Resolving Water Quality and Permitting Issues for Native Hawaiian Fishponds

Project Loko I'a

FINAL REPORT

September 1999 – August 2003

Pacific American Foundation
33 South King Street
Honolulu, Hawai'i 96813

U.S. Environmental Protection Agency
Form SF424A

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Acknowledgments

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Introduction

This final report summarizes the project goals, activities and achievements of Project Loko I'a. Project Loko I'a is a grass roots initiated, community-based project committed to the restoration and reuse of traditional Hawaiian fishponds *loko i'a* for educational, cultural and commercial purposes.

Project Loko I'a is based on the island of Moloka'i, a rural community that views the rehabilitation of these fishponds as a centerpiece of future economic prosperity. With more than 70 fishponds and 15,000 acres of fringing reef, this small community of 7,000 sees these traditional resources and cultural treasures as one of their most important assets.

Project Loko I'a's primary support has come from $1.5 million in congressional funding via the U.S. Environmental Protection Agency. Pacific American Foundation has been the nonprofit management organization for Project Loko I'a. This three year EPA-Pacific American Foundation collaboration with Project Loko I'a ended in August 2003. It has been a very successful partnership—note, EPA's Region IX Environmental Award in 2001 and in 2003, The National Trust for Historic Preservation-Historic Hawai'i Foundation Preservation Award.

The goal of Project Loko I'a has been to create local on-island capacity building through training and education enabling the community of Moloka'i to reuse their ponds in the most productive and appropriate manner that suites this most traditional island. Also, integral to the project, was to disseminate and collaborate with other communities throughout the state who share similar goals and aspiration for their fishponds.

The outcomes of Project Loko I'a have been significant. We have trained Moloka'i youth in fishpond restoration techniques, aquaculture methods, water quality assessment, leadership and business training. We have simplified the permit process to access, rebuild and reuse the fishponds. Our trainees have restored Kahinapohaku fishpond, an immense and physically demanding achievement. We have hosted schools, community groups and tourists from throughout the State and the world to the fishponds. Once again we are successfully doing aquaculture in our fishponds. We have created awareness, pride and capacity in our Moloka'i youth through rebuilding fishpond walls and growing fish. We have created a base of operations at Keawanui Fishpond, a magnificent 72-acre fishpond. We have developed a long-

term master plan for Keawanui that builds upon the outcomes of Project Loko I'a; this will enable us to take our successes to the next level and the ultimate goal--making these ancient fishpond flourish once again and be economically viable, self-sustaining entities. We have also created State-wide interest in the proper reuse of the fishponds and have provided state-wide leadership in fishpond development.

Produced, as an outcome off these accomplishments, are the following documents that we feel are a useful resource for others who wish to reuse the fishponds:

> Regulatory Permit Guide (found in Appendix B).
> Application Template Form Army Corps 404 Permit (Appendix C).
> Application Template Form State DLNR - MCDUA (Appendix C).
> Approved Management Plan for Panahaha Fishpond (Appendix D).
> Approved Management Plan for Keawanui Fishpond (Appendix E).
> Permit Process Flow Chart and Guide. (Appendix B).
> Moloka'i Mangrove Forest and Reef Sediment Report (Appendix F).

The Goals and Outcomes Achieved of Project Loko I'a. The major deliverables components of the project work plan as outlined in the original proposal are as follows:

1. Community Engagement and Outreach

Conduct outreach activities to build a foundation of community understanding and support for the restoration and use of fishponds in communities throughout the state:

> Project Aquaculture Trainees are chosen by Moloka'i community leaders.
> Community Working Group established to develop rapport and input from community.
> Two project Loko I'a staff sit on the Moloka'i Federal Empowerment Community (EC) Board.
> Develop working relationships with Federal, State, County and other non-profit organization to advance the project goals.
> Project Loko I'a organize and hold Loko I'a Night, a public gathering on Moloka'i attended by over 600 people.
> Hosted hundreds of school children to the fishpond sites for orientation and education programs.

> Over 500 volunteers have participated in our demonstration project to rebuild the fishpond and do aquaculture. Some of these groups included The White House Fellows, The Nature Conservancy, State, County and Federal regulators, Kamehameha School Trustees and State Department of Education curriculum writers and a delegation of senior government officials and local community representatives from Thailand.
> The Channel 4 news team visited and aired a special on Moloka'i fishponds.
> Various printed media (magazines, newspapers) reported on the project.
> Project Loko I'a visited the islands of Oahu, Maui, Kaua'i and Hawai'i Island consulting and lending their expertise with various individuals and community groups interested in fishpond restoration.

2. Environmental Permit Process Streamlining

> In February 2001, held a one-day workshop and field visit to Moloka'i for all government regulators involved with fishpond permit regulatory issues.
> Developed a set of user-friendly application templates that meet the basic needs of the regulators;.
> Developed a streamlined permit process flow chart and guide.
> The first test of the "streamlined" regulatory process was implemented with the submittal of an application to restore and reuse Panahaha Fishpond for small-scale non-commercial aquaculture research purposes.
> On August 20, 2002 State of Hawai'i, Department of Land and Natural Resources (DLNR) gave authorization to Project Loko I'a to reuse Keawanui Fishpond for aquaculture, education and research purposes. This is the first fishpond to successfully utilize the streamlined Master Conservation District Use Permit Application (MCDUA) process to obtain permits.

3. Water Quality Research

> Three Project staff were trained and certified in water sample collection and analysis procedures.
> Established and maintained a water quality testing laboratory at Keawanui Fishpond.
> Conduct water quality data collection and analysis to document water quality issues under various fishpond use scenarios.

4. Fishpond Demonstration Models for Permits, Restoration and Production

> Kahinapohaku Fishpond restoration is completed January 2001.

> Panahaha Fishpond work site is cleared. Permits applied for—Contested Case Hearing ensued.

> 'Ualapu'e Fishpond site undergoes improvements and new facilities (meeting space, storage facility, fish nursery) and multi-crop aquaculture production is established.

> Keawanui Fishpond aquaculture production is established. Site improvements include native plant nursery, fish nursery and meeting space. Permits are obtained.

> Development of a long-range plan for Keawanui Fishpond that incorporates aquaculture production, economic sustainability, education and research.

5. Production and Marketing Strategies of Pond Reared Aquaculture Products

> Ramped up fish production in net pens at 'Ualapue and Keawanui Fishponds.

> Developed *limu* production at 'Ualapu'e.

> Developed Moloka'i Live Rock production and implementation of business plan.

6. Staff Development and Training

> Kia'i Loko Program in aquaculture training and development established.

> Trainees undergo an intensive two-week aquaculture program at Oceanic Institute, Oahu.

> Trainees submit plans and permit for reuse of Kahinapohaku and Panahaha Fishponds.

> Three trainees undergo training to conduct water quality sampling and lab analysis.

> Staff and Trainees conduct community outreach through school visits, hosting Loko I'a Night, writing news articles, visiting government officials and elected representatives and holding positions on local boards and commissions.

> Staff and Trainees take courses in business development, grant writing, first aid, aquaculture and computers.

> Leadership and cultural training. *Lomi lomi* message, *lauhala* cordage, tattoos, woodworking classes taught by experts brought to Moloka'i from throughout the State.

7. Neighbor Island Outreach

> Maui. Assist Ao ao o Na Loko I'a o Maui in their efforts to rebuild Ko'ie'ie Fishpond through sites assessment and water quality analysis. Consult with fishpond users in Hana.

> Hawai'i Island. Consult with Edith Kanakaole Foundation and survey fishponds in Hilo (Keokaha). Meet with community members in Ka'u interested in restoring their fishponds. Visited with the master wall builders and their on-going restoration project at Kaloko Fishpond (part of Kaloko-Honokohau National Historical Park).

> Kaua'i. Consult with the Waipa Foundation, the non-profit organization restoring the *ahupua'a* watershed of Waipa and their fishpond.

> Oahu. Collaborate with fishpond practitioners at He'eia, Moli'i and Waikalua Loko Fishponds.

> Co-sponsor the State-wide fishpond conference by and for fishpond operators at He'eia Fishpond, Oahu, Sept 2004.

A synopsis of significant activities, issues, and accomplishments for each objective are summarized in the following sections.

1. Community Engagement and Outreach

Community Engagement

It is well documented that the island of Moloka'i is very supportive of the reuse and restoration of their fishponds. From the 1993 *Report of the governor's Task force on Moloka'i Fishpond Restoration* and the 1994 *Moloka'i Aquaculture Strategic Plan* to the 1998 Empowerment Zone Application (and resultant Federal Enterprise Community designation in 1999) restoring these traditional Hawaiian Fishponds has been identified as a major goal for this island community.

The Empowerment Zone Application and Enterprise Community (EC) award was a watershed event for Moloka'i. This was the first time that every business, charitable organization, agency, church, school and family participated in creating a community strategic plan.

The guiding vision of the EC Plan is to develop a community-based economic development model that supports a strong healthy economy yet preserves the quality rural lifestyle that Moloka'i is known for. The EC Plan consisted of 25 community economic development projects that were created by and for the community. Fishpond production development, in conjunction with creating an economically viable diversified agriculture industry was one of the top five "benchmark" development projects in the EC community plan.

To unite diverse elements of the community for the common good was sited as an important means to achieve the EC goals. As such, Project Loko I'a continually worked to become a known and accepted partner within the community and seeks to be a key stimulus of the EC Project. We have done this through actively involving community members through on-site visits, employment opportunities, education and training programs.

Engagement with the community took many forms. Here are some of the highlights:

To involve the community in key decision-making processes three members of the community were invited to assist the Pacific American Foundation (PAF) in the hiring of our initial group of Kia'i Loko or Fishpond Trainees. The panel members were reputable community leaders and represented several organizations with distinct educational and vocational missions targeting

Native Hawaiians: Queen Liliuokalani Children's Center, Queen's Hospital, and the State Department of Education.

Figure 1. Trainees with Manu Kaiama, Native Hawaiian Leadership Program.

Twelve young men and women from the Moloka'i community were selected to join the Kia'i Loko (guardians of the fishpond) or Fishpond Trainees (Trainees) Program. Project Loko I'a staff and numerous partners organized and developed a program designed to teach skills related to the restoration and reuse of fishponds including aquaculture techniques, micro-enterprise training, environmental stewardship and leadership training (for details see Section Six – Staff Development and Training).

Figure 2. Trainees Building Dry Stack Stone Wall at Kulana O'iwi.

A Community Working Group was established whose role was to provide input on key issues as the project progressed. Members were recruited from the educational, social welfare, healthcare, and private sectors. The group met three times a year in addition to numerous individual discussions with group members as specific issues arose.

Project Loko I'a has two members that sit on the EC board. Another one of the EC board members is specifically assigned to our project to provide unbiased information back to the EC board. The Board has monthly meetings and quarterly island-wide community meetings for dissemination of information and collections of input. We also attend district community meetings to give out information about our project. We have written newspaper articles regarding our project in the local paper, The Moloka'i Dispatch (see Appendix A). We also work with the UH

agricultural extension agents (College of Tropical Agriculture and Human Resources - CTAHR), to help communicate with the community.

Figure 3. Trainees and Moloka'i youth work day at Kahinapohaku Fishpond.

As the project progressed it became clear that beyond just engaging the community, there was a need to coordinate and partner with other organizations and agencies that share an interest in revitalizing the fishponds and aquaculture. To this end, we established a number of partnerships:

Figure 4. Kahinapohaku Fishpond. Passing *'ili'ili,* small stones, to the fishpond wall using red plastic baskets.

