driest part of the island. Water is being stolen from the stream and relocated somewhere else.
- Climate change
    - There is less rain then 70 years ago. It is warmer. Plants that usually grow in the lower elevations are more frequently seen in the higher elevations.
- Flooding
    - Honolua always a real flashy system. Mr. Nakagawa remembers that as a kid he had less than an hour warning to get out of the stream.
    - Last big flood was in Dec 2006.
    - There is a gage at Honolua above the dam.
- Fishing (Glenn). People have lost an understanding of how to fish.
    - Opai runs have been reduced
    - No parrot fish and unicorn fish have declined

3. Recommendations:

- Change the policies for water use to reduce fertilizer runoff - especially for golf courses.
- Golf courses should consider better turf management such as using liquid fertilizer that is diluted with the sprinklers. Less fertilizer is needed and can be sprayed an more appropriate times.
- Golf courses should use recycled water from waste water treatment area. Only one golf course doing this now but the water is a blend of recycled and regular.
- Increase enforcement
- Put bathroom facilities at Honolua and the other areas.
- Injection wells. Don't inject, redirect (DIRE) program that Honolua Coalition has been supporting is critical to addressing threats to coral reefs.
- Fix leaking infrastructure
- Restore low flows to the streams
- Address sediment introductions. Iniki example shows the reef will recover.
- Can you address the quick fixes first such as getting rid of diversions and outdated dams?
- ID the key stressors to the coral reefs so they can be removed and allow the system to recover.
- Fishing restrictions needed to allow fish to recover.

Other contacts.

- Hanna Bernard with Save Honolua Coalition good source of information.

U.S. Army Corps of Engineers Pacific
West Maui Watershed Study Meeting Notes

Date:	**March 5, 2009**
Attendees:	USACE Honolulu - Cindy Barger USACE IWR - Stacy Langsdale Trilogy Staff - Captain Kevin
Organization/Association:	**Trilogy Staff**

Issues were discussed with Captain Kevin of Trilogy informally from the perspective of the tourism snorkeling industry.

- **Lack of education for the boat operators**. Capt. Kevin and his crew share information that they pick up and try to educate customers as they come aboard but it would be very helpful to have tools, handouts, and other resources for boat operators to relay to customers.
- **Greening boats**. Trilogy has taken a green approach to boat operations with no plastic on the boat, limited paper, reusing plates, and cups, towels etc. There is a lot of rubbish seen while they are out that is obviously from boats. Education efforts to help green all tourism boats would be beneficial.
- **Education of beach users**. When customers are on the boats, the operators can give them some education and remind them not to step on the reef or pick up things from the reef but people that snorkel from shore - especially tourists - have no education. There are also limited trash receptacles on shore.
- **Mooring Buoys**. Having mooring buoys will help operators reduce their damage because they won't have to drop anchor. It also helps inadvertently limit the number of users in a bay. If the buoys are full - operators should be required to wait until buoys open up to reduce overuse.
- **Size of vessels**. The large excursion snorkels with 100 people on one trip cause a lot of damage with overuse. Hard to control that many people. Vessels should be restricted in size to help limit the number of people at any one time.

Napili Bay and Beach Foundation Community Meeting
January 12, 2009 10:30 am
Napili Kai Beach Resort Conference Room

Purposes: **1) To share information:**

- **situation with storm breakthrough events**
- **current status of weirs, aka D- basins 2-3 and 4-5**
- **plans for improvements in this portion of West Maui Watershed.**

2) Partner to begin planning future actions.

Participants: Nane Aluli (Mauian G.M. and NBBF Director), Milton Arakawa (Director of Public Works, Maui Co.), John Astilla (West Maui Soil and Water Conservation), Cindy Barger (by telecon; U.S. Army Corps of Engineers), Leonard Costa (Maui County Dept. of Public Works, Highways), Yarrow Flower (Maui Land and Pineapple Outreach), Bob Graybosch (Napili Shores Resort G.M.), Dave Hoffmann (Napili Shores Resort homeowner), Robin Knox (Water Quality Consulting, Inc. and Univ. of Hawaii), EarleRay Kukahiko (Maui County Dept. of Public Works, Highways), Pat B. Lindquist (NBBF President and Napili Shores homeowner), Robert Lindquist (Napili Shores homeowner), Gregg Nelson (Napili Kai Resort G.M. and NBBF Director), Wes Nohara (West Maui Soil and Water Conservation, Maui Land and Pineapple), Robert Sides (Kapalua Resort Association Executive Director and NBBF Director), Ian Swezey (West Maui Soil and Water Conservation), Scott Ullrich (Napili Surf G.M.), Megan Webster (West Maui Soil and Water Conservation, Maui Land and Pineapple Outreach).

Mahalo to all of you for sharing your time and expertise !

EXECUTIVE SUMMARY:

Participants heard background information and updates regarding

- Napili Bay and Beach Foundation, Inc. (NBBF),
- Stream 4-5 storm breakthrough events since 1992,
- Background and updates on work of West Maui Soil and Land Conservation (WMSWCD) programs, as well as history of the desilting basins above Napili Bay (2-3 and 4-5),
- Updates and understanding of maintenance programs for these basins
- Information regarding ongoing efforts to put plans in place for West Maui watershed as a whole

Two issues were addressed for future actions:

1) D-basin 4-5 overflow system

Goals agreed upon –

a) Mitigate debris/overflow/storm runoff
b) Improve water quality leaving the basin
c) Maintain basin to work as designed

Possible WAYS to achieve these goals

a) Restore gate valve or install standpipe system to control outflow
b) Keep debris out of basin
c) Educate public regarding dumping debris into the area
d) Increase storm runoff capacity under the bridge at highway

Persons/agencies identified who should work together to achieve these goals

a) NRCS – specifically Ranae Ganske-Cerizo. NRCS likely to do projects improving existing structures.
b) WMSWCD , Robin Knox as consultant, and USACE to work on design of any new watershed structures/systems so that they 'fit' in context of entire West Maui watershed plans
c) Maui Co. Public Works Dept. in terms of maintenance programs needed for any new or improved structures.

Timing for beginning such work was set as Q1, 2009. P. Lindquist will be responsible to initiate planning meetings between relevant parties.

2) D-basin 2-3 overflow system

Goals agreed upon:

a) Return basin to original intent /function
b) Continue surveillance and silt removal on smaller weir above 2-3, known as B7 on aerial map (see attached)

Possible WAYS to achieve these goals

a) MLP work together with Maui Co. Public Works to de-water this desilting basin.

Persons/agencies identified who should work together to achieve these goals

a) MLP representatives including Golf Course Superintent
b) Maui Co. Public Works Dept. representatives

Timing? L. Costa and E. Kukahiko plan to begin silt measurements on 1.14.09.
M. Webster and/or Y. Flower will contact Golf Course mgr.
P. Lindquist will request update in February, 2009.

3) Funding possibilities were named; NBBF to explore all

- NRCS under public law 566
- EPA (DOH) under Clean Water Act 319
- USACE with matching funds from Maui Co. for improvements/modifications
- Private donations (especially to generate matching funds)
- Tri-Island RC&D

4) How NBBF can help is through coming to planning meetings, participating in the Watershed Advisory Group, then helping with public education and outreach. NBBF will follow up on particulars.

MORE DETAILS (for those who want/need them):

1. Overview of situational analysis. Pat Lindquist gave a brief history of the Napili Bay and Beach Foundation, its mission, support received, studies contracted to date, the findings and current focus on storm breakthrough events at south end of the bay as one way to mitigate erosion of the beach and protect benthos from runoff damage.

2. Brief summary/documentation of stream runoff effects at Napili.
Scott Ullrich described storm breakthrough events on stream 4-5 , from desilting basin 4-5, located mauka of One Napili Way. Since 1992, 12 or 14 major breakthroughs have occurred. These have been destructive… causing erosion along streambanks, undermining adjoining property structures, and depositing debris and muddy water into the bay. In 1996, 4 large dumpsters of debris and dead marine life were pulled out of the bay. Severe beach erosion has occurred during these events, causing loss of foundation for beach access stairs, etc. One guest (an engineer) suggested after viewing the weir 4-5, that installation of a standpipe could mitigate the problem of overflows and would be advantageous in that it does not require opening/closing a gate valve. This engineer suggested that such a standpipe would cost ~$10,000. Scott's opinion is that the weir is no longer functioning as designed due to the fact that the gate valve is no longer functioning, may no longer be in place. In early 2004, DLNR took water samples after one breakthrough; no feedback ever received.

3. Update from MLP as to history of desilting basins and the WMSWCD.

Wes Nohara outlined to history and accomplishments of West Maui Soil and Water Conservation District, which was formed in mid 1950's. They work with government agencies, community groups, and private individuals/commercial entities to manage the extensive West Maui watershed district (includes Kahoolawe). Wes indicated that the desilting basins were originally built with public safety as primary concern, and retaining mudflows (large debris) as secondary. The 'fines' were expected to flow to the ocean and be cleaned up by ocean currents. Originally the gate valves were intended to release water AFTER a storm; the gate valves are not present or not operating at this time. (Note added: Ian Swezey indicated that when these two basins were opened, Jack Millar (founder of Napili Kai Resort) took the keys to them.)

Wes and Leonard Costa indicated that drainage from Basin 4-5 under the highway bridge is problematic….water overflows onto the road due to lack of sufficient capacity under the bridge. Wes indicated that bridge reinforcements/improvements are not currently in the 2009 workplan, but they could be. The current focus of watershed planning and work is a large Lahaina project, to prevent flooding there.