Moloka'i Community Services Council (MCSC) provided vocational training in aquaculture to young adults and youths enrolled in a Federal Department of Labor (DOL) funded program to facilitate capacity building aimed at youth development through educational achievement, career development and leadership training. Project Loko I'a staff, after a year's experience with fishpond restoration, production and operation, served as trainers and mentors for youths and young adults enrolled in MCSC's DOL program, known as the Hoikaika Program. These youth, about 20 in total, consisting of in school 14-18 year olds and out-of-school 18-24 year olds, participated in various work experiences such as office work, forestry, native plant cultivation, taro and vegetable agriculture, *limu* culture, pond aquaculture and fishpond rebuilding. To us, they are seen as the next generation of fishpond operators. Joining our two Federal programs we coordinated and stretched resources to further community

Figure 5. Bill Kekahuna Tending to the Net Pens at 'Ualapu'e Fishpond.

goals of providing training, development and employment opportunities for youth that takes into consideration our rural lifestyle and desire for a sustainable aquaculture industry.

The University of Hawai'i–CTAHR helped Project Loko I'a establish a hatchery and grow-out facilities consisting three 150 by 50 foot pens for nurseries and three round net pens of 7,500 square feet each for fish grow out at 'Ualapu'e fishpond.

Senator Daniel Inoye's office brought together off-island organizations that have aquaculture, fishpond interests and expertise--Oceanic Institute, PAF, Kamehameha Schools, State Office of Community Services and the University of Hawai'i--with on-island agencies and the community. The purpose was to ensure the efficient and coordinated use of Federal resources flowing into Moloka'i to build a sustainable aquaculture industry.

Project Loko I'a, EPA, and Senator Inouye's Office coordinated a one-day Fishpond Permit Workshop in February 2001. The purpose was to bring regulators and fishpond practitioners together to find common ground and work towards creating a streamlined and user-friendly permit process. Attendees included community members and local business people, EPA, Army Corps of Engineers, United States Department of Agriculture (USDA), Department of Land and Natural Resources, University of Hawai'i, State Department of Health, State Department of Labor, Oceanic Institute, Kamehameha School, Office of Hawaiian Affairs and representatives from the Senator's office and the Honolulu and Maui county administrations (for details see Section Two–Permit Process Streamlining).

Figure 6. School Kids Visiting Keawanui Fishpond.

In March 2002 Project Loko I'a obtained a low-cost lease to Keawanui Fishpond, a magnificent 72-acre fishpond with approximately 5 acres of adjacent land that

Figure 7. Collecting *Pua* Fry in the Nursery Pond, Keawanui.

Figure 8. Walter Ritte Leading a School Group at the Visitors *Hale* at Keawanui Fishpond.

comprises our base of operation. We have created the Keawanui Learning Center a place of collaboration between community members, scientists, researchers, entrepreneurs and cultural practitioners. It is here we are developing a sustainable model of fishpond reuse and production that can be replicated statewide. We have many partners assisting us with this goal. Much of the help comes from donated in-kind services. For instance, the land cost, the land clearing and preparation costs and the conceptual plans have been donated from the landowner, Kamehameha Schools and the County of Maui. With assistance and collaboration from the Oceanic Institute, University of Hawai'i (Institute for Maine Biology, Marine options program, College of tropical Agriculture and Human Resources, College of Engineering), Kamehameha Schools and private planning consultants we have developed a long-range master plan for Keawanui Fishpond and are pursuing research and production activities at the site (for details see Section Four–Fishpond Demonstration Models).

Figure 9. Families Visiting Kahinapohaku Fishpond.

Community Outreach

To further our goals of fishpond rehabilitation and employ them as educational and cultural teaching tools, Project Loko I'a has worked with numerous community organizations, schools, church groups, Hawaiian programs, families, and individuals. Our extensive community outreach includes speaking

Figure 10. Kahinapohaku Fishpond. Having Collected the *'Ili'Ili*, Small Fill Stones, from the Fishpond Basin, Workers Move Towards the Fishpond Wall.

engagements at elementary, middle and high schools and at community meetings, community workdays and on-site orientations and at the fishponds.

Over 500 volunteers have participated in our demonstration projects to rebuild fishpond walls and do aquaculture production. We have developed and nurtured a network of people who love the ocean and believe in *malama 'aina* (care for the land). In welcoming groups and individuals working in the fishponds we spread the knowledge and wisdom which these cultural sites embody—care of our ocean and land resources, ocean sciences, fish behavior and propagation and a direct link to our past. Through these efforts we see a new generation of environmentally and culturally aware young people who will continue in the efforts to protect and revitalize the ancient fishponds and the lands that surround them and the seas and reefs that they embrace.

Figure 11. Trainees Visit With Students and Talk About Hawaiian Fishponds.

The primary means to educate the community about the ancient fishponds has

been through onsite orientations for school and community groups, educational presentations in the schools and participating in various community events. Outreach into the local Moloka'i primary, middle and high schools took place by project staff and the Aquaculture Trainees. Over 10 in-school presentations were made by project staff throughout the period reaching several hundred people. The Aquaculture Trainees also made presentations on fishpond activities to various community groups including the Manae Community(east-end Moloka'i), the Moloka'i Enterprise Community and the Moloka'i Planning Commission. These outreach efforts did much to inform the community on the project- many residents were not aware of the extent of fishpond work done by their own that involved not only restoration, but a full circle of services from production to job training to leadership development.

Figure 12. Josh Kalua on the cover of the March 24, 2004 issue of the Honolulu Weekly.

Over 1,000 youths and adults participated in onsite orientations and community workdays. Field visits took place primarily at 'Ualapu'e Fishpond and Keawanui Fishpond. Other visitors took part in workdays at these ponds and also at Kahinapohaku Fishpond. Workdays included an orientation session, rebuilding rock walls, fish feeding, net pen maintenance and/or site maintenance. Several high profile groups visited and worked in these fishponds including the White House Fellows, The Nature Conservancy, State, County and Federal regulators, Kamehameha School, Bishop Estate Trustees and Department of Education curriculum writers and school teachers (for a detailed list refer to Appendix G).

It should be noted that since 1964 The White House Fellowships are considered America's most prestigious program for leadership and public service. The White House Fellowships have offered outstanding young Americans the opportunity to participate in the business of governing the Nation. Each full time Fellow works as a special assistant to a Cabinet member or senior presidential advisor. They also participate in an education program designed to nurture their development as a leader. The Fellows sited their visit to Moloka'i and the fishponds as the highlight of their field trip to Hawai'i.

Another strategy employed to educate the community were a series of articles written by project staff that ran over the course of eight weeks in the local Moloka'i newspaper. These articles chronicled the personal experience and growth of staff as a result of their work with Project Loko I'a. It also gave the project staff practice in solidifying their computer literacy skills. The articles created a noticeable community enthusiasm for the project as evidenced by the numerous inquiries and comments that staff encountered whenever the articles appeared in the paper. Copies of these articles can be found in Appendix A– News, Articles and Citations.

Figure 13. Loko I'a Night. Buddy Keala Overseeing Live Fish Exhibit.

Various local newspaper and Magazines including the Honolulu Advertiser, the Honolulu Weekly, the Maui News and Hawaiian Airline's *Hana Hou Magazine* covered the story of Moloka'i Fishpond restoration. Copies of these articles can also be found in Appendix A.

Other Community outreach successes include:

> Produced Loko I'a Night, a public gathering at Mitchell Pauole Community Center in Kaunakakai featuring the Moloka'i fishponds

Figure 15. Loko I'a Night. Entertainment by Amy Hanaialii !

Figure 16. Loko I'a Nite. Various Educational Exhibits.

and attended by over 600 people. The Trainees and its major partners (PAF, EPA, State Office of Community Services, UH-CTAHR, EC, Ho'ikaika, Farber & Associates, Alu Like, Rural Development Program, Native Hawaiian Leadership Program, Kamehameha Schools, Ke Kua'aina Hanauna Hou, Oceanic Institute, Hui O Kuapa) did a "show and tell" that included poster boards, information tables, PowerPoint presentations; live fish tanks and water quality demonstrations. For attending, everyone was treated to a free Hawaiian dinner. To keep people there and the event going, dinner was followed by live entertainment and door prizes. The successful event lasted until after 10:00 p.m.

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> The Local ABC news anchor Gary Sprinkle (KITV-4) produced a documentary on Moloka'i Island and the communities practice and preservation of Hawaiian ways. Featured prominently in the program was the Kahinapohaku Fishpond restoration effort. The Program, *Pacific Adventures: Moloka'i* earned a number of awards in broadcast journalism and from the Hawaiian Visitors Bureau.

> Project Loko I'a visited the islands of Oahu, Maui and Hawai'i Island consulting and lending their expertise with various individuals and community groups interested in fishpond restoration (details of this can be found in Section Seven–Neighbor Island Outreach).

> EPA Award. In November 2001, Project Loko I'a received a national award for excellence from Region IX, Environmental Protection Agency. Recognizing the outstanding leadership and teamwork of the Moloka'i Hawaiian men and women and their contribution to the environment, EPA's Administrator praised the high quality and standards of the project and the support from the Pacific American Foundation.

Figure 17. Joshua Kalua, Greg Chun and Walter Ritte Receive EPA Award.

> National Trust for Historic Preservation Award. In April 2003 Project Loko I'a received The National Trust for Historic Preservation Award-Historic Hawai'i Foundation Preservation Award. The Trust

noted in their award the community organizing and leadership skills of Project Loko I'a and Project Coordinator Walter Ritte and the restoration of Kahinapohaku Fishpond.

> Keep it Hawai'i 2001 Award. The State of Hawai'i Visitors and Convention Bureau honored the Kahinapohaku Restoration Project for the efforts to preserve Hawaiian culture.

> Visit from Thai delegates. In August 2002 Moloka'i hosted a delegation of government officials from Thailand. In January 2002, EPA Administrator, Governor Christine Todd Whitman, had an audience with His Majesty King Bhumiphol of Thailand. During their discussion, King Bhumiphol raised his interest in engaging indigenous communities in Thailand to restore local fishponds that had suffered environmental and economic deterioration. Governor Whitman shared the example of the work being done by communities in Moloka'i to restore fishponds using indigenous methods. His Majesty was very interested in learning more. As a result a Thai delegation of senior government officials and local community representatives visited Moloka'i in August 2002 to learn more and prepare a report for His Majesty.

Figure 18. Exchange of Gifts.

Beyond the specific details regarding how the fishponds were restored, one of the primary purposes of this mission is for the delegates to learn how communities organized themselves and interacted with other groups, non-profit organizations and government agencies to accomplish their goals.

Figure 19. Moloka'i Community Welcomes the Delegation from Thailand.

Figures 20, Thai Delegates Help Repair Honouliwai Fishpond.

Figure 21, Thai Delegates Visit *Limu* Seaweed Farm.

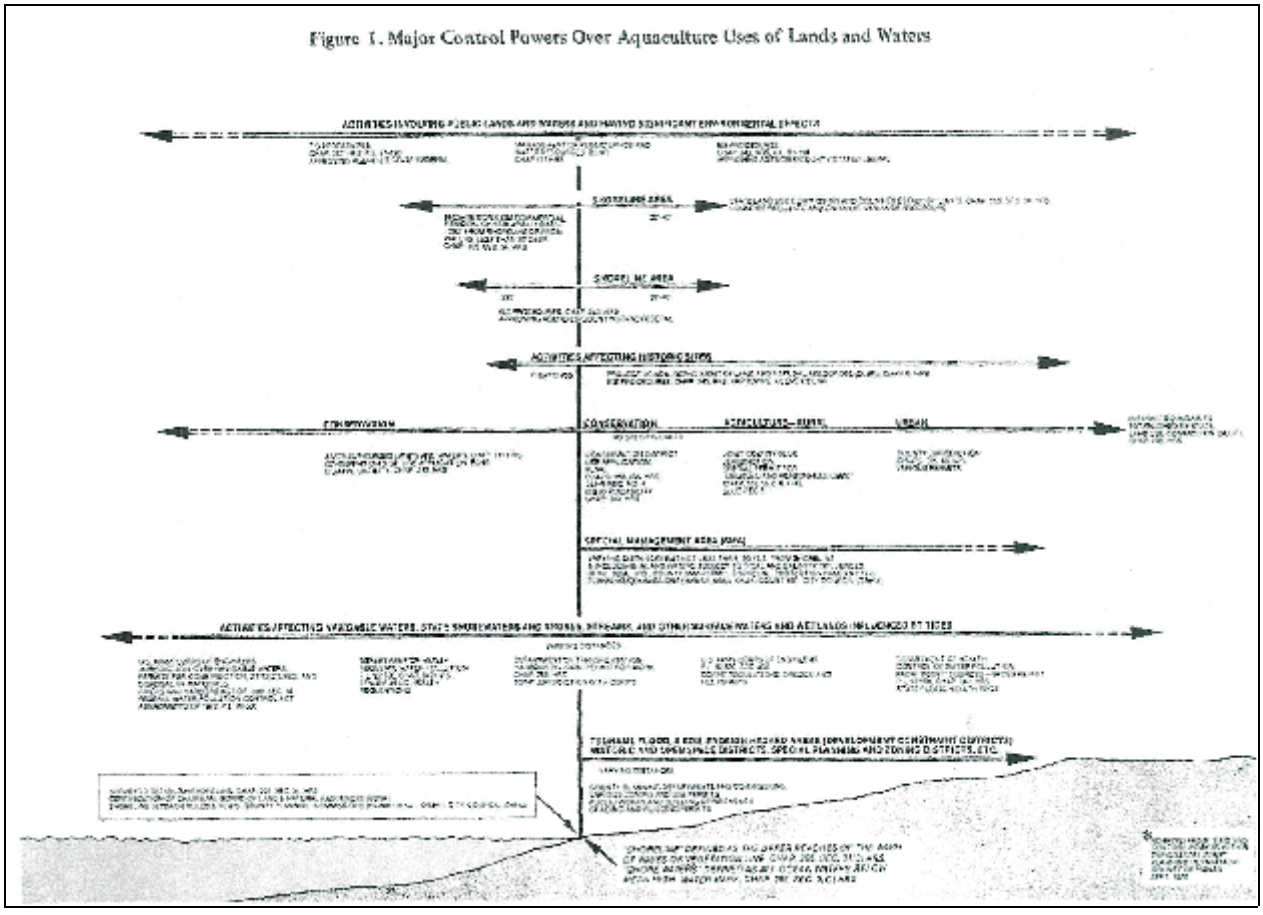
Figure 22, Children Perform Hula at Kahinapohaku Fishpond.

Figure 22, *Pau Hana,* Finished Working for the Day, Workers at Kahinapohaku Fishpond.

Figure 23, Lab Time at Keawanui Fishpond.

2. Environmental Permit Process Streamlining

Complex Federal, State, and County regulatory permits are necessary before any Hawaiian fishpond restoration, revitalization and reuse effort can be started. The jurisdiction of Hawaiian fishponds occurs at the shoreline, which interface between land and ocean and is heavily regulated (please note Figure 1, below, and figure 24 on the following page). It has been noted that to restore a fishpond there are potentially 17 permits and processing could easily cost $50-$80,000 and take several years to complete. The complexity lies in the fact that there are multiple regulatory agencies with often times overlapping regulatory purpose but no established guiding process nor lead agency to help navigate one through the labyrinth of permits. What a community is up against is a process that by default favors those with the resources necessary to hire experts to navigate through this regulatory process—leaving those who wish to restore fishponds for traditional purposes at a disadvantage.



In streamlining the permit process, our goal was to create a standardized process that the average person could navigate through in a timely manner and at minimal cost. To that end we accomplished the following:

> Untangled and simplified the current environmental regulatory framework;

> Sought collaboration with regulators and lawmakers for devising a mutually agreed upon streamlined process;

> Developed standardized user-friendly application templates that meet the basic needs of the regulators;

> Tested out the streamlined process by acquiring permits and leases for several State-owned fishponds. Reviewed the streamlined process, made changes as seen fit;

> Developed a streamlined permit process flow chart and guide.

While much work remains to make this permit process a "user-friendly" experience—Project Loko I'a has made substantial progress towards that goal. In doing so we have sown awareness among the regulatory community for the need to show flexibility when working with grass roots community projects. In addition, we have created a number of guides to help others move through the process. These products include:

> Regulatory Permit Guide (found in Appendix B)
> Permit Process Flow Chart and Guide (Appendix B)
> Application Template Form Army Corps 404 Permit (Appendix C)
> Application Template Form State DLNR - CDUA (Appendix C)
> Approved Management Plan for Panahaha Fishpond (Appendix D)
> Approved Management Plan for Keawanui Fishpond (Appendix E)
> Moloka'i Mangrove Forests and Reef Sedimentation Assessment Report (Appendix F).

Figure.24, South-East Coastline of Moloka'i. Note the Interface Between the Fishponds the Land and the Sea.

The following is the sequence of events, activities that took place and products produced in working towards permit simplification:

Streamlining the Permit Process

Methodology. A team of project staff, public agencies and private consultants was formed to develop a plan for streamlining the permit process[1]. After the initial analysis of the permit requirement issues, it was concluded that the development of the desired streamlined process would require three actions: 1) obtain regulator agreement on exempted issues and permit requirements; 2) development user friendly application templates that meet the basic needs of the regulators; and 3) standardize what is necessary to meet the requirements that remain. To accomplish this we have met with the regulators to identify both common and distinct needs and to assess where there might be room for gaining exemptions, standardizing requirements, and generally decreasing the amount of information, redundancy and data required.

Identify Existing Environmental Regulatory Framework. Work on streamlining the regulatory process began by educating ourselves about what permits could be required if someone wanted to restore a fishpond back to productive use. Below is list of those permits. A detailed summary of the Permits and their requirements can be found in Appendix B: Regulatory Permit Guide.

FEDERAL PERMITS:
- > Department Of Army Permit (404)
- > Dept. of Health 401 Water Quality Certification
- > U.S. Fish & Wildlife Service (Review)
- > Coastal Zone Management (CZM) Consistency Statement

STATE PERMITS:

Department of Land & Natural Resources:
- > Conservation District Use Permit
- > Environmental Impact Statement/Environmental Assessment (343 HRS)
- > State Historic Preservation Office (Historic Site Review-Sec.106)
- > Fishpond Operators Permit

[1] PAF contracted Jack Keppler, former Deputy Director of the Department of Land and Natural Resources. State Office of Community Services (OCS) and University of Hawai'i (UH) recommended two planners, Joe Farber of Farber & Associates, and Eugene Dashiell of Environmental Planning, both whom possess extensive experience with Hawaiian fishponds. In addition to the aforementioned consultants, Buddy Keala, UH Cooperative Extension Service; Jan Dill and Gregory Chun, Ph.D., PAF; Susan Polanco, Environmental Protection Agency (EPA); and Walter Ritte, Mark Forman and Keith Yabusaki, Ph.D., OCS, formed the nucleus of the permit team.

COUNTY (MAUI) PERMITS:

> Shoreline Management Area (SMA) Permit
> Shoreline Setback Variance
> Building Permit
> Grading, Grubbing & Stockpiling Permit

STATE-OWNED FISHPONDS:

DLNR-Land Management Division
State Lease mechanism:

> Non-Profit 501(c) 1 or 501(c) 3 Status
> Certified Shoreline Survey
> Land appraisal
> Lease Rent Negotiations
> Right-of-Entry permit
> Insurance Coverage

MASTER CONSERVATION DISTRICT USE PERMIT APPLICATION PERMIT (MASTER CDUA).

In 1996, 29 Moloka'i fishponds (12 state-owned and 17 private) analyzed and selected by community members and the Governor's Task Force on Moloka'i Fishpond Restoration as having a high potential for restoration, were packaged under a single Master Permit Application. The advantage of the Master CDUA was that a single CDUA application and Environmental Assessment in support of the application was drafted for all 29 fishponds. This eliminated redundancy and the costs associated with individual CDUA/EA applications, which are required for any proposed activities within the State Conservation District. The motive behind creating the MCDUA was the belief that it would expedite the historically accurate restoration of Hawaiian fishponds by community groups for traditional '*Ohana*-based (family) management.

Reduce, Simplify Permit Requirements. Every permit granted by the regulatory agencies come complete with a number of requirements and conditions. For example, the Master CDUA comes with 19 conditions. Some of these conditions are costly and time consuming such as fishpond coring ($6,000), land appraisal ($2,000) and certified shoreline survey ($2,000-3,000). Working with regulators we negotiated to have a number of these conditions simplified and or eliminated. These include:

1. DLNR has agreed that a pre-project survey to assess impact of restoration activities on protected bird species would not be necessary, as their own Division of Fish and Wildlife has indicated that restoration of these ponds will likely *improve* bird habitat conditions.

2. Fishpond mapping and sediment coring (a requirement of DLNR's State Historic Preservation Division) can be met by having individuals who have received training by the State Historic Preservation Division in mapping and coring techniques, thereby averting the need to hire a professional to meet this requirement (see letter from State Historic Preservation Office, Appendix D).

3. Conditional exemption from the Army Corp of Engineers permit authorized under Section 404 of the Clean Water Act. A determination from the Corps is always required for every fishpond project. However, the Army Corps has stated that restoration of a fishpond wall does not pose a significant impact to ocean water quality *if* such a restoration plan adheres to Best Management Practices (BMPs)—restoring the wall along the existing footprint, no dredging and machinery kept to a minimum, etc. If such a project plan adheres to "restoration work under BMP's," a 404 Permit waiver will be granted.

4. If an ACE 404 exemption is granted, the State Department of Health administered 401 Water Quality Certification is not required. This permit is the most costly and time-consuming permit to obtain.

5. County requirements for a Special Management Area (SMA) permit have been waived. The County of Maui has concurred that since fishponds are located below the shoreline high-water mark, which is outside of the SMA, fishponds are exempted from this permit (see exemption letter in Appendix D).

6. Certified Shoreline Survey (CSS). Our position is that the expensive ($3,000 – 10,000) CSS is not necessary. In the case of restoration, we are following the historic imprint of the pond wall that is shown on a variety of maps, including tax key maps. This is a static boundary that will not be broached. As to possible impacts on adjacent shorelines and beaches from a restored fishpond wall, we suggest that beach profiles and photos documenting a series of transects be taken along the shoreline before, during and after restoration to monitor possible impacts to the shoreline. DLNR generally agrees with this argument and has somewhat backed off of the CSS requirement but still feels that a CSS exemption should be considered on a site-by-site basis. In the case of the Panahaha

Management Plan Application, we conducted beach transects in lieu of a CSS (These can be found in the Panahaha Management Plan, Appendix: D).