Using the aerial photo of the area, Wes outlined the areas of responsibility in and around d-basin 4-5 – north side of stream area is now (makai to mauka) a community garden, organic farm/orchards, organic pineapple fields, and native forest. The south side of the stream bed is most likely MLP responsibility, but clarification of possible DOT involvement is needed **(Y. Flower and N. Aluli).** Ownership/responsibility of the stream from highway to ocean is not clear: State or private lands? **P. Lindquist and R. Sides to ask DLNR or State Representative at meeting on Jan. 21, 2009.** Maintenance of the swale and drainage area makai of basin 4-5 is also responsibility of Maui Co. Public Works.

4. Update from Leonard Costa as to basin maintenance, status/plans.

Leonard indicated that Maui Co. Public Works is responsible for the maintenance of de-silting basins, including 2-3 and 4-5. They typically inspect the outside surfaces of the basin, clearing away Hale Koa, checking dam for cracks.
They also clean silt out of the basins about once a year, usually in the Summer months. Basin 2-3 has been a 'model' dam, though its function as a water hazard on Kapalua golf course has created some differences in objectives for this structure. The County would like to see it emptied, as are concerned that because it is constantly full it may compromise the safety of the structure. MLP values the basin as a water hazard on the 15th hole of their golf course. A question about high presence of nitrogen from golf course water runoff into this basin was asked.... not known if any practices to mitigate this effect are in place.

The main concern with maintenance of basin 4-5 has been the small capacity of culvert under the highway bridge, leading to flooding the highway, then water re-entering the stream makai of this bridge.

5. West Maui Watershed Plans in progress.

Robin Knox is working with WMSWCD to develop comprehensive watershed plans for West Maui, with funding from DOH (Clean Water Act 319). This plan will be submitted to Congress and will take into account nine elements (e.g. water quality, biology affected, physical integrity, fishable/swimmable waters) which must be considered when new projects are proposed. No specific projects will be funded outside this framework, but a small project such as NBBF might propose could roll up under an approved framework. This report will be made to Congress with goal of having funding to do take corrective actions needed in non-point pollution sources.

When asked how this fit with the USACE efforts – response was that they are working hard to make it dovetail. The USACE Watershed studies while focusing on Corps programs (flood risk management, ecosystem restoration – wetland, freshwater and marine, and coastal issues) can identify other programs from other federal, state or local agencies or non-governmental organizations that may be used to address problems within the watershed and can also look at a wide range of objectives. For the Ala Wai Watershed – the Corps is partnering with other agencies to address objectives in flood risk management, ecosystem restoration, water quality, water supply, coastal issues, recreation, infrastructure maintenance and community involvement. For West Maui – Watershed Study – USACE is at the first step in the planning process – conducting a reconnaissance study. The purpose of the reconnaissance study is to identify if there is a federal interest to do a full watershed study in West Maui and if the Corps programs are the best option. The reconnaissance study identifies the problems, opportunities, and challenges in the area in terms of Corps programs – ecosystem restoration, coastal issues, and flood risk management – and identifies the scope of the feasibility study, the cost and schedule for the feasibility study, and who the non-federal sponsors will be (right now DLNR Division of Forestry and Wildlife (DOFAW) is the non-federal sponsors but this could be expanded). USACE studies are cost-shared 50/50 with non-federal sponsor(s). The reconnaissance study will be completed in Sep/Oct 2009 which would allow the feasibility study to begin as early as Oct 2009 pending funding from Congress. However, the West Maui Watershed Study does not meet the guidelines for Congressional economic stimulus packages. Because of the cost of the economic stimulus package, it is unclear what funding projects will receive that are not a part of that package. There could be a lag from the reconnaissance study to the beginning of the feasibility study

which may limit opportunities to have the WMSWCD watershed plans coincide with the USACE/DOFAW West Maui Watershed Study.

John Astilla is working as a conservation specialist with WMSWCD and using special mapping skills, identifying key stakeholders, etc. as part of creating the overall West Maui Watershed Plans.

The summary of decisions made on two issues we identified can be seen at the end of the Executive Summary, above.

Mahalo again to all!
Pat

Nuisance Algal Bloom EcoHAB Workshop
December 10, 2008
Honolulu Zoo, Discovery Center

Consensus - What we know

- Maui has a 20 year history of nuisance algae blooms that have contributed to the degradation of coral reefs, one the island's most important cultural, natural and economic assets.
- The cost of nuisance algae to Maui's economy is estimated in excess of $20 million/year for the Kihei region alone, via noxious odors and reduce aesthetic values of that coast.
- An ecological shift is underway at sites around Maui from productive coral reef to algal beds.
- Land-based pollutants from agricultural and urban lands are transported to nearshore waters where pollutants interfere with the natural dynamics of coral reef communities.
- Treated wastewater disposed via injection into the groundwater then seeps into the ocean at the shoreline of popular Kihei and Kaanapali beaches, and in Kahului Harbor and contributes to the unusual high abundance of algae at these locations.
- Algae store and use nutrients from land-based sources (including treated sewage and fertilizers) for growth, resulting in flourishing blooms that can spread to areas removed from the sources affecting reefs not directly impacted by land-based stressors.
- Nutrient fueled algal blooms are a major cause of decline of coral reef ecosystems.
- The rapid decline coral reef ecosystems represent a crisis requiring immediate action.
- The current level of scientific understanding is sufficient to support immediate management actions.
- Treatment technologies and land management practices exist that reduce land-based nutrient loads.

Recommended actions include:

- Reduce nutrient input from the land
  - Reduce nutrient loading from injection wells
  - Eliminate cesspools, where practicable, especially within coastal zone Special Management Areas
  - Implement and reward improved management practices to further reduce loads from agricultural and landscape sources
  - Reduce erosion and sediment loads from roads, agricultural lands, development, and conservation lands.
- Enhance marine herbivore populations
  - Implement more and larger marine protected areas
  - Implement cost-effective and environmentally sound methods of algal removal from impacted reefs and beaches in bloom areas.

These actions will not only reduce nutrient loads, sediment loads, and algal blooms, but will also reduce amounts of harmful bacteria and toxic chemicals and result in improved coastal water quality.

Additional ideas that were discussed but may not belong in this statement are:

Look at actions such as removing physical barriers limiting water movement such as dredge spoils in Kihei that may be a contributing factor to algal blooms
Investigate innovative solutions such as using algae to further treat wastewater and
Engage social sciences –

- Policy analysis
- Capture historical and traditional ecological knowledge from long time residents
- Community outreach and education so that the community understands the benefits of implementing the recommended actions.

	TITLE	AUTHOR	DATE	VERSION	Categories: Streams	Groundwater	Watersheds	Flooding/Coral Reefs	General
1	Winds, Waves, Tides, and the Resulting Flow Patterns and Fluxes of Water, Sediment, and Coral Larvae off West Maui, Hawaii	Curt D. Storlazzi and Michael E. Field	2008	Harcopy				x	
2	West Maui Watershed Restoration Project, Island of Maui, Hawai'i - Preliminary Restoration Plan (PRP) Tab C	U.S. Army Corp of Engineers	10/8/02	Electronic	x		x	x	
3	Honokōwai Ecosystem Restoration Project, Island of Maui, Hawai'i	U.S. Army Corp of Engineers	11/18/03	Electronic	x		x	x	
4	Honokahua Ecosystem Restoration Project, Island of Maui, Hawai'i Preliminary Restoration Plan (PRP)- Tab C	U.S. Army Corp of Engineers	11/18/03	Electronic	x		x	x	
5	Mokupe'a Ecosystem Restoration Project, Maui, Hawai'i Reconnaissance Stage- Continuing Authorities Program (Section 206) Project Management Plan	U.S. Army Corp of Engineers	11/17/03	Electronic	x		x	x	
6	Hāhākea Ecosystem Restoration Project, Island of Maui, Hawai'i- Preliminary Restoration Plan (PRP)- Tab C	U.S. Army Corp of Engineers	11/17/03	Electronic	x		x	x	
7	The State of Coral Reef Ecosystems of the Main Hawaiian Islands	Waddell, J.E., and A.M. Clarke (eds)	2008	Electronic				x	
8	Recent Hydrologic Conditions, Lahaina District, Maui, Hawaii	U.S. Department of the Interior U.S. Geological Survey Pacific Islands Water Science Center	7/21/08	USGS Website	x	x			
9	Recent hydrologic conditions, Iao and Waihee aquifer areas, Maui, Hawaii	U.S. Department of the Interior U.S. Geological Survey Pacific Islands Water Science Center	7/18/08	USGS Website	x	x			
10	Water Budget for the Lahaina District, Island of Maui, Hawaii	Shade, Patricia J.	1996	USGS Website	x	x			
11	Water Budget for the Iao Area, Island of Maui, Hawaii	Shade, Patricia J.	1997	USGS Website	x	x			
12	The Response of the Iao Aquifer to Ground-Water Development, Rainfall, and Land-Use Practices Between 1940 and 1998, Island of Maui, Hawaii	William Meyer and Todd K. Presley	2001	USGS Website		x			
13	Effects of Agricultural Land-Use Changes Rainfall on Ground-Water Recharge in and West Maui, Hawai'i, 1926–2004	John A. Engott and Thomas T. Vana	2007	USGS Website	x	x			
14	Availability and Distribution of Base Flow in Lower Honokohau Stream, Island of Maui	Richard A. Fontaine	2003	USGS Website	x				