Fishpond Permit Workshop. A major meeting of regulatory agencies was held at Keawanui Fishpond to address specific concerns that hinder approval of permits. Held in February 2001, the one-day workshop and field visit to various Moloka'i fishponds was coordinated by Project Loko I'a, EPA, and Senator Inouye's office. Represented were EPA, Army Corps of Engineers, United States Department of Agriculture, Department of Land and Natural Resources, University of Hawai'i, State Department of Health, State Department of Labor , Oceanic Institute, Kamehameha Schools, Office of Hawaiian Affairs, and representatives from Senator Inouye's office and the Honolulu and Maui county administrations. Interested local community members and business people also attended.

The workshop focused on facilitating the development of the mutual understanding between agencies of their respective roles and regulatory interests in the permitting and access processes.

Figure 25. Fishpond Permit Workshop; Jenifer Goto Sabas; Regulators Visiting Kahinapohaku Fishpond.

Even through Project Loko I'a staff has developed a strong understanding of the regulatory process regarding fishpond reuse, there are clearly gaps in understanding between the regulators themselves.

The workshop and field visit provided the regulators critical face-to-face interaction with each other in a non-territorial environment. They got the opportunity to see first hand the fishponds they are charged with regulating. It also provided the regulators the opportunity to hear from the Moloka'i community its vision for fishpond reuse and an aquaculture industry on the island.

Develop Army Corps of Engineers and Pond Management Plan (State DLNR) Templates.
Two generic application templates that outline a management plan for restoring and operating a specific fishpond were developed to replace: 1) The Department of Army 404 Permit Application (administered by the Army Corps of Engineers); and 2) Management Plan as required by DLNR in its Master Conservation District Use Permit Application (See Appendix C).

These templates are basic forms that cover all the required information in these respect permits but are simplified to the point where applicants "fill in blanks" and "check appropriate box". This was seen as a way to standardize the requirements. It had been found that permit requirements were so open to ambiguity and individual regulator's interpretation that it often resulted in overly detailed or unnecessary documentation and even outright inaction by potential applicants due to this confusions and lack of clear guidance. The templates are intended as a simplified application form that anyone can prepare and submit themselves to acquire the necessary permits.

Testing the Streamlined Permit Process

Panahaha Fishpond. Our first test of the "streamlined" regulatory process came with the submittal of an application to restore and reuse the state-owned Panahaha Fishpond for small-scale non-commercial aquaculture research purposes. Four program participants, Kalaniua Ritte, Brandon Ikaika Lima, Marlin La Voie, and Scott Kauhane Adams, organized and formed a *hui* group, Four Brothers and a Fishpond. In January 2001 the *Hui* conducted site assessments and developed a plan.

In February 2001 the Hui filled out and submitted the draft templates to DLNR and the Army Corp of Engineers. Based on the submittal, The Corp did grant an exemption to the 404 requirements (see fill-out templates in the Final Panahaha Management Plan, Appendix D). The template for the MCDUA Permit met resistance at DLNR. Even though key DLNR regulators were involved in the crafting of the template, when the document was submitted to them for processing, they felt the form, as a stand-alone document, was not sufficient. They wanted a much more comprehensive management plan with a more detailed narrative of the project and the added requirements of an oral history report and further research on the archaeology of the fishpond (as to assure the restoration of the wall is as historically accurate as possible), and to restrict their production activities to subsistence use only. The additional requirements were completed and an expanded

and revised management plan was submitted to DLNR in December 2001 (see copy of letter from DLNR dated December 21 2000 and Final Panahaha Management Plan in Appendix D).

As required, DLNR held a public hearing about the Panahaha Fishpond restoration proposal. Over 100 people attended the meeting held at Moloka'i School on December 6, 2001. The overwhelming majority testified in favor of restoring this cultural treasure.

On January 30, 2002, the *Hui* held a Mana'e (East-end Moloka'i) community meeting at the Kilohana Elementary School to inform and answer questions about their proposed reuse of Panahaha Fishpond.

On December 26, 2001 one of the adjoining landowners to Panahaha Fishpond opposing our proposal filed a petition for a Contest Case hearing with DLNR. This in effect stopped dead the processing of the permits until the State Attorney General ruled if the opposing parties have "standing" to request the Contested Case. Twelve months later, December 2002, Contest Case standing was denied. Because of the contentious nature of this particular fishpond—while the State (DLNR) says they are again "moving ahead" with processing our permits—they are "reluctant" to grant us the permits to restore this fishpond. While Project Loko I'a seeks to one day have a permit to reuse this fishpond, our efforts and energies moved on and went into making Keawanui Fishpond the successful operation that it is.

Keawanui Fishpond. Keawanui Fishpond is a privately owned fishpond that is covered under the Master CDUA permit. In August 2002, the Department of Land and Natural Resources (DLNR) gave authorization to PAF to reuse Keawanui Fishpond for small-scale noncommercial aquaculture actives, research and educational purposes. Authorization was granted per the Keawanui Management Plan submitted to DLNR in March 2002 (Appendix E). Keawanui is the first fishpond to successfully utilize the streamlined MCDUA process to obtain its DLNR permits. Important to note that unlike Panahaha Fishpond, Keawanui is privately owned. Thus the permit process was significantly easier because it eliminated the State land lease disposition phase. The time from submittal of application to permit authorization was five months.

The templates were not used in the Keawanui application. Reasons cited were: 1) DLNR was not satisfied with the template as an application. They required a more narrative description of the proposal thus we based the application on the revised Final Panahaha Management Plan (see

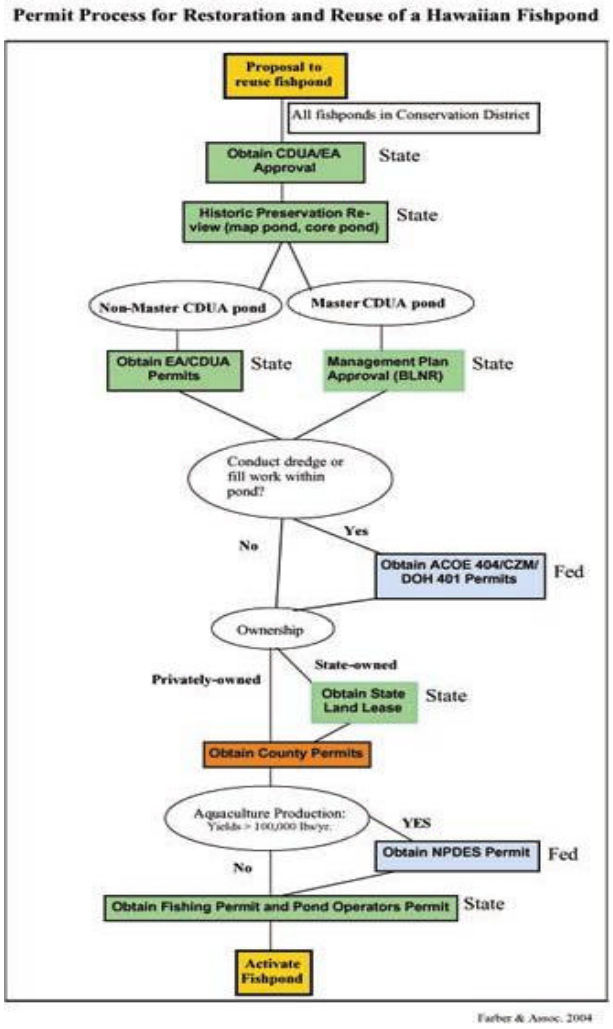
letter date December 21 2000 from DLNR in appendix D), 2) The applicant was PAF not a community group, they wanted the permit ASAP and as such hired a professional planner (Joseph Farber, Farber & Associated) to draft the entire Management Plan and Permit package, and 3) The information content of the templates are mostly on fishpond restoration and wall rebuilding. Keawanui Fishpond is in very good condition. No restoration work was needed. A copy of the approved Keawanui Management Plan can be found in Appendix E.

Leasing of Kahinapohaku Fishpond. Restoration of Kahinapohaku was completed in January 2001. A resident family from the community organized as the *Hui Ohana 'O Naki* to accept responsibility for the care of the fishpond and to begin the application process to obtain a long-term lease from the State for access and use of the fishpond. Project Loko I'a has consulted with the Naki Ohana to organize the group. As to date the Ohana has yet to submit plans and application to acquire a state lease.

Other groups have shown an interest in acquiring the fishpond to use and manage—but as of yet no one has moved forward to make the commitment.

Summary

While just a beginning, these efforts represent a significant step towards the goal of a streamlining the permitting process. We have gain awareness and some support from the regulatory community. We have standardized the permit process and have eliminated and simplified a number of permit conditions saving time and money. The current streamlined process is graphically represented in a flow chart (*right*) and accompanying table, found In Appendix B. Comparing this chart to the ambiguity, overlapping regulatory jurisdictions and complexity of Figure 1 on page 21, the preexisting process, we indeed have made great strides.



The templates have had mixed results. The template worked for the Army corps (they could form a decision based on it), but not for DLNR. It allowed the group Four Brothers and a Fishpond to begin forming their plans about how to reuse Panahaha. It was a start. The template for DLNR has morphed into what is now the latest draft of the Panahaha Management Plan and the Final Keawanui Management Plan.

We obtained all permits for the privately owned Keawanui Fishpond in five months, a record time. It is the first fishpond to demonstrate the benefits of the Master CDUA permit process. The documentation for this approval was a Keawanui Management Plan that contains 12 pages of text, four maps and two pages of photos. As comparison—Ko'ie'ie Fishpond is a state-owned fishpond on Maui that is currently moving through the permit process under restoration for cultural and interpretive purposes. This project has large support amongst the Maui community and permitting-wise is relatively very straightforward—no major glitches—one could argue this is a good example of best-case scenario for a stand-alone fishpond EA/CDUA permit. The EA/CDUA took five months to obtain permit approval. However, the document and its related studies took over a year to compile, it is 195 pages long and includes an underwater archeological survey and Cultural Impact Assessment study.

Though we have had success there remains a number of issues with permit requirements that we feel need to be resolved. These include the restriction on commercial use, leasing issues and "lead agency" government support for fishpond restoration efforts.

Commercial Use. Under the MCDUA permit, a fishpond cannot be used for commercial purposes. This condition will severely limit the development of fishpond-based aquaculture on Moloka'i. It is an issue that needs to be resolved if the community's vision is to be realized. As was the case with Panahaha Fishpond, the original application had to be amended and the applicants, against their wishes, agreed to restrict their production activities to subsistence use only. Yet fishponds will only be revitalized and reused on a larger scale if the investment to do such work can be recovered through commercial activities. Through discussion with DLNR they recommended that it would be better to address this issue separately, in another forum, outside of individual fishpond permits. This is because such changes will require significant resources to amend the hard won existing MCDUA permit (legal review, administrative amendments, Public Hearings, etc).

Lead Agency. One of the goals of fishpond streamlining was to find a "lead" permit agency—whereby those interested in reusing the a fishpond would know where within government they could go and find the help they need. We call this the one stop shop. Again, the goal here is to make the permit process accessible, legible and as inexpensive as possible—finding a way out of hiring professional to do the permit work

All roads in the regulatory process in fishpond reuse lead to DLNR as they constitute the central agency through which both environmental permitting and access and use rights are ultimately determined for a fishpond. Fishponds are unique in Hawaii in that they are considered submerged lands, yet they are real property that can be brought, sold and leased. Regardless of ownership, any proposed use within a fishpond requires DLNR approval as they administer all Conservation Lands, which fishponds are classified. As for the state-owned fishponds, DLNR has the added responsibility to take care of these resources. This responsibility includes the need to determine their highest and best use as a public owned asset and resource.

Figure 26: Walter Ritte, Project Loko I'a, speaking to Community in Ka'u, Hawai'i Island on their visions to restore local fishponds:

"How do you get government to help you?
Government is like a slimy slippery squid...
You got to grab and hemo 'em and not let go!
No one is going to come and give it to you on a silver platter. The Ka'u community is forced to come together, unify, and write a community plan before outside assistance will step in."

Unfortunately DLNR are understaffed, overwhelmed and have been unwilling to take on such a task. Maybe it's not even feasible to think they can interface with the community at the grass roots level. As it stands now—DLNR controls the state-owned fishponds—but this control is disbursed among different departments (land leases in the Land Division, permits in the Office of Conservation and Coastal Lands, historic site issues in Historic Preservation, fishing and aquaculture issues in Department of Aquatic Resources). Each division knows their role but the bigger picture is lost in bureaucratic rule making and job descriptions. Things will not change in the foreseeable future—in fact their budget is undergoing further cuts. It

is obvious to us that if we want to move forward we need to organize and network among ourselves to achieve our mission.

There is growing movement within the state to revitalize the ancient fishponds. It is exciting to us that Project Loko i'a has been apart of helping to nurture this movement through outreach and technical exchange, taking what we have learned on Moloka'i, out to the neighbor islands (for full details see Section 8: Neighbor Islands Outreach). Through these efforts we have networked with others who share our vision of community-based fishpond restoration and reuse: the non-profit (501c3) Moloka'i organization Hui o Kuapa, the Hawaiian Learning Center located at Keawanui Fishpond, the 501c3 Paepae o He'eia located at He'eia Fishpond, Oahu and Ao'ao Na Loko I'a o Maui at Ko'ie'ie Fishpond, Maui. These groups also see themselves as a resource on their respective islands to help others who are interested in restoring fishponds. In September 2004 a fishpond operator's conference was held at He'eia Fishpond to further these aims. It is through these groups, our shared experiences and resources and through modern means of communication (email, web communities and video conferencing, etc) we have grown to rely on and support each other in our quests to reuse the fishponds, rather than expect government to be there to help us.

Leasing. Obtaining a lease to a state owned fishpond poses many obstacles—both costly and time consuming. While we have yet to successful obtain a state lease to a fishpond, or know of any other group that has done so, we have managed to tackle some of the leasing issues. DLNR-Land Division, the agency that handles the state land leases, has agreed to relax the requirement for a Certified Shoreline Survey (CSS) on a case-by-case basis. For example, with the Ko'ie'ie Fishpond on Maui, they are asking for a simple metes and bounds survey, based on preexisting maps rather than a full CSS.

An appraisal (cost approx $2,000) is a requirement we still oppose and would like to see waived. The appraisal is used to establish the lease rent amount. We feel as long as the current restrictions of no commercial use apply, there is no realistic way to establish a value of a fishpond based on comparable properties alone. Furthermore, since a group reusing a fishpond is in effect improving the property through restoration and active use—the State should reward such actions by charging nominal rent, if any.

Yes, we eased some of the barriers to permitting and leasing of fishponds. However, consider a community prospective that questions the need to seek out authorization from State government to reuse a fishpond. Such a perspective is quite valid especially in view of the way fishponds were created, operated and used, and the current means to "legally" reuse them, who controls that process, and the informal use that continues to this day.

The fishponds are a legacy and a tangible, visible link to our ancestors. Many remain, despite their condition, a valuable resource that are informally used for gathering of seafood, fishing, throwing net and recreation.

If the desire for reuse of these fishpond is purely non-commercial (which under the MCDUA is the only allowable use) and the barriers to "reuse" and "access" are so steep, time consuming and costly—it really comes down to perceived need for permits. DLNR controls the State-owned fishponds—they have done an abysmal job being a steward to these resources and yet are also reluctant to let others take an active role in reusing them and improving their condition. Ownership? Control? Responsibility? The fishponds truly "belong" to the Community. They will continue to be reused despite the barriers at the official level. As the case with Kahinapohaku, the extended family that has ties to that pond looks after it, use it---informally. As they always have. Until there is perceived need for a lease, there is no motivation to seek that out.

Other Permit Streamlining Efforts

Mangrove and Reef Sedimentation Assessment. A major obstacle in the permitting process is the degree to which mangrove infestation and removal is significant and will need to be addressed in order to restore and operate a given fishpond. If the infestation is significant and requires heavy equipment to remove, a host of permitting conditions are triggered which make it cost- prohibitive to gain the permits that will allow restoration and operation of the fishpond. Off-shore reef sedimentation due to runoff is another concern, both as it relates to the spread of mangrove infestation along the coast (sedimentation serves as a carrier) as well as to water-quality issues, such as turbidity, that affect the health of the fishpond.

In 1988 a mangrove and sedimentation assessment of the southern shore of Moloka'i was conducted by Bigelow. This study was replicated during the first year of Project Loko I'a to document changes in mangrove growth, shoreline accretion and fishpond size reduction due to

mangrove infestation, and sedimentation along the southern shore reef flats of Moloka'i. A copy of the study found in Appendix F. Major findings of this study include:

1. Estimates of mangrove area calculated from aerial photographs taken in 1965, 1975, 1988, and 2000 indicate that infestation has increased approximately 85% along Moloka'i's southern shore, with the most substantial growth occurring along the western end of the island.

2. Due to sediment deposition and mangrove advancement, the shoreline in many areas on the western end of Moloka'i continues to advance seaward.

3. The impact of mangrove growth on fishponds has been most substantial on the western end of the island, where fishpond size has been reduced by as much as 50% in some cases due to mangrove infestation.

4. Overall, a decrease in sedimentation along the reef flats appears to have occurred, which is encouraging and suggestive of improved land management practices. However, there is a trend towards increased sedimentation as you move west along the shoreline that, along with the mangrove growth, paints a less optimistic view for restoration and revitalization of the fishponds on the western end of the island.

3. Water Quality Research

Background

There has been a running debate for years about the impacts to ocean water quality that fishpond restoration and its aftermath pose. Do raising these walls; enclosing bodies of water, doing aquaculture in the ponds degrade the quality of the water? There were many assumptions made about these questions—but no proof. The primary assumption, namely that restoring and reusing fishponds would degrade the existing quality of the water, made by the State Department of Health, ensured that the permit process (obtaining their costly and time consuming 401 Water Quality Certification) would prevent fishponds from being restored in any large number. Yet, Babcock's study of fishpond water quality in 1999 on six different Moloka'i fishponds show that many of the parameters (turbidity, nitrate and nitrite and total phosphorus) that are required to be monitored for DOH 401 certification do not meet their standards[2]. In other words, the ponds fail water quality standards *before* any work has even begun—making it virtually impossible to obtain the necessary permits for restoration and operation of a fishpond.

Figure 27, *right*, South East Moloka'i after a heavy rain. Note sediment runoff into the fishponds due to poor land management practices.

Figure 28, *above*, restoring Kahinapohaku Fishpond wall.

How much does manually moving rocks back onto a fishpond footprint pose to ocean water quality relative to a good rain?

[2] Babcock, W. Roger and Hisato Keith Oshiro (1999). Water Quality Evaluation and Analytical Method Equivalency Testing for Hawaiian Fishponds on Moloka'i. Water Resources Research Center. University of Hawai'i at Manoa.

Project Loko I'a along with its partners conducted an in-depth Water Quality Study of Moloka'i Fishponds in an effort to understand: 1) the water quality make-up of fishpond waters, the waters outside a fishpond, the effects of restoration and production activities on these waters and, 2) to determine the appropriateness of the existing water quality standards, and if need be, work with the permitting agencies to streamline the permit process through development of area-specific water quality criteria.

Project Description

The Environmental Protection Agency (EPA) approved Project Loko I'a's Quality Assurance Plan (QAP) in February 2001. Implementation of the QAP began in the fall of 2001 after Project staff had been trained and certified in sample collection and on-site analysis procedures.

Development of the QAP was headed by our UH partners at the College of Tropic Agriculture and Human Resources (CTAHR), with the guidance of EPA and DOH. The research hypotheses and appropriate data collection and analysis protocols were identified and subjected to several rounds of intense reviews to ensure the reliability and validity of the data being collected and analyzed.

To obtain representative samples of all areas and conditions that might be affected by restoration and aquaculture activities, water sampling was conducted every two months over a 12-month period (May 2001-2002) within five fishponds. The fishponds and the rational for their selection are:

- Niaupala – control pond – wall intact- no aquaculture activity, lower erosion, few cattle adjacent.
- Kahinapohaku – monitor water quality before, during after wall restoration.
- Panahaha- wall is down- no aquaculture activity.
- Keawanui and 'Ualapu'e- wall is intact-aquaculture production (using net pens).

The samples were analyzed for temperature, pH, conductivity, and turbidity, dissolved oxygen. Total dissolved phosphorus, total dissolved nitrogen, dissolved nitrate/nitrite, ammonia, total suspended solids and chlorophyll-a. These parameters were chosen because they are the criteria required for monitoring open coastal water per DOH Hawai'i Administrative rules (HAR) 11-54, Water Quality Standards, and the tested criteria required for Water Quality 401 Certification.

In addition to sampling within each pond at prescribed transects (generally about 7 to 9 set sampling locations within each fishpond), one transect at each pond extended from 1 meter to 1,000 meters offshore with sampling locations at 1m, 10m, 50m, 100m, 500m and 1,000m. This offshore transect was used to monitor the concentrations of nutrients from near shore to open ocean. Generally there are higher nutritional concentrations closer to shore, because of the groundwater flow into the shoreline area and then the gradual decrease of nutrient concentration further out into the open ocean due to mixing with seawater. The location of the transect generally ran from the shoreline through the gates of the fishpond wall--chosen because it is assumed that this would be path of the greatest flow of water from the shoreline out.

West Hawai'i Model. Under HAR 11-54 there is no consideration of water quality characteristics that naturally exist in a given area. The one exception is the West Hawai'i Model—DOH approved criteria tailored to the Kona Coat that better represented achievable water quality goals for the area than do the statewide criteria. Given that we know many of the fishponds do not meet the state criteria "as is" we adopted parts of the West Hawai'i model for our project. In addition to sampling within each pond at prescribed transects, one transect at each pond extended from 1 meter to 1,000 meters offshore with sampling locations at 1m, 10m, 50, 100, 500m and 1,000m. This offshore transect is used to monitor the concentrations of nutrients from near shore to open ocean. In the West Hawai'i model allowances have been made for higher nutritional concentrations closer to shore because of the groundwater flow into the ocean and then the gradual decrease of nutrient concentration further out into the open ocean due to mixing with seawater. Employing transects also help further our knowledge in understanding the water quality within a fishpond and how that differs (if at all) from its surrounding areas. For regulatory purposes using the West Hawai'i model was a start in finding a more reasonable criteria that the fishponds could possibly meet.


Figure 29, Water Quality Lab at Keawanui.


Figure 30, Guy Naehu at the Lab.