	TITLE	AUTHOR	DATE	VERSION	Categories: Streams	Groundwater	Watersheds	Flooding/Coral Reefs	General
15	Analytical Versus Numerical Estimates of Water-Level Declines Caused by Pumping, and a Case Study of the Iao Aquifer, Maui, Hawaii	Delwyn S. Oki and William Meyer	2001	USGS Website		x			
16	Ground-Water Nutrient Flux to Coastal Waters and Numerical Simulation of Wastewater Injection at Kihei, Maui, Hawaii	Charles D. Hunt, Jr.	2007	USGS Website		x		x	
17	Maui County Water Use and Development Plan, Water Use and Demand, Department of Water Supply Systems	Carl Freedman Haiku Design & Analysis	5/1/07	http://www.co.maui.hi.us/documents/Water/Water%20Resource%20Planning%20Division/Water%20Use%20and%20Demand%20Draft%20May%201%2C%202007.PDF	x	x			
18	Integration of Wireless Sensor Networks into Cyberinfrastructure for Monitoring Hawaiian ''Mountain-to-Sea'' Environments	Michael H. Kido; Carsten W. Mundt; Kevin N. Montgomery; Adam Asquith; David W. Goodale; Kenneth Y. Kaneshiro	7/11/81	Electronic			x	x	
19	Final Environmental Assessment for the West Maui Mountains Watershed Protection Project	West Maui Mountain Watershed Partn	Feb-01				x		x
20	Draft Environmental Assessment Kapunakea Natural Area, West Maui Partnership Program	The Nature Conservancy	10/8/08	Electronic			x		
21	Background History and Review of Historic Preservation Efforts at Moku'ula and Recommendations for the Mokuhinia/Moku'ula Ecosytem Restoration Project	Cultural Srveys Hawai'i	Sep-08	Hardcopy					x
22	Survey of Native Hawaiian Stream Fauna in Nā Wai 'Ehā, West Maui	John Ford, Robert Kinzie III, Tiffany Thair, Ryan Taira SWCA Environmental Consultants	Jun-08	Electronic	x				

	TITLE	AUTHOR	DATE	VERSION	Categories: Streams	Groundwater	Watersheds	Flooding/Coral Reefs	General
23	West Maui Watershed Owners Manual	West Maui Watershed Management Advisory Committee for THE COMMUNITY	Nov-97	Electronic	x	x	x	x	x
24	Volume 1 (Part 1): He Wahi Moʻolele No Kauaʻula A Me Kekāhi Āina O Lahaina I Maui - A Collection of Traditions and Historical Accounts of Kauaʻula and other Lands of Lahaina, Maui	Kēpa Maly & Onaona Maly Kumu Pono Associates LLC	Jun-07	Electronic					x
25	Status of Maui's Coastal Reefs	Hawaiʻi Division of Aquatic Resources & Hawaii Coral Reef Initiative Research Program	no date listed	Electronic				x	
26	Coastal Circulation and Sediment Dynamics along West Maui, Hawaiʻi - PART IV: Measurements of waves, currents, temperature, salinity and turbidity in Honolua Bay, Northwest Maui: 2003-2004	U.S. Department of the Interior U.S. Geological Survey	2005	Electronic					x
27	Cross-shore velocity shear, eddies and heterogeneity in water column properties over fringing coral reefs: West Maui, Hawaiʻi	C.D. Storlazzi, M.A. McManus, J.B. Logan, B.E. McLaughlin U.S. Geological Survey, Pacific Science Center, Santa Cruz &Oceanography Department, University of Hawaii at Mānoa,	12/15/05	Electronic					x
28	West Maui Mountains Watershed Management Plan	West Maui Mountains Watershed Partnership	Jun-99	Electronic			x		
29	Honolua Bay-Mokuleia Bay Special Projects	West Maui Soil & Water Conservation District and Maui Pineapple Company	1999	Electronic				x	
30	319 Projects of West Maui, The Implementation of BMP to Reduce Runoff from Pineapple Fields in the West Maui Watershed	Maui Pineapple Co. LTD Honolua Division	1996?	Electronic				x	

	TITLE	AUTHOR	DATE	VERSION	Categories: Streams	Groundwater	Watersheds	Flooding/Coral Reefs	General
31	West Maui Conservation Projects ASO Log. No. 01-188	West Maui Soil & Water Conservation District and Maui Pineapple Company	2003	Electronic				x	
32	The application of acoustic Doppler current profilers to measure the timing and patterns of coral larval dispersal	C.D. Storlazzi, M.E. Field - U.S. Geological Survey, E.K. Brown - National Park Service	4/12/06	Electronic				x	
33	Recreational Carrying Capacity Evaluation of Honolua Bay	Caterhine A. Courtney, Ph.D. - Tetra Teach EM Inc.	Jul-07	Electronic				x	
34	Summary - land-based activities and nutrients in coastal settings	Chip Hunt, Luri Herzfeld, Robin Knox and Wendy Wiltse	2004?	Electronic				x	
35	Coral Reefs of Maui - status, stressors and suggestions	Florent Angly, Eric Brown, Meghan Dailer, Mike Field, Alan Friedlander, Ann Gibbs, Luri Herzfeld, Celia Smith, Jennifer Smith, Heather Spalding, Russell Sparks, Curt Storlazzi, Mark Vermeij, Darla White, Ivor Williams	2008	Electronic				x	
36	Background: Algal blooms and decline of the reef at Kahekili Maui	Dailer et.al, University of Hawai'i at Mānoa, Department of Botany, St. John Piant Science Laboratory		Electronic				x	
37	A Global Review of the Distribution, Taxonomy, and Impacts of Introduced Seaweeds	Susan L. Williams and Jennifer E. Smith	2007	Electronic				x	
38	Algae-Dominated Reefs	Peter S. Vroom, Kimberley N. Page, Jean C.Kenyon and Russell E. Brainard	2006	Electronic				x	
39	Characterization of a large-scale ephemeral bloom of the green alga *Cladophora sericea* on the coral reefs of West Maui, Hawai'i	Jennifer E. Smith, John W. Runcie, Celia M. Smith	11/4/05	Electronic				x	
40	Impacts of introduced seaweeds	Britta Schaffelke and Chad L. Hewitt	2007	Electronic				x	

	TITLE	AUTHOR	DATE	VERSION	Categories: Streams	Groundwater	Watersheds	Flooding/Coral Reefs	General
41	Mapping anthropogenic nitrogen through point sources in coral reefs using δ15N in macroalgae	Hsing-Juh Lin, Chen-Yi Wu, Shuh-Ji Kao, Wen-Yuan Kao, Pei-Jie Meng	4/16/07	Electronic				x	
42	Executive Summary - Environmental Data Management at NOAA: Archiving, Stewardship, and Access	NOAA	2007	Electronic				x	x
43	Report in Brief - Environmental Data Management at NOAA: Archiving, Stewardship, and Access	NOAA	2007	Electronic				x	x
44	Economic valuation of the coral reefs of Hawai'i	Sam Pintz, Jan Dierking - Cesar Environmental Economics Consulting	Nov-02	Electronic				x	
45	Domesticated Nature: Shaping Landscapes and Ecosystems for Human Welfare	Peter Kareiva, et. al	2007	Electronic				x	
46	Ecological and socioeconomic impacts of invasive alien species in island ecosystems	Jamie Reaser, et. al	5/25/07	Electronic				x	
47	Issues in Ecology - Ecosystem Services: Benefits Supplied to Human Societies by Natural Ecosystems	Ecological Society of America - Yvonne Baskin	1997	Electronic				x	
48	The Importance of Refuges for Reef Fish Replenishment in Hawai'i	Charles Birkeland and Alan M. Friedlander - Hawai'i Audobon Society	2002	Electronic				x	
49	Primer - Coral Reefs	Nancy Knowlton	2008	Electronic				x	
50	Primer - Biological Invasions	Jonathan M. Levine	2008	Electronic				x	
51	Resilience, Robustness, and Marine Ecosystem-based Management	Simon A. Levin and Jane Lubchenco	Jan-08	Electronic				x	
52	Issues in Ecology - The Role of Nearshore Ecosystems as Fish and Shellfish Nurseries	Ecological Society of America - Yvonne Baskin	2003	Electronic				x	
53	Plos Biology - Shifting Baselines, Local Impacts, and Global Change on Coral Reefs	Nancy Knowlton and Jeremy B.C. Jackson	Feb-08	Electronic				x	
54	Issues in Ecology - Water in a Changing World	Ecological Society of America - Yvonne Baskin	2001	Electronic				x	

	TITLE	AUTHOR	DATE	VERSION	*Categories* Streams	Groundwater	Watersheds	Flooding/Coral Reefs	General
55	BioScience - Watersheds and Coral Reefs: Conservation Sciene, Policy, and Implementation	Robert H. Richmond, Teina Rongo, Yimnang Golbuu, Steven Victor, Noah Idechong, Gerry Davis, Willy Kostka, Leinson Neth, Michael Hamnett, and Eric Wolanski	July/Aug-2007	Electronic				x	
56	2008-2012 National Invasive Species Management Plan	The National Invasive Species Council	Aug-08	Electronic				x	
57	NOAA Coral Reef Conservation Program - Roadmap for the Future - A Plan for Developing CRCP Direction Through 2015	NOAA	Jul-08	Electronic				x	
58	Issues in Ecology - Nonpoint Pollution of Surface Waters with Phosphorus and Nitrogen	Ecological Society of America - Yvonne Baskin	1998	Electronic				x	
59	Issues in Ecology - Nutrient Pollution of Coastal Rivers, Bays, and Seas	Ecological Society of America - Yvonne Baskin	2000	Electronic				x	
60	The Importance of Fishery Management of Leaving the Big Ones	Charles Birkeland and Paul K. Dayton	Jul-05	Electronic				x	

APPENDIX C
WEST MAUI WATERSHED RECONNAISSANCE STUDY, INVENTORY OF ON-GOING ACTIVITIES

Army Corp of Engineers – Honolulu District
West Maui Watershed Survey of On-Going and Planned Research
June 2009 – July 2009