Water Quality Laboratory. Another critical component to conduct this research was the establishment of an on-island water quality analysis laboratory capable of processing the water samples. Most all of the analyses were conducted on-island by local Project Loko I'a staff. The exceptions being the more complex tests for dissolved nitrate/nitrite, total dissolved nitrogen and chlorophyll-a that were analyzed on Oahu at the University of Hawai'i at Manoa (CTAHR-Agricultural Diagnostic Service Center and College of Engineering-Water Resources Research Center). EPA and CTAHR purchased and set up the lab, stocked it with the necessary equipment, hired a water-quality technician to oversee sample processing and conducted on-island analyses. Dr. Roger Babcock, UH-Civil Engineering-Water Resources Research Center, trained our staff in all aspects of the QAP from sampling, analysis to running the lab. Another critical contribution by CTAHR was the purchase of a boat that allowed collection of the offshore transects samples.

Date Analysis, Findings and Recommendations

In summary, water quality within the Moloka'i fishponds sampled did not generally meet a significant proportion of the existing regulatory criteria (HAR 11-54). Most notably; compliance with turbidity, chlorophyll-a, nitrate-nitrogen, total nitrogen, total phosphorus, and dissolved oxygen was poor; compliance with ammonia-nitrogen and temperature was fairly good, and compliance with conductivity was very good.

It is particularly important to note that even the locations of best water quality given the parameters tested (generally the waters outside Kahinapohaku and Panahaha Fishpond—which many casual observers would agree has some of the best clarity and circulation along this stretch of coastline) did not meet the HAR criteria. This indicates that the criteria as established under HAR 11-54 is not achievable nor appropriate for Southern Moloka'i fishpond areas and needs to be changed.

The control pond generally did very poor in terms of overall compliance with HAR criteria. In formulating new criteria for these fishponds—the numbers within Niaupala should be considered as average and yet acceptable criteria and using the numbers found outside Panahaha and Kahinapohaku as best case. As such, suggested criteria for Southern Moloka'i fishpond areas are given in Table 1 below. For the full report, please refer to Appendix I).

Table 1. Suggested Water Quality Criteria for Southern Moloka'i Fishpond Areas

Parameter	Geometric mean not to exceed the given value
Total Nitrogen (ug N/L)	230.00
Ammonia Nitrogen (ug N/L)	3.50 (existing)
Nitrate + Nitrite Nitrogen (ug N/L)	30.00
Total Phosphorus (ug P/L)	70.00
Chlorophyll-a (ug/L)	6.0
Turbidity (NTU)	6.0
Conductivity (Salinity)	Shall not vary more than 10% from natural or seasonal changes considering hydrologic input and oceanographic factors (existing)
Dissolved Oxygen (% Saturation)	Not less than 50% saturation, determined as a function of ambient water temperature and salinity
Temperature (Degrees Celsius)	Shall not vary more than one degree Celsius from ambient conditions (existing)
PH	Shall not deviate more than 0.5 units from a value of 8.1, except at coastal locations where and when freshwater from stream, storm drain or groundwater discharge may depress the pH to a minimum level of 7.0 (existing)

Figures 31, 32. No two fishponds are alike. Niaupala Fishpond (control pond) *above right*, and Panahaha Fishpond, *left*. Two fishponds with very different water circulation dynamics. Note Niaupala is actually an enclosed bay; Panahaha's wall was built out onto the reef resulting in better water circulation and water quality.

Other Findings and Observations:

Control Pond. Niaupala Fishpond is about 35 acres in size and has an intact wall, much of it is submerged at high tide. The wall encloses what was once a small inlet—thus circulation of these waters is fair. The pond is quite shallow in places and there is a fair amount of silt. No production. Water quality at this pond was very poor, yet it was the only pond that met the criteria for nitrogen.

Before and After Restoration of Kahinapohaku. In general there were no major changes to water quality within Kahinapohaku after the fishpond wall was restored. Levels of turbidity and nitrogen increased somewhat within the fishpond, but in general the water quality remained among the best of the six fishponds tested. This probably can be attributed to a number of factors including the style of fishpond, in that the fishpond basin was created by a wall arching out onto an open reef rather than enclosing a bay, thus it is naturally exposed to more water movement. Also, the water quality outside of the pond wall has some of the cleanest in the study. However, even though the water quality is some of the best in the study, it generally did not meet the criteria as established under HAR 11-54. This indicates that the criteria can't be achieved even under the best ambient conditions of Southern Moloka'i and needs to be changed.

To compare the water quality within and outside the fishpond before and after restoration we used Roger Babcock's study from 1999 that conducted water quality sampling 10 times from 11/26/1997 through 2/24/98.[3] The QAP sampling at this pond lasted from 5/22/2001 through 12/6/2003 and consisted of six different sampling events. The pond was restored in January 2001. There is no aquaculture activity at the fishpond.

The one notable change in parameters after restoration was in the nitrogen levels. The pond met the criteria (GeoMean not to exceed –> 150 ug/L)-- before restoration (150 ug/L inside the pond/110 ug/L outside)-- but not afterwards. Note that after restoration levels of nitrogen increased within the pond to 171 ug/L and outside they jumped to 166 ug/L.

Phosphorus levels were the same inside and outside the pond prior to restoration. After restoration phosphorus levels were actually higher outside the fishpond 73.8 than inside 66.7.

[3] Babcock, W. Roger and Hisato Keith Oshiro (1999). Water Quality Evaluation and Analytical Method Equivalency Testing for Hawaiian Fishponds on Moloka'i. Water Resources Research Center. University of Hawai'i at Manoa.

Turbidity. The allowable turbidity per HAR 11-54 is GeoMean not to exceed –> 0.50 NTU). Total of 16 sampling episodes; turbidity levels vary widely from each sampling event to the next and there seems to be no real trend over time. This is not unusual as turbidity along this coastline is mostly a result of high winds and upslope soil runoff due to heavy rain. However, if we take the average mean for all events before and all events after restoration we do see that inside the fishpond showed an increase in turbidity, 1.8NTU before vs. 4.01NTU after. Outside the fishpond little changed: before 1.14NTU vs. 1.17NTU after.

Figure 33, 'Ualapu'e Fishpond with Net Pens for Fish Production. Note Encroaching Development Around Fishpond.

Production Fishponds. 'Ualapu'e and Kahinapohaku were the two ponds that production was taking place, the latter on a larger scale. Relative to the other ponds, these two had poorer than average numbers in terms of meeting the HAR criteria. Keawanui Fishpond is over 70 acres. Given the relatively small scale of the aquaculture activities it would seem those impacts were quite minor, especially considering that the water quality numbers were very similar both inside and outside the fishpond. 'Ualapu'e is about 20 acres in size and has poor circulation. The numbers especially parameters related to aquaculture activities (Dissolved Oxygen, chlorophyll-a, total phosphorus) seem to indicate that aquaculture did to some degree impact the quality of the water—especially compared to the water quality outside of the fishpond—which was noticeable better. However, they're maybe other land-based factors in the case of 'Ualapu'e. During the course of testing, two homes were built in front of the pond, there are four other houses that front the fishpond and a small subdivision (new roads, sidewalks, grading, homes built) was constructed across the main highway from the fishpond.

Individual Ponds. A couple trends stand out in terms of the water quality in the five fishponds tested. The control pond, Niaupala generally had some of the lowest numbers in meeting the

various criteria. While Niaupala was the only pond to meet the criteria for total nitrogen, it had the lowest scores for turbidity, Chlorophyll-a, Nitrate Nitrogen. This is probably due to the poor circulation and its relatively shallow, silty waters. 'Ualapu'e also preformed poorly and is probably attributed to poor circulation, aquaculture activities taking place and encroaching development. While Keawanui Fishpond generally had low scores, what stood out with this pond was the fact that there was less differentiation between water quality inside the pond than outside the pond compared to the others. Panahaha generally had the best scores followed by Kahinapohaku. Both these ponds have good circulation patterns.

Observations on Selected Parameters Tested

Nitrogen. One of our hypotheses to test was if aquaculture production increases levels of nitrogen within the fishpond as that activity creates a higher level of nitrogen due to fish waste and input of fish feed. Excess nitrogen in the water can lead to low levels of dissolved oxygen, poor water clarity and harmful or toxic algal blooms.

Nitrogen levels outside the fishponds were lower than inside the ponds for Niaupala and Kahinapohaku. For the other 3 three ponds it was the opposite. Niaupala was the only pond to meet criteria for nitrogen (GeoMean not to exceed150 ug/L) (143 ug/L) followed closely by 'Ualapu'e (161). Keawanui had very high levels of nitrogen both inside and outside the pond (212/229).

Compared to inside the pond, 'Ualapu'e's nitrogen level outside the pond was very high (161 vs. 225). Given 'Ualapu'e's production activities it would seem the results would be the opposite. One explanation for the lower level of nitrogen inside 'Ualapu'e and Niaupala is that they are productive sites of naturally occurring and cultivated seaweed *gracilaria*, *limu* ogo. *Gracilaria* prefers calm waters and waters rich in nitrogen and phosphorus that they absorb and store in large amounts.

Panahaha has good circulation yet high levels of nitrogen inside and out the pond. This may suggest nitrogen entering these waters from the homes just adjacent.

Based on this mixed data for nitrogen it is hard to infer that the fishponds are of worse water quality than the natural ambient water quality outside the fishponds and instead it could infer that the existing water quality criteria is not realistic.

Ammonia nitrogen. Low-level ammonia nitrogen may be present in water naturally as a result of the biological decay of plant and animal matter. Higher concentrations may be found in raw sewage, industrial effluents and fertilizers.

All of fishponds except Keawanui met most of the criteria (GeoMean not to exceed –> 3.50 ug/L) for ammonia nitrogen. Keawanui, both inside and outside the fishpond, had abnormally high levels of ammonia nitrogen (6.28 inside/6.48outside). All the other ponds geometric mean levels varied between 0.63 and 1.88). Keawanui also has high levels of nitrogen inside and outside the pond. A possible explanation for these phenomena could be the results of outfall of wastes associated with the commercial aquaculture facilities on the land immediately east (and up current) from the fishpond. For 'Ualapu'e, ammonia nitrogen concentrations were more than double within the fishpond than outside of it (both still well within the criteria [1.64/.79]). Aquaculture production and surrounding development could possible explain these differences.

Nitrate Nitrogen. Nitrate is an inorganic form of nitrogen that occurs naturally. It is also a component of atmospheric and wastewater pollution and elevated concentrations may be associated with acidification or indicative of wastewater pollution. Excess nitrate in receiving waters can stimulate algae growth and, as a result, deplete the supply of oxygen necessary to fish and disrupt the aquatic food chain.

None of the ponds met the criteria geomean (5.0 ug/L). Four of the ponds exceeded the criteria by more than 300% (14.8 – 19.6). Kahinapohaku exceeded the criteria by more the 500% (27.5).

It can be observed that nitrate concentrations inside all of the ponds are higher than outside the ponds possibly indicating that processes and/or activities occurring inside the pond are causing increased nitrate levels. Yet, the nitrate concentrations in nearly all of the ponds have lower values than the "control" pond. This later finding is not expected and may just indicate the natural variability of nitrate concentrations within these types of fishponds. Also note that even the lowest reading of nitrate nitrogen (8.08), outside of Keawanui, still exceeds the allowable criteria.

Total Phosphorus. Phosphorus is an essential element for plant life. Rainfall can cause varying amounts of phosphates to wash from soils into nearby waterways. Phosphate will stimulate the growth of plankton and aquatic plants that provide food for fish. This increased growth may cause an increase in the fish population and improve the overall water quality. However, if an excess of

phosphate enters the water, algae and aquatic plants will grow wildly, choke up the waterway and use up large amounts of oxygen.