Primary Concerns:

- Stormwater management
- Erosion control
- Native habitat protection
- Protecting coastal water quality
- Invasive weeds and biological controls of weeds
- Feral ungulates
- Fire
- Forest pathogens
- Climate change impacts
- Protection of rare species
- Water quality and quantity
- Human impacts such as dirt bikes and illegal trails
- Vandalism of fences
- Outreach and education watershed issues
- Statewide weed biological control effects
- Lack of or non-existent stream flow
- No more wells
- No more channelizing of the land
- Protection and expansion of watershed, conservation, and sensitive lands
- Prevent Maui Land & Pineapple from removing sensitive lands designation from their Kapalua Mauka project
- Periodic storm runoff causing structural, streambed, beach and reef damage at Napili Bay
- Beach erosion - loss of recreational uses at Napili and Kapalua Bays
- Restore and protect chemical and biological integrity of the waters
- Keeping it natural
- Aquifer sustainable yields
- Instream flow standards
- Ground water/surface water quality
- Water use permitting
- Water use and development planning
- Drought planning
- Legacy plantation irrigation systems
- Abandoned wells
- Injections wells
- Sewage
- Nutrients
- Sediments
- Toxicants
- Identify and address sources of land-based pollutants
- Algal blooms
- Coral reefs

Desired Improvements:

- Restore stream flow
- Mountain restoration and threat prevention
- Follow ancient Ahupua'a systems
- Improved health of coral reef and inhabitants
- Beach erosion slowed or reversed
- Improvement of ground and surface water quality
- Guidance for water and land use planning
- Facilitation of alternative water source development
- No further property damage/streambed erosion from storm events
- Enhancement/augmentation of ground and surface water quantities
- Reduce polluted runoff to improve coastal water quality and habitat
- Increased education and awareness
- Decrease invasive algae
- Decrease sediment transport from land to sea
- Improve coastal water quality
- Improve habitat quality for corals
- Reduce marcoalgal blooms in problem areas
- Data sharing

Types of ongoing/planned studies/projects:

1. Lahaina Watershed Project – Flood control system above Lahaina that diverts stormwater through a system of grassed/concrete channels and sediments basins to a stable ocean outlet. (The project extends from Lahainluna Road and goes across watershed to ocean outlet)

Expected Completion:

- Phase 1 construction to begin in Sept 2009

Benefits:

- Protect Lahaina from flooding and storm runoff

Individuals/Groups Involved:

- Maui Soil and Water Conservation
- USDA-Natural Resources Conservation Service designed system and assisted funding

2. Honolua Wao Kele Reforestation – Former pineapple field is being converted back to native forest habitat. (This project is located on the mauka side of highway, above Honolua Bay)

Expected Completion:

- The project covers approximately 30 acres and is scheduled to take three years

Benefits:

- Protect the area from flooding and runoff

Individuals/Groups Involved:

- Maui Soil and Water Conservation
- Pu'u Kukui Watershed Preserve
- DLNR-DOFAW Forestry Stewardship Program

3. Mauna Kahalawai Projects – These are primarily smaller projects that include acquiring aerial imagery for invasive weed analysis for 50,000 acres; fencing feral ungulates; coordinating fire education and drought mitigation programs; preventing the introduction of forest pathogens; protecting rare plant species; working with the Department of Health on water quality monitoring; studying human recreational impacts; and establishing outreach and educational watershed programs. (The projects are located in several locations: Lahaina, Honolua, Ka'anapali, and Waiehu.)

Expected Completion:

- Most issues are ongoing and/or need to be maintained

Benefits:

- Protection of native forest in order to provide habitat for rare species
- Preserve island water resources

Individuals/Groups Involved:

- West Maui Mountains Watershed Partnership
- State Department of Health; John Verelle; Jonathan Kurtz; John Russell

4. Honolua Water Quality Monitoring – Obtain a base number for stream flow to set the instream flow standard. The monitoring is headed by water specialist, Robin Knox. In addition, Liz Foote and her associates from Project SEA-Link partake in an educational table at Honolua Bay during the summer months. (The data collection is being done in the Honolua area, particularly Honolua Stream and its affect on Honolua Bay)

Expected Completion:

- Ongoing study

Benefits:

- Determine base number for stream flow in order to set the in-stream flow standard
- Finding a possible explanation and preventive measures for the dying reefs in Honolua Bay

Individuals/Groups Involved:

- Maui Unite!
- Robin Knox, Water Quality Consulting
- Liz Foote, CORAL & Project SEA-Link

5. Napili Streams and Basins – Return basins 4-5 and 2-3 to full functionality; improve storm runoff capacity under bridge on Lower Honoa Pi'ilani Road; restore streambed makai of bridge to beach dune area; create wetland watershed areas on Napili Stream 4-5; restore beaches and dunes. (These projects are located in the northwestern portion of the West Maui Watershed.)

Projects and Expected Completion:

Requested Maui Co. increase surveillance and maintenance of basis 4-5
- Completed first round of improved maintenance - Spring 2009

Future Projects
- Best case scenario for restoration of Napili streambed and dunes - Summer 2010
- Beach dune restoration at Kapalua pending design and funding - 2011
- Beach nourishment pending funding and design - 2012

WMSWCD accepted work plan for culvert/bridge project
-Improvements pending funding and engineering studies

Three scientific studies planned, funded, and completed to date:
a) initial sand mapping
- Completed in 2007 and 2008
b) offshore and beach sand quality analysis (SEI)
- Completed in 2007 and 2008
c) benthic habitat analysis (AECOS)
- Completed in 2007 and 2008

Results pending on grant proposal to NOAA/TNC

Benefits:

- Decreased storm overflow impacts
- Gains or no losses on benthic health in Napili Bay
- No losses to benthic habitat at Kapalua Bay
- Increased recreational value at both beaches due to sustainable beach replenishment

Individuals/Groups involved:

- Napili Bay and Beach Foundation
- Kapalua Resort Association
- Maui Land and Pineapple
- West Maui Soil and Water Conservation District
- Maui Co Department of Public Works
- Zoe Norcross
- Dolan Eversole
- Sam Lemmo (DLNR)
- Dr Charles Fletcher (UH)
- Emily Fielding, Nature Conservancy Maui Office
- Robin Knox, WQ consultant

- Napili Hui members: Napili Kai, The Mauian, Hale Napili, Napili Sunset, Napili Bay Resort, Napili Surf, Napili Shores Resort

6. Plant Restoration Projects – Reintroducing native plants along the cement walk ways. (These projects are located at the trailhead of the Ohai Loop Trail and Overlook in Poelua, Kahakuloa, Maui and at the Mokuleia Stairs in Honolua-Mokuleia Marine Life Conservation District, Lahaina, Maui.)

Expected Completion:

- These projects are ongoing and will require continual maintenance and replacement of plants and compost materials

Benefits:

- Create educational opportunities
- Benefits to the native ecosystem

Individuals/Groups Involved:

- Na Ala Hele
- Maui Land and Pineapple (Owner of Mokuleia Stairs)

7. Water Resource Management Projects – All of the project presented are to support the Water Resource Management mission, which is to protect and manage water resources, obtain reasonable and beneficial uses, and ensure water rights. Hydrologic data is required to determine ground and surface water availability. In addition, monitoring is needed to guarantee regulatory programs are working and to identify areas where more regulation is necessary.

Projects and Expected Completion:

Planned Rehabilitation of Deep Monitor & Future Well Logging (Lahaina & Waihee)
Ongoing Quarterly Deep Monitor Well Logging (Ioa & Waiehu)
Statewide Rainfall Atlas Update (Completion Date 6/30/10)
Statewide Stream Channel Alternative Survey (Completion Date 1/31/10)
Statewide Stream Division Works Verification (Completion Date 1/31/10)
Maui County Drought Mitigation Plan Update (Completion Date 7/31/10)
Honokohau & Honolua Instream Flow Standard Amendment (Completion Date 2010)
Na Wai Eha Instream Flow Standard Assessments (Ongoing contested case hearing)
Statewide Aquifer Hydrologic Unit Map (Completed)
Statewide Aquifer Sustainable Yield Map (Completed)
Statewide Depth to Water Table Map (Completed)
Statewide Surface Water Hydrologic Unit Map (Completed)
Statewide Stream Diversion Works Map (Completed)
Handbook for Stormwater Reclamation and Reuse BMP's in Hawaii (Completed)
Streamflow and Stream-Macrofauna Characteristics Study, Central Maui (Completion Date 12/2009)

Benefits:

Provide guidance on water development and use to facilitate long-range planning

Individuals/Groups Involved:

- US Geological Survey
- US Bureau of Reclamation
- US Department of Agricultural
- US Fish and Wildlife
- University of Hawaii
- Department of Land and Natural Resources
- Office of Hawaiian Affairs
- Maui Civil Defense
- Maui Department of Water Supply
- Maui Public Works
- Maui Office of Economic Development
- Wailuku Water Company

- State Department of Agriculture
- Earthjustice

8. Land-based Source of Pollution (LBP) Threats to Coral Reefs and Climate Change and Marine Disease Local Action Strategies (LAS) Project – The purpose of the project is to assess the correlation between coral and fish disease with land-based pollution loads in three priority watersheds. In the study, "belt transects for colony counts and coral disease will be conducted at several shallow water sites." (The study is primarily in Honolua Bay; however, it includes Honolua, Mokuleia, Napili, Kahekili, and possibly Olowalu.)

Expected Completion:

- June 30, 2010

Individuals/Groups Involved:

- Hawaii's Coral Program, University of Hawaii

9. Atlas of Hawaiian Stream Species Project – In the process of developing an information resource that will have the latest distribution and habitat use for native and introduced stream animals. The resource would provide useful information, especially for stream restoration projects. In addition, there will be maps of distribution of stream animals. (The project is being conducted statewide and includes all watersheds.)

Expected Completion:

- The majority of the data analysis is complete and should be available in digital form in the ending part of 2009.

Benefits:

- Compiled information about native and introduced stream animals' habitat suitability, which will be useful in stream restoration projects.

Individuals/Groups Involved:

- Glenn Higashi, DAR
- Bob Nishimoto, DAR
- Skippy Hau, DAR
- Eko Lapp, DAR
- Darrell Kuamoo, DAR
- Dan Polhemus, DAR
- Mike Fitzsimons, PAEC
- Bill Devick, PAEC

10. Kahana Watershed Monitoring – Since the beginning of 2009, DOH has been sampling coastal waters from the shoreline to 30 meters depth. The purpose is to assess the water quality conditions and determine if it meets with the state water quality standards. (The location is the coastal waters adjacent to Kahana watershed.)

Expected Completion:

- Late 2010

Benefits:

- Establish water quality condition of coastal waters adjacent to Kahana
- Determine viability of probabilistic sampling
- Determine changes in water quality after management practice is implemented.

Individuals/Groups Involved:

Watson Okubo, DOH-Monitoring Section

11. EPA/State Projects – (The projects will be primarily located in Lahaina.)

USGS tracer study of Lahaina Injection Well plume
- Indentifies wastewater tracers and the location of groundwater seeps in the ocean
Revise watershed plan for Lahaina to Honolua area
- Summarize past BMP's and identify future needs of reducing erosion and nutrient loads
Issued draft Underground Injection Control Permit for Lahaina Wastewater Reclamation Facility
- New controls require Lahaina's watershed injection wells to reduce nitrogen and pathogen loads

Expected Completion:

- Final permit expected at the end of 2009

Individuals/Groups Involved:

- Environmental Protection Agency
- Hawaii State Department of Health

12. Volunteer Cleanup/Reforestation Programs – Lipoa Point and Puu Kukui watershed

Expected Completion:

Ongoing

Individuals/Groups Involved:

- Puu Kukui

13. County's General Plan for West Maui – The proposed plan would create thousands of new housing units in West Maui. The county planners recommended designating 1,535 acres, which would produce around 5,000 new homes. According to county housing forecasts, by the year 2030, the demand for housing units could reach 15,000. (There are several proposed construction sites: Kaanapali, Lahaina town, Kahoma, Mahinahina, and Olowalu.)

Expected Completion:

- Still in the planning stage

Benefits:

- Create homes for growing population
- Proximity to jobs

Individuals/Groups Involved:

- The Maui Planning Commission

14. Statewide Channel Condition Inventory – GIS layers of channel conditions

Expected Completion:

- January 2010

15. Mayor's Task Force on Wastewater Wells and Nitrogen – The Mayor of Maui is convening a task force to look at nitrogen issues associated with County owned wastewater wells Maui wide. The objective is to provide recommendations to Maui County Department of Environmental Management ways to adjust treatment of wastewater and utilize treated water to reduce nitrogen inputs into the ocean.

Expected Completion:

- December 2010

Benefits:

- Establish recommendations to reduce nitrogen and improve water quality associated with County owned wells

Individuals/Groups Involved:

Kuhea Parcuelles, Environmental Coordinator, Office of the Mayor, Maui County

16. Hawaii Marine Ecoregional Assessment (MERA). The Nature Conservancy has conducted a Marine Ecoregional Assessment for the Main Hawaiian Islands The MERA with stakeholders to provide a comprehensive set of data and decision support tools as a foundation for partners to develop better ecosystem-based management; identify a portfolio of priority sites for natural resource management, and a full range of conservation strategies, that are evaluated based on ecological, social, economic and political needs of individual places; help develop regional strategies for ensuring better integration of management activities across entire ecosystems; and guide a unique set of region-wide, place-based conservation actions.

Expected Completion:
- November 2010

Benefits:
- Provides identification of priority marine habitats for conservation. Screening criteria can be weighted differently to identify other priorities – i.e. restoration over conservation.

Individuals/Groups Involved:
- John Park, The Nature Conservancy

16. State of Hawaii Water Quality Assessment Checklist for Maui.

Expected Completion:

Benefits:

Individuals/Groups Involved:
- Robin Knox, Water Quality Consultant

Other Individual/Groups with Potential Studies:

Ed Lindsey, Maui Cultural Lands	Gordon Cockett
Kuleana O' Kahalawai-Kapali Keahi	George Lavenson
Kekai Keahi	AECOS for SEI, Study 1112 at Kapalua Bay 2006
Lehua I'i	AECOS Incorporated, Study 1181 at Napili Bay 2008
Daniel Palikikio	HCRI (UH) funding algal bloom research at Kahekili
Yolanda Dizon	Hawaii's coral program at DAR
Ke'eaumoku Kapu	

Emily Fielding: TNC - Marine Assessment for the Main Hawaiian Islands 2009

Additional Comments:

-Make watershed accessible for educational purposes to the general public

-Showing the beauty and importance of the watershed will cause people to be proactive in protecting it

Interested Parties Surveyed:

Astilla	John	Conservation Specialist	Maui Soil & Water Conservation Districts
Brosius	Chris	Watershed Coordinator	West Maui Mountains Watershed Partnership
Cochran	Elle	President	Maui Unite!
Lindquist	Pat	President	Napili Bay & Beach Foundation
Nohara	Torrie	Trails & Access PM	DLNR-DOFAW, Na Ala Hele
Ohye	Lenore	Planning Branch Chief	Commission on Water Resource Management
Oram	Risa	Coordinator	Hawaii's Coral Program
Parham	James	Research Hydrologist & Aquatic Biologist	Bishop Museum
Potts	Les		
Slay	Hudson	Environmental Planner	DOH-Polluted Runoff Control Program

APPENDIX D
ESA SPECIES LISTS AND FISH AND WILDLIFE COORDINATION ACT CORRESPONDENCE FOR THE WEST MAUI WATERSHED RECONNAISSANCE STUDY

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122, Box 50088
Honolulu, Hawaii 96850

PR-C

In Reply Refer To:
2009-SL-0386

SEP 10 2009

Mr. Anthony J. Paresa
Deputy District Engineer
Programs and Project Management
Department of the Army
Army Corps of Engineers
Fort Shafter, Hawaii 96858

Subject: Species List for West Maui Watershed Restoration Plan, Maui

Dear Mr. Paresa:

This letter acknowledges the U.S. Fish and Wildlife Service's June 29, 2009, receipt of your June 25, 2009, letter requesting a list of threatened and endangered species and critical habitat that may be affected by implementation of the West Maui Watershed Restoration Plan. On August 27, 2009, we discussed the project via telephone with Project Manager, Ms. Cindy Barger to confirm you would like a list of all species and critical habitat occurring in West Maui in order to facilitate project planning. Ms. Barger confirmed receipt of our response by September 10, 2009, would meet your project planning schedule.

Based on the information you provided and pertinent information in our files the 48 listed and 17 candidate species listed in Table 1 have been observed in the vicinity of the proposed project. The 62 critical habitat units in Table 2 occur entirely within the West Maui area.

Table 1. Listed and Candidate Species in West Maui

Scientific Name	Common Name	Status
Acaena exigua	liliwai	Endangered
Alectryon macrococcus var. macrococcus	ala alahua, mahoe	Endangered
Anas wyvilliana	Hawaiian duck	Endangered
Bidens campylotheca subsp. pentamera	ko oko olau, koko olau	Candidate
Bidens conjuncta	ko oko olau, koko olau	Candidate
Bidens micrantha subsp. kalealaha	ko oko olau, koko olau	Endangered
Bonamia menziesii	no common name	Endangered
Calamagrostis expansa	no common name	Candidate
Calamagrostis hillebrandii	no common name	Candidate
Cenchrus agrimonioides var. agrimonioides	kamanomano	Endangered
Centaurium sebaeoides	awiwi	Endangered

Scientific Name	Common Name	Status
Cyanea glabra	oha, haha, oha wai	Endangered
Cyanea grimesiana subsp. grimesiana	oha, haha, oha wai	Endangered
Cyanea kunthiana	oha, haha, oha wai	Candidate
Cyanea lobata	oha, haha, oha wai	Endangered
Cyanea lobata subsp. baldwinii	haha	Endangered
Cyanea obtusa	oha, haha, oha wai	Candidate
Cyrtandra filipes	ha iwale, kanawao ke oke o	Candidate
Cyrtandra munroi	ha iwale, kanawao ke oke o	Endangered
Cyrtandra oxybapha	ha iwale	Candidate
Dermochelys coriacea	leatherback sea turtle	Endangered
Diellia erecta	no common name	Endangered
Dubautia plantaginea subsp. humilis	na ena e	Endangered
Eretmochelys imbricata	hawksbill sea turtle	Endangered
Fulica alai	Hawaiian coot, alae ke oke o	Endangered
Gallinula chloropus sandvicensis	Hawaiian common moorhen	Endangered
Gardenia remyi	nanu, nau	Candidate
Geranium hillebrandii	hinahina, nohoanu	Candidate
Gouania hillebrandii	no common name	Endangered
Hedyotis coriacea	no common name	Endangered
Hedyotis mannii	no common name	Endangered
Hesperomannia arborescens	no common name	Endangered
Hesperomannia arbuscula	no common name	Endangered
Hibiscus brackenridgei subsp. brackenridgei	Native yellow hibiscus, mao hau hele	Endangered
Himantopus mexicanus knudseni	Hawaiian stilt, aeo	Endangered
Huperzia mannii	no common name	Endangered
Joinvillea ascendens subsp. ascendens	ohe	Candidate
Lasiurus cinereus semotus	Hawaiian hoary bat, opeapea	Endangered
Lysimachia lydgatei	no common name	Endangered
Manduca blackburni	Blackburn's sphinx moth	Endangered
Megalagrion pacificum	Pacific megalagrion damselfly	Endangered
Megalagrion xanthomelas	orange-black megalagrion damselfly	Endangered
Myrsine vaccinioides	kolea	Candidate
Nothocestrum latifolium	aiea	Candidate
Panicum fauriei var. carteri	no common name	Endangered
Plantago princeps	laukahi kuahiwi	Endangered
Plantago princeps var. laxiflora	ale	Endangered
Platanthera holochila	no common name	Endangered
Pritchardia munroi	loulu	Endangered
Pseudognaphalium sandwicensium var. molokaiense	ena ena	Candidate
Pteris lydgatei	no common name	Endangered
Pterodroma sandwichensis	Hawaiian dark-rumped petrel, uau	Endangered
Puffinus auricularis newelli	Newell's shearwater	Threatened