Only Panahaha met the geometric mean criteria (16.71 ug/L) for total phosphorus (GeoMean not to exceed –> 20 ug/L). Keawanui and Niaupala exceeded the criteria by more than 200% (41.08 and 47.51). Kahinapohaku and 'Ualapu'e exceeded the criteria by more than 300% (66.75 and 68.39). Interesting to note there were wide differences between levels inside and outside the ponds. None of the samples outside the ponds met the criteria. The levels of phosphorus were more than double outside of Panahaha than inside (16.71 vs. 30.21). It may be that the aquaculture facilities just east (up current) of Panahaha are impacting the waters outside the pond. 'Ualapu'e had the largest difference between inside the pond and outside (68.39 vs. 33.41). This may be due to the aquaculture activities within the pond and runoff from surrounding development.

Chlorophyll-a. Measuring the amount of chlorophyll in a water sample gives us an estimate of the quantity of phytoplankton (microscopic plants also know as 'algae') living in the water. Among other valuable functions, algae are important food for fish and shellfish. When nutrient loading increases and algae blooms result, many problems may occur including fish kills due to lower levels of dissolved oxygen and the decrease in the clarity of the water. For fishponds, reduced circulation and the availability of nutrients stimulate algae growth, thus raise the level of chlorophyll-a in the water.

None of the ponds meet the criteria for chlorophyll-a per HAR 11-54 (GeoMean not to exceed –> 0.30 ug/L) and in fact even the lowest counts within a fishpond at (Panahaha) exceeded the criteria by 300%. As expected the ponds that have good circulation (Panahaha, Kahinapohaku) and the areas outside all of the ponds had the lowest levels of chlorophyll-a. The production pond 'Ualapu'e had the highest levels of chlorophyll-a (5.57). Production might not totally explain 'Ualapu'e's high chlorophyll-a counts. This is a well-protected fishpond will relatively poor circulation and many homes around it. Note the control pond Niaupala has no production, is well-protected, low circulation and high chlorophyll-a counts as well (4.27). Interesting to note that unlike most ponds where the chlorophyll-a levels drop significantly as you more outside the pond (i.e., 'Ualapu'e 5.57 vs.1.05) Keawanui's counts did not (1.72 vs.1.30). Also note that even the lowest readings outside of Kahinapohaku (.52)—an area considered by most observers as some of the cleanest, clearest and well circulated water on this stretch of coastline did not meet the criteria.

Turbidity. Turbidity within Moloka'i fishponds is the result of stirred up sediment caused by upslope soil erosion particularly during heavy rains and prevailing trade wind patterns. High levels of turbidity can restrict light penetration and limit photosynthesis. Sedimentation of soil particles may also smother fish eggs and destroy beneficial communities of bottom organisms such as bacteria.

None of the ponds meet the numeric criteria for turbidity in open coastal waters per HAR 11-54 (GeoMean not to exceed –> 0.50 NTU). As expected, outside the fishponds and those ponds that have good circulation, had the lowest levels of turbidity. Yet, even the lowest turbidity levels, found outside of Kahinapohaku (1.17) were over 200% greater than the criteria. While four of the ponds had a relatively similar range of turbidity (3.45 to 6.51), Niaupala, the control pond, was far higher (12.38). Greater still was the difference of turbidity readings outside of Niaupala compared to outside the other four ponds (6.09 vs. 1.17 to1.84).

Dissolved Oxygen. Dissolved oxygen (DO) is by far the most important chemical parameter in aquaculture. Low-dissolved oxygen levels are responsible for more fish kills, either directly or indirectly, than all other problems combined. Fish are not the only consumers of oxygen in aquaculture systems; bacteria, phytoplankton and zooplankton consume large quantities of oxygen as well. Decomposition of organic materials (algae, bacteria, and fish wastes) is the single greatest consumer of oxygen in aquaculture systems. Oxygen enters the water primarily through direct diffusion at the air-water interface and through plant photosynthesis. Direct diffusion is relatively insignificant unless there is considerable wind and wave action.

The criteria for DO (not less than 75% saturation, determined as a function of ambient water temperature and salinity) was met for 35% (34 of 97) of the samples taken in the study. Of the samples that met the criteria 60% (19 of 34) of them were from outside the fishponds. Dissolved oxygen concentration is an indirect measure of biological activity in the ponds. When there is high activity and poor circulation, then DO concentrations will decrease. The DO data for 'Ualapu'e pond indicate that there is significant biological activity and poor circulation since none of the samples inside the pond (21) met the criteria. Keawanui pond also seems to have high activity and poor circulation since 71% (17 of 24) of the samples were less than 75% of saturation. For Panahaha pond 35% (7 of 20) of the samples did not meet the criteria-- that may be indicative of better circulation since all of the samples from outside the pond were in compliance with the criteria. The data also shows how seasonal or temporal variation can affect the DO. All the ponds

sampled showed certain sampling dates more in compliance than other times. The extreme example being at Kahinapohaku, where on one day all the samples met the criteria, and during another sampling event none of the samples met the criteria. It appears the increase in water temperature was responsible for those samples not meeting the criteria.

Temperature. After oxygen, water temperature may be the single most important factor affecting the welfare of fish. Fish are cold-blooded organisms and assume approximately the same temperature as their surroundings. The temperature of the water affects the activity, behavior, feeding, growth, and reproduction of all fishes. Temperature also determines the amount of dissolved gases (oxygen, carbon dioxide, nitrogen, etc.) in the water. The cooler the water the more soluble the gas.

The criteria for temperature (shall not vary more than one degree Celsius from ambient conditions) was met 96% of the time (out of a total of 56 samples taken). Of the 8 samples that failed to meet the criteria, 6 of them occurred at Kahinapohaku on a single day. It is not known why eight samples did not meet the criteria; it could be due to localized warming within the pond due to a lack of good circulation.

Figure 35, Kahinapohaku Fishpond About Midway Through Wall Restoration.

4. Fishpond Demonstration Models for Permitting, Restoration, Education and Production.

This section focuses on four fishponds and the various challenges and lessons learned to bring them back to productive use: Kahinapohaku Fishpond, restoration; 'Ualapu'e Fishpond, establish aquaculture production and educational experiences; Panahaha Fishpond; obtain permits, restoration, production and Keawanui Fishpond, aquaculture production and educational experiences.

Kahinapohaku Fishpond

The art of fishpond restoration requires all the engineering genius, craft and sheer strength of the ancient Hawaiians. Kahinapohaku Fishpond lies on the far southeastern end of Moloka'i. It is known as a *loko kuapa*, or pond whose solid walls extend out in an arc into the ocean with the two ends of the wall connecting to the shore at distant points. *Loko kuapa* are considered unique to Hawai'i and an advancement in aquaculture practice because they contained *makaha* gates in the wall constructed of wood in a grate-like fashion that allowed for the control and management of fish stocks.

Figure 36, Kahinapohaku Fishpond.

The Restoration of Kahinapohaku was completed in January 2001. The fishpond is about 5 acres in size, enclosed by a 1,200-foot long wall that is 15 feet wide at its base, 5 feet wide at the top and 5 feet high. Rebuilding the rock wall that had eroded away over the centuries took nearly 15 months to complete with over 300 people participating in the effort. To rebuild the wall, stones

were excavated from inside and outside the pond and stacked in the traditional dry-stack fashion following the footprint of the original wall. Larger stones were placed by hand and *o'o* spade and interlocked, forming an inner and outer wall. Smaller rock, known as *'ili'ili*, were used as fill between these walls.

All of the rock used in the restoration was from the original wall. These stones were disbursed throughout the pond after years of wave action had deteriorated the wall. Using a barge constructed of plywood and 55-gallon drums, stones were retrieved from the pond basin and hauled across the pond to rebuild the wall.

In site preparation, new facilities were built to accommodate the workers and visitors to the site. We built a new 12ft. x 16ft. traditional *hale* house using modern material along with traditional wood posts and grass roof. The hale contains a 6ft.x8ft storage shed and a kitchen with sink and counter and work bench.

The Moloka'i Fishpond Trainees were trained in ancient art of dry stack rock wall construction techniques, archeological mapping of the wall remains (footprint), underwater survey methods, water quality monitoring procedures and health and safety procedures. In addition training in modern and traditional aquaculture methods and procedures was obtained, a work plan was developed and the land site prepared before restoration of the wall began. The training program ensured the wall reconfiguration, location and alignment of the fishpond wall were as accurate and true to the existing fabric of the fishpond as possible.

The revitalized fishpond stands as a tribute to the determination and hard work of the Aquaculture Trainees and all the people throughout the community who participated in helping to move rocks and rebuild the wall. It is equally a tribute to our ancestors who created this wonder, and to the coming generations of Moloka'i peoples for whom fishponds represent a rich and proud past and a hopeful future.

Since restoration, a resident family from the community has begun to organize as the *Hui Ohana 'O Naki* to accept responsibility for the care of the fishpond. They have indicated they would like to apply for a long-term lease from the state. It is the intent of Project Loko I'a, as part of our philosophy to build the capacity of and empower communities, to assist the *Hui Ohana 'O Naki* in the planning and permit applications they will be required to submit for a lease. In the meantime

the pond continues to be used informally for gathering and fishing by the community as it always has.

Figures 37-42;
Kahinapohaku Fishpond Restoration Project.

'Ualapu'e Fishpond

'Ualapu'e is a 22 acre fishpond located on the southeast end of Moloka'i. The pond was restored in 1989. Since restoration the fishpond has been used for *limu* seaweed and fish research, community education, and subsistence use by the community. In recent years the pond has been somewhat inactive. After Kahinapohaku fishpond was restored, Project Loko I'a's demonstration efforts focused on developing aquaculture production activities for research and training purposes at this pond. Activities accomplished at the site include net pen installation and fish culturing, development of a new earthen nursery pond system, construction of an open-sided teaching *hale*, major site improvements, training and education programs and hosting visitors.

Site Improvements. In March 2001, the Moloka'i Aquaculture Trainees started site preparation and building of a traditional *hale* at the 'Ualapu'e fishpond site. The Trainees collaborated with Maui County to collect and store the necessary rock materials for the project and later in July, about thirty visiting Canadian Indians and church group members assisted in hauling cinders and covering the access road and floor of the traditional *hale*. In August, one hundred twenty five young women from Oahu volunteered to participate on a workday at the pond. Over 20 Hoikaika participants worked at the fishpond alongside their Aquaculture Trainees team leaders providing help with site clearing, maintenance, and improvements (classroom construction, installation of storage shed and composing toilet), mangrove eradication, pond aquaculture and fishpond rebuilding.


Figure 43, *Hale* at 'Ualapu'e Fishpond.

Aquaculture Activities. Under the direction of one of our project partners, the University of Hawai'i – College of Tropical Agriculture and Human Resources, Project Loko I'a established hatchery and grow-out facilities consisting three 150 by 50 foot pens for nurseries and three round net pens of 7,500 square feet each for fish grow out (aerial photo of fishpond can be found on page 64).


Figure 44, 'Ualapu'e Fishpond. Taking Feed Out to the Net Pens.

The old earthen nursery system was reconnected to the main 'Ualapu'e fishpond. The nursery pond wall and channel were rebuilt and lined with rocks. A double-gated *makaha* gate was created allowing the natural recruitment of seed stock into the nursery. Upon opening the nursery, an estimated 2,000 to 3,000 striped mullet migrated into the two earthen ponds. Recruitment of milkfish that "run" during summer to late fall, was also realized but at much lower numbers than the mullet. Fish caught from the wild in the earthen nursery exhibit growth rates comparable or even better than our net pen nursery in the main pond.