Scientific Name	Common Name	Status
Sanicula purpurea	no common name	Endangered
Santalum freycinetianum var. lanaiense	iliahi	Endangered
Scaevola coriacea	naupaka	Endangered
Schiedea pubescens	no common name	Candidate
Schiedea salicaria	no common name	Candidate
Sesbania tomentosa	ohai	Endangered
Solanum nelsonii	no common name	Candidate
Spermolepis hawaiiensis	no common name	Endangered
Tetramolopium capillare	no common name	Endangered
Tetramolopium capillare	no common name	Endangered
Tetramolopium remyi	no common name	Endangered

Table 2. Critical Habitat Units in West Maui.

Critical Habitat Unit Name

01 - *Centaurium sebaeoides* – a
01 - *Sesbania tomentosa* – a
02 - *Brighamia rockii* – a
02 - *Brighamia rockii* – b
02 - *Centaurium sebaeoides* – b
16 - *Hibiscus brackenridgei* – a
17 - *Alectryon macrococcus* – d
17 - *Cenchrus agrimonioides* - b
17 - *Clermontia oblongifolia ssp. mauiensis* – a
17 - *Colubrina oppositifolia* – b
17 - *Ctenitis squamigera* – a
17 - *Ctenitis squamigera* – b
17 - *Ctenitis squamigera* – c
17 - *Cyanea glabra* – d
17 - *Cyanea glabra* – f
17 - *Cyanea glabra* – g
17 - *Cyanea grimesiana* ssp. *grimesiana* – a
17 - *Cyanea lobata* – a
17 - *Cyanea lobata* - b

17 - *Cyrtandra munroi* – a
17 - *Cyrtandra munroi* – b
17 - *Cyrtandra munroi* – c
17 - *Diellia erecta* – c
17 - *Diellia erecta* – d
17 - *Diplazium molokaiense* – c
17 - *Dubautia plantaginea* ssp. *humilis* – a
17 - *Dubautia plantaginea* ssp. *humilis* – b
17 - *Dubautia plantaginea* ssp. *humilis* – c
17 - *Gouania vitifolia* – a
17 - *Hedyotis coriacea* – b
17 - *Hedyotis mannii* – a

Critical Habitat Unit Name

17 - *Hesperomannia arbuscula* – a
17 - *Hesperomannia arbuscula* – b
17 - *Hibiscus brackenridgei* – b
17 - *Isodendrion pyrifolium* – a
17 - *Lysimachia lydgatei* – a
17 - *Lysimachia lydgatei* – b
17 - *Lysimachia lydgatei* – c
17 - *Lysimachia lydgatei* – d
17 - *Lysimachia lydgatei* – e
17 - *Neraudia sericea* – b
17 - *Peucedanum sandwicense* – b
17 - *Phlegmariurus mannii* – d
17 - *Phlegmariurus mannii* – e
17 - *Plantago princeps* – b
17 - *Platanthera holochila* – b
17 - *Platanthera holochila* – c
17 - *Pteris lidgatei* – a
17 - *Pteris lidgatei* – b
17 - *Remya mauiensis* – a
17 - *Remya mauiensis* – b
17 - *Remya mauiensis* – c
17 - *Sanicula purpurea* – a
17 - *Sanicula purpurea* – b
17 - *Sanicula purpurea* – c
17 - *Spermolepis hawaiiensis* – b
17 - *Tetramolopium capillare* – a
17 - *Tetramolopium remyi* – a
18 - *Alectryon macrococcus* – f
18 - *Colubrina oppositifolia* – c
18 - *Ctenitis squamigera* – d
18 - *Remya mauiensis* - d

Thank you for your ongoing efforts to conserve listed species. If you have questions or would like additional information, please contact Consultation and Technical Assistance Program Fish and Wildlife Biologist, Dawn Greenlee (phone: 808-792-9400; fax: 808-792-9581).

Sincerely,

for Loyal Mehrhoff
Field Supervisor

Barger, Cindy S POH

From: Lance Smith [Lance.Smith@noaa.gov]
Sent: Monday, June 29, 2009 2:07 PM
To: Barger, Cindy S POH
Subject: species list

Hi Cindy - we received a request from Anthony Paresa with you as the contact requesting a species list for the West Maui Watershed Development Plan. Our Hawaii species list is at

http://www.fpir.noaa.gov/Library/PRD/ESA%20Consultation/Hawaii%20Species%20List%20Apr%202008.pdf

There is no critical habitat for ESA-listed marine species in the main Hawaiian Islands. However, you may be interested to know that we recently announced our decision to revise monk seal critical habitat, so the forthcoming proposed rule could include portions of the main islands. For more info, see

http://www.fpir.noaa.gov/PRD/prd_critical_habitat.html

Just let me know if you have any questions, thanks, ls

--
Lance Smith, PhD
Endangered Species Team Leader
Protected Resources Division
NOAA Fisheries Pacific Islands Regional Office
1601 Kapiʻolani Blvd., Suite 1110
Honolulu, Hawaiʻi 96814
TEL (808) 944-2258
lance.smith@noaa.gov

MARINE PROTECTED SPECIES of the HAWAIIAN ISLANDS

National Marine Fisheries Service, Pacific Islands Regional Office

MARINE MAMMALS

All marine mammals are protected under the Marine Mammal Protection Act. Those identified under the ESA Listing are also protected under the Endangered Species Act.

Common Name	Scientific Name	ESA Listing
Blue Whale	*Balaenoptera musculus*	Endangered
Blainville's Beaked Whale	*Mesoplodon densirostris*	
Bryde's Whale	*Balaenoptera edeni*	
Cuvier's Beaked Whale	*Ziphius cavirostris*	
Dwarf Sperm Whale	*Kogia simus*	
False Killer Whale	*Pseudorca crassidens*	
Fin Whale	*Balaenoptera physalus*	Endangered
Humpback Whale	*Megaptera novaeangliae*	Endangered
Killer Whale	*Orcinus orca*	
Longman's Beaked Whale	*Indopacetus pacificus*	
Melon-headed Whale	*Peponocephala electra*	
Minke Whale	*Balaenoptera acutorostrata*	
North Pacific Right Whale	*Eubalaena japonica*	Endangered
Pygmy Killer Whale	*Feresa attenuata*	
Pygmy Sperm Whale	*Kogia breviceps*	
Sei Whale	*Balaenoptera borealis*	Endangered
Short-finned Pilot Whale	*Globicephala macrorhynchus*	
Sperm Whale	*Physeter macrocephalus*	Endangered
Bottlenose Dolphin	*Tursiops truncatus*	
Common Dolphin	*Delphinus delphis*	
Fraser's Dolphin	*Lagenodelphis hosei*	
Pantropical Spotted Dolphin	*Stenella attenuata*	
Risso's Dolphin	*Grampus griseus*	
Rough-toothed Dolphin	*Steno bredanensis*	
Spinner Dolphin	*Stenella longirostris*	
Striped Dolphin	*Stenella coeruleoalba*	
Hawaiian Monk Seal	*Monachus schauinslandi*	Endangered
Northern Elephant Seal	*Mirounga angustirostris*	

SEA TURTLES

All sea turtles are protected under the Endangered Species Act.

Common Name	Scientific Name	ESA Listing
Green Turtle	*Chelonia mydas*	Threatened
Hawksbill Turtle	*Eretmochelys imbricata*	Endangered
Leatherback Turtle	*Dermochelys coriacea*	Endangered
Loggerhead Turtle	*Caretta caretta*	Threatened
Olive Ridley Turtle	*Lepidochelys olivacea*	Threatened

Last updated April 2008

Pacific Islands Regional Office
NOAA National Marine Fisheries Service

ABOUT Protected Resources

Sea Turtles
Whales and Dolphins
Hawaiian Monk Seals
Critical Habitat
Species of Concern
Laws/Policies/Guidelines
ESA Consultation
Marine Mammal Response
Protected Resources Outreach and Education
Volunteer Opportunities
Staff Listing

To report monk seal sightings:
220-7802 (Oahu) or email

To report stranded / entangled marine mammals:
1-888-256-9840

To report stranded / entangled sea turtles:
983-5730 (Oahu)

Critical Habitat

What is Critical Habitat?

Critical habitat is a specific area needed by an endangered or threatened animal or plant in order for it to survive, not go extinct and recover to a healthy population.

This area:

- may require special management, like protection from development;
- may include an area that the species is not currently using, but will need to use as its population grows and recovers;
- is only officially designated after a public comment period.

What Critical Habitat is NOT:

Critical habitat is not a Marine Protected Area (MPA), Marine Life Conservation District (MLCD), Shoreline Fisheries Management Area (SFMA), sanctuary, reserve, refuge, park or wilderness area.

Hawaiian Monk Seal Critical Habitat

On July 9th, 2008, the NOAA Fisheries Service (also known as the National Marine Fisheries Service) received a petition by three conservation groups to review and establish revised critical habitat for the Hawaiian monk seal. Critical habitat is an area that is designated because it is considered essential for the conservation of a species. These areas have primary constituent elements or physical and biological elements that are necessary for the species to survive and recover to a healthy population. In turn, the Endangered Species Act (ESA) prohibits any changes or "destruction or adverse modification" to these areas (as a result of to federally funded or authorized activities) that will diminish its value as important habitat for the survival and recovery of the species.

Photo: Jessica Aschettino

Critical habitat for the Hawaiian monk seal was first established in the Northwestern Hawaiian Islands in 1986. This habitat included "all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 10 fathoms around Kure Atoll, Midway Islands (except Sand Island and its harbor), Pearl and Hermes Reef, Lisianski Island, Laysan Island, Gardner Pinnacles, French Frigate Shoals, Necker Island, and Nihoa Island" (51 FR 16047, April 30, 1986). In 1988, critical habitat for the Hawaiian monk seal was extended to include "all beach areas, sand spits and islets, including all beach vegetation to its deepest extent inland, lagoon waters out to a depth of 20 fathoms around the following: Kure Atoll; Midway Islands, except Sand Island and its harbor; Pearl and Hermes Reef; Lisianski Island; Laysan Island; Maro Reef; Gardner Pinnacles; French Frigate Shoals; Necker Island; and Nihoa Island"(53 FR 18988, May 26, 1988; 50 CFR 226.201). The recent petition requests this current designation be "expanded to include key beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 200 meters around the main Hawaiian Islands, and to extend critical habitat designation in the Northwestern Hawaiian Islands to Sand Island and ocean waters out to a depth of 500 meters."

Current Information on the Hawaiian Monk Seal Critical Habitat Petition Process

Posted 06.12.09

On October 3rd, 2008, NOAA Fisheries published a "90-day finding" in the Federal Register announcing that the monk seal critical habitat petition presented enough information to consider a revision to designated critical

habitat. On June 12th, 2009, NOAA Fisheries published a "12-month finding" in the Federal Register announcing our intention to revise monk seal critical habitat. The next step in this process is the publication of a proposed rule describing the revision of monk seal critical habitat, which will be followed by a public comment period and public meetings.

- Hawaiian Monk Seal 90-day Finding, Federal Register / Vol. 73, No. 193 / Friday, October 3, 2008 (Oct 2008, pdf 55kB)
- Hawaiian Monk Seal 12-month Finding, Federal Register / Vol.74, No.112 / Friday June 12, 2009 (Jun 2009, pdf 75kB)

How may critical habitat affect YOU?

Public Access

Q: Will I still be able to recreate in beach areas that have been designated as critical habitat for the Hawaiian monk seal?
A: Yes. A critical habitat designation will not impact access to, and recreation on, the public beaches of Hawaii. Critical habitat designation DOES NOT RESTRICT PUBLIC ACCESS. Areas designated as critical habitat are not reserves, refuges, Marine Protected Areas (MPAs) or parks.

Fishing

Q: Will I still be able to fish in an area that has been designated as critical habitat for the Hawaiian monk seal?
A: Yes. A critical habitat designation only affects Federal activities (those that are federally authorized, funded, or carried out). This means that any fishing within State waters (3 miles or less from shore) will not be affected by critical habitat designation.

Q: Will I still be able to fish in Federal waters (more than 3 miles from shore)?
A: Yes. Even though fishing in Federal waters is Federally-managed, analysis conducted during previous management actions determined that such fishing has little effect on potential monk seal critical habitat.

Private Development

Q: Can private development still occur in an area that has been designated as critical habitat?
A: Yes. The only developments that may be affected are those activities requiring Federal funding or authorization, such as filling of a wetland or repair of a seawall. This precaution is in place to ensure that Federal agencies do not destroy or adversely modify critical habitat through development or other activities.

What activities are *allowed* and *restricted* in a critical habitat area?

Allowed Activities:

Non-Federal activities on private land, such as:

- **Construction**
- **Farming**
- **Logging**
- **ATV use**
- **Hunting**

Non-Federal activities on non-Federal public land or water, such as:

- **Beach recreation**
- **Walking the dog**
- **Hunting**
- **Ocean recreation in State waters**
- **Shoreline and lay gill net fishing in State waters**
- **Boating and jet-skiing in State waters**
- **Operation of tour vessels in State Waters**

Possibly Restricted Activities:

Federally authorized, funded or carried out activities, such as:

- **Federally-permitted fisheries**
- **Beach replenishment**
- **Coastal development**
- **Shoreline protection**
- **Channel/harbor dredging**
- **Military activities on or near**

shorelines

What is the process to decide whether or not a federal action will be restricted in a designated critical habitat area?

Section 7 of the Endangered Species Act (ESA) requires Federal agencies to ensure that actions they authorize, fund, or carry out do not jeopardize the existence of any species listed under the ESA, or destroy or adversely modify designated critical habitat of any listed species. Thus, Section 7 requires consultation by the Federal 'action agency' (the agency authorizing, funding, or carrying out the action) with the appropriate regulatory agency, either the NOAA Fisheries Service for marine species, or the U.S. Fish & Wildlife Service (USFWS) for terrestrial and freshwater species. Please see the ESA Consultation page to learn more about this process.

What is the next step in the process of revising monk seal critical habitat?

The next step in this process is the publication of a proposed rule describing the revision of monk seal critical habitat, which will be followed by a public comment period and public meetings.

Points to Remember...

- **Critical habitat does not set up a refuge or preserve.**
- **Critical habitat does not affect non-Federal actions.**
- **Effects of Federal actions on critical habitat are analyzed in Section 7 consultation.**

Critical Habitat Definitions:

Critical habitat:

- Specific areas within the geographical area occupied by the species, at the time it is listed, on which are found those physical or biological features (primary constituent elements) that (a) are essential to the conservation of the species, and (b) may require special management considerations or protection;
- Specific areas outside the geographical area occupied by the species at the time of listing that are essential for the conservation of the species (ESA Sec 3(5)(A); 50 CFR Sec 424.02).

Destruction or adverse modification:

A direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species, including but not limited to alterations adversely modifying any of the primary constituent elements (50 CFR Sec 402.02).

Federal action / Federal activity:

Any action carried out, funded, permitted, or authorized by a Federal agency.

Primary constituent elements:

Physical and biological features essential to the conservation of the species, including but not limited to:

1. Space for individual and population growth, and for normal behavior;
2. Food, water, air, light, minerals, or other nutritional or physiological requirements;
3. Cover or shelter;
4. Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal;and generally
5. Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species (ESA Sec 3; 50 CFR 424.12).

Unoccupied critical habitat:

Not permanently or seasonally occupied, but necessary to either stabilize the population or assure eventual recovery (U.S. Fish & Wildlife Service and National Marine Fisheries Service Endangered Species Consultation Handbook).

More Information

- Hawaiian Monk Seal 12-Month Finding, Ferderal Register/ Vol. 74, No. 112 / Friday, June 12, 2009 (Jun 2009, pdf 75kB)
- Hawaiian Monk Seal 90-day Finding, Federal Register/ Vol. 73, No. 193 / Friday, October 3, 2008 (Oct 2008, pdf 55kB)
- Hawaiian Monk Seal Critical Habitat Petition, (July 2008, pdf 757 kB)

- Hawaiian Monk Seal Critical Habitat, 1986, Federal Register / Vol. 51, No. 83 / Wednesday April 30, 1986 (51 FR 16047), (April 1986, pdf 695 kB)
- Hawaiian Monk Seal Critical Habitat, 1988, Federal Register / Vol. 53, No. 102 / Thursday May 26, 1988 (53 FR 18988), (May 1988, pdf 403kB)
- U.S. Fish & Wildlife Service and National Marine Fisheries Service Endangered Species Consultation Handbook

Fact Sheets and Frequently Asked Questions (FAQs)

- FAQ: Hawaiian Monk Seal: Relocations to the Main Hawaiian Islands, (Oct 2008, pdf 1004kB)

DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

June 25, 2009

Programs and Project Management Division
Civil and Public Works Branch

Mr. Patrick Leonard
Field Supervisor
U.S. Fish and Wildlife Service
Pacific Islands Ecoregion
300 Ala Moana Boulevard, Room 3-122
Box 5008
Honolulu, Hawaii 96850

Dear Mr. Leonard:

The U.S. Army Corps of Engineers, Honolulu District (USACE) in partnership with the State of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife (DoFAW) is developing the West Maui Watershed Restoration Project. The objective of the project is to address water resources problems, including restoring coral reefs, in a watershed context. The West Maui watershed includes the entire area associated with the West Maui Mountains (approximately 90,000 acres) on the island of Maui. It encompasses all of the West Maui drainage areas from the north at Honokohau to the south at Maalaea, and from the east at Wailuku to the west at Lahaina (see figure 1).

The project is in the reconnaissance phase. The purpose of this phase is to establish if there is federal interest in addressing the problems, and to scope out the extent and cost of the feasibility study and EIS. Potential areas that USACE may provide assistance are ecosystem restoration, flood risk management, coastal storm protection, beach stabilization, water supply, water quality, and drainage/wastewater infrastructure maintenance and support.

To ensure that we fully capture the likely cost of the USFWS involvement in the study in accordance with the Fish and Wildlife Coordination Act (FWCA) of 1934, as amended, we request that you provide us with a Planning Aid Letter (PAL) in accordance with the FWCA. We would like for you to include in your PAL a rough order of magnitude cost and conceptual scope of work for your involvement with the following tasks: assistance with the collection of freshwater and marine baseline condition information, participation on the Technical Advisory Teams and Stakeholder meetings in the review of baseline information, review of ecosystem restoration objectives, metrics and valuation methodology, review of proposed alternatives, review of any mitigation requirements that may be associated with other watershed objectives such as flood risk management, coastal protection or water supply, and any research or data gaps that USFWS will need to collect or conduct in order to fully meet your requirements of the FWCA. The earliest we anticipate receiving funds to move forward on the feasibility study is after February 2010.

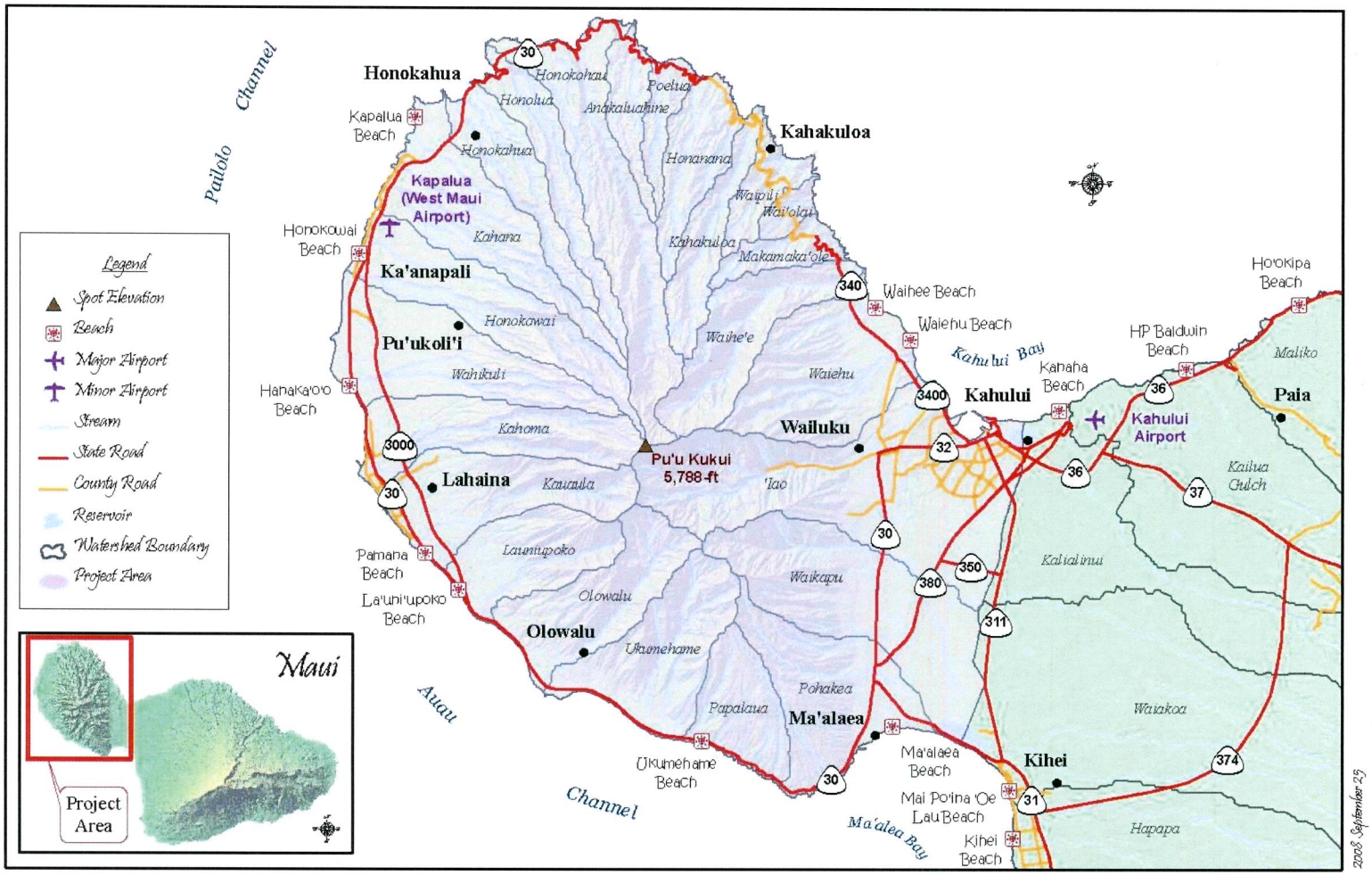
We have sent a similar request to Mr. Gerry Davis of the National Marine Fisheries Service and are forwarding a copy of this letter to Dr. Wendy Wiltse, U.S. Environmental Protection Agency (EPA-PICO), 300 Ala Moana Blvd. Box 50003, Room 5-152, Honolulu, Hawaii, 96850. If you have any questions, please contact Ms. Cindy Barger, Project Manager at (808) 438-6940 or by e-mail at cindy.s.barger@usace.army.mil.

Sincerely,

Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosure

West Maui Watershed Project, Maui, Hawai'i



DEPARTMENT OF THE ARMY
U.S. ARMY CORPS OF ENGINEERS, HONOLULU DISTRICT
FORT SHAFTER, HAWAII 96858-5440

REPLY TO
ATTENTION OF:

June 25, 2009

Programs and Project Management Division
Civil and Public Works Branch

Mr. Gerry Davis
Chief
Habitat Conservation Division
National Oceanic and Atmospheric Administration Fisheries
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814

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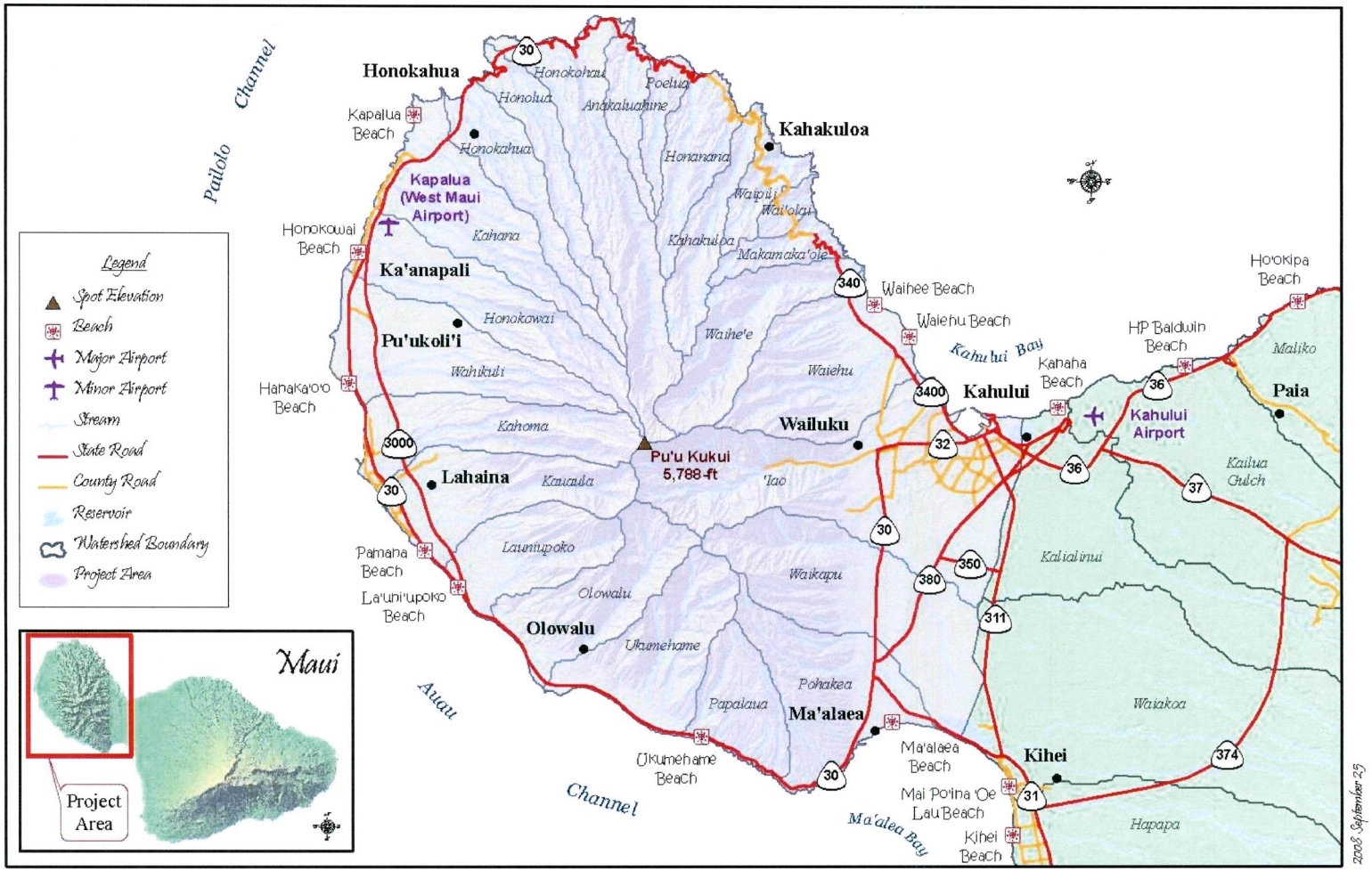
Anthony J. Paresa, P.E.
Deputy District Engineer for
Programs and Project Management

Enclosure

West Maui Watershed Project, Maui, Hawai'i



APPENDIX E
WEST MAUI WATERSHED RECONNAISSANCE STUDY, GIS MAPBOOK