Figure 45; Nursery Ponds.


Figure 46, Nursery Ponds Connection to Main Pond.

In addition to the fish stock reared in the nurseries, *awa* milkfish and mullet fingerlings were purchased from the Oceanic Institute on Oahu. The Mullet and *awa* required daily care, feeding, net pen maintenance, weekly water quality and monthly sampling.


Figure 47, Feeding the Fish.

Typical of an extensive (more natural) fishpond system, growth data showed weight increase at a slower rate than contemporary land-based aquaculture systems. *Awa* growth reaching "market-size" rates occurred in about twelve months. *Mullet* growth has been characteristically slower with anticipated "market-size" rates at about 18 months.


Figure 48, Mullet in Feeding.

Polyculture *limu* ogo (*Gracilaria)* was transplanted into all net pens that contain fish stocks. *Limu* ogo is highly prized edible seaweed that grows well in the nitrogen-enriched conditions common in net-pen fish production settings.

Freshwater runoff from the mountains during the winter season has significantly reduced the quality and quantity of the *limu ogo* growth trends we were experiencing. This has lead us to experiment with the design and implementation of alternative models of growing the *limu* in an attempt to deal with the periodic influx of fresh water these fishponds are going to experience because of their location along the shoreline, which often is at the mouth of streams or rivers, or adjacent to fresh water springs. Project staff designed and constructed floating cages built of PVC tubing and wire mesh that can be moved and anchored in different locations in the fishpond. It is anticipated that the ability to move these production cages to areas in the pond where the effects of the freshwater runoff during the winter months is not as significant can serve to mitigate the negative impact of the freshwater on *limu* growth.

Education Programs. Project Loko I'a staff have hosted over 1,000 people to the fishpond sites over the past three years. Most of visitors are school-aged children. However, the fishponds have hosted many teachers, university students, community members, cultural practitioners, researchers and scientists as well. In addition we have hosted several high profile groups to our fishpond projects including The White House Fellows, Nature Conservancy, Elder Hostel groups, State, County and Federal regulators, Kamehameha School Trustees and Department of Education curriculum writers. 'Ualapu'e is a particularly valuable learning environment as we have a covered *hale* which can accommodate large groups and the nursery and net pens that provide hands on experiences in aquaculture production (for full list of visitors, see Appendix G) .

The Future at 'Ualapu'e. The Hoikaika Program (see page 7) has taken over the 'Ualapu'e site as a training base. They provide a capacity building program focused on youth development through educational achievement, career development and leadership training. The students are paid interns (generally 10 participants per class) that do field work at the fishpond twice a week in aquaculture production and fishpond site maintenance. Staff consists of two full-time employees. The participants are able to earn college and high school science credits for their work at the fishpond.

Panahaha Fishpond

Panahaha Fishpond, located along the southwest coast of Moloka'i is 22 acres in size (see photo on page 39). The pond wall at medium tide is almost completely submerged. The fishpond is owned by the State of Hawai'i.

Project Loko I'a sought to obtain the permits, rebuild the fishpond and do aquaculture. Panahaha Fishpond was chosen for its good water quality, ability to rebuild the rock wall given the existing amount of rocks in the pond, lack of siltation and mangrove inundation and most importantly, access. Access to Panahaha is through a county-owned and maintained public access right of way. The public uses the access to take advantage of the beach along the pond shoreline, launch boats, swim, fish, drive, etc.

As previously mentioned in Section 2-Permit Streamlining, we had the Trainees fill out the permits to rebuild the fishpond for commercial aquaculture purposes. We quickly met strong opposition from homeowners who live in front of the fishpond. These two, a brother and sister, object to the proposed reuse and restoration of the pond citing (incorrectly) that our proposal would limit access to the pond and the current activities taking place there, degrade water quality and destroy this archeological site. We countered these erroneous and negative accusations which the owner's were spreading through the community by holding informational meetings to share with the community our plans and applications, meet with surrounding land owners and touching base with our *kupuna* elders, and completing a preliminary oral history of the pond.

As required, DLNR held a public hearing about our proposed plan. Over 100 people attended the meeting held at Moloka'i School in Kaunakakai on December 6, 2001. The overwhelming majority testified in favor of restoring this cultural treasure.

Subsequently, the Trainees held a Mana'e (east-end Moloka'i) community meeting at the Kilohana Elementary School that is located right near the fishpond to inform and answer questions about their proposed reuse of Panahaha Fishpond.

On December 26, 2001 the neighbors opposing our proposal filed a petition for a Contest Case hearing with DLNR. This in effect stopped dead the processing of our permits until the State Attorney General ruled if the opposing parties have "standing" to request the contested case. Twelve months later, December 2002, the contest case hearing petition was denied. We won the

case and would like someday to revive this project. However, the delays forced us to move onto other projects. As such our focus and energies have gone into making Keawanui Fishpond a successful operation incorporating aquaculture, research and educational activities for the community and off-island visitors.

Keawanui Fishpond

The home of Project Loko I'a is Keawanui Fishpond, a magnificent 73-acre pond, the largest on the island. Besides the fishpond waters the site contains a classroom, offices, water quality lab and visitors center. In February 2002 Project Loko I'a obtained a lease from the landowner, Kamehameha Schools. Government permits to operate the fishpond were obtained at the same time based on the Keawanui Management Plan that is included in this report (see Exhibit E).


Figure 49, Keawanui Fishpond.

Keawanui has played a crucial role in the success Project Loko I'a. It has serve as a base for all that we have accomplished. The site contains our administrative offices and a double-wide trailer that serves as a meeting place and classroom. We have a fully functioning water quality lab and trained staff to operate and maintain it.


Figure 50, Keawanui Fishpond Grounds. From left to right, storage container, lab, offices and classroom.

The work we have done and valuable lessons learned in the other fishponds has taken us to this step--creating a world-class research, production and educational institution at Keawanui that will serve as a model and resource for other fishpond practitioners throughout the state.

Figure 51, Native Plan Nursery at Keawanui.

Figure 52, Constructing the *Hale* at Keawanui.

Figure 53, Mangrove Study with University of Hawaii.

Figure 54, Walter Ritte Teaching Class.

Figure 55, Kalaniua Ritte, Joshua Kalua and Guy Naehu Show off the Rock Wall they Constructed for the Native Plan Garden at Keawanui.

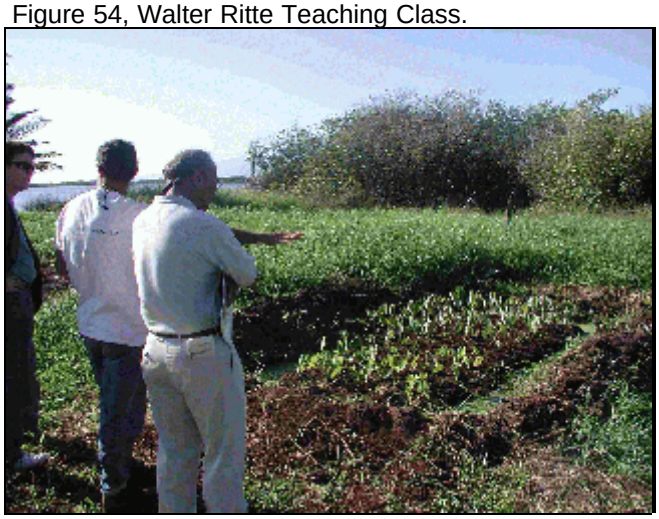


Figure 56, Taro Patch at Keawanui.

We have many partners assisting us with this goal. Much of the help comes from donated in-kind services. For instance, the land cost, the land clearing and preparation costs and the conceptual plans have all been donated from the landowner, Kamehameha Schools and the County of Maui. With the assistance and collaboration with the Oceanic Institute, University of Hawai'i (Institute for Maine Biology, Marine options program, College of tropical Agriculture and Human Resources, College of Engineering, Sea Grant), Kamehameha Schools and private planning consultants we have developed a long-range master plan for Keawanui Fishpond. The planning process was community led, culturally sensitive, with the goal of economic sustainability. The plan and listing of the partners involved can be found in Exhibit J.

The vision as stated in the Master Plan is to create the physical and organizational infrastructure necessary to support our goal of a world-class research, production and educational institution at Keawanui that is economically viable, environmentally sustainable and replicable.
To date, moving towards this vision, we have:

> Institutional Organization. Created The Hawaiian Learning Center and have re-energize the 501c3 non-for profit,. Moloka'i-based fishpond advocacy organization, Hui o Kuapa.

> Infrastructure. Repair and maintain Keawanui fishpond. With the assistance of the Country of Maui Department of Public Works we have cleared and landscaped a three acre site adjacent to the pond with a native plant garden, build a traditional *hale* open air house to accommodate visitors, build a walk through *ahupuaa* (watershed) park and a fish nursery.

> Production/Economic Development. Develop Diversified Aquaculture Products. We have net pens for growing fish and *limu.* We have also created a venture growing manmade "live rock" within the fishpond for the aquarium industry. Live Rock is manufactured from lightweight cinder and cement, placed in the ocean to obtain the necessary coverage of encrusted organisms, and then removed for sale. Hawaiian fishponds provide an exceptional culturing environment for live rock.

Figure 57, US Representative Ed Case visits Keawanui and inspects the Live Rock.

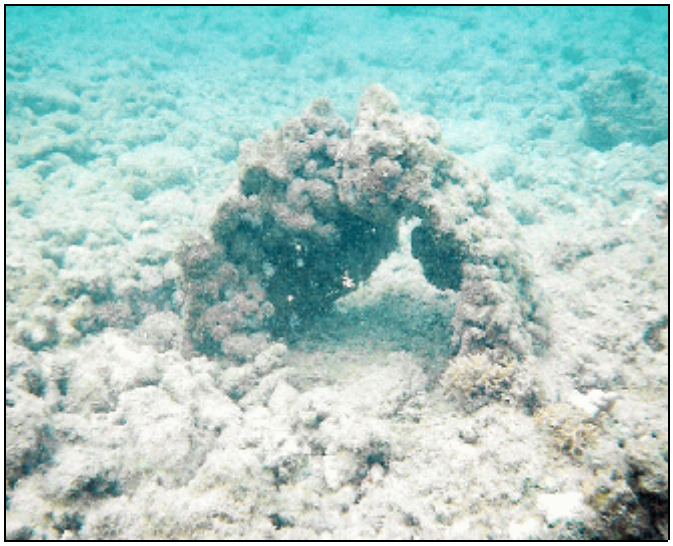


Figure 58, 59. Live Rock.

The ponds protect the rocks from human disruption while providing minimal turbidity and sedimentation, abundant sunlight, and moderate currents. While in the ocean, the rock acts as wild coral and helps to create a habitat for a myriad of sea life.

All forms of coral are illegal to sell, purchase, or possess in the state of Hawai'i. All forms of wild live rock (reef substrate) are also illegal. This manmade live rock is a perfect antidote to illegal coral mining that is happening all over the pacific to meet the demands of the saltwater aquarium market.

> Education. Project Loko I'a has hosted over 1,000 visitors to the Moloka'i fishponds over the past three years. We will continue to host day visitors to Keawanui Fishpond to teach them about the ancient fishpond and their connection to the cultural and land use patterns of past and their current role today. Project staff have completed the visitors infrastructure to allow visitors to experience hands on tank exhibits of fish, limu and coral that are in the fishpond, a walk through mini-ahupua'a (watershed) complete with native plan garden and visitors center.

Keawanui is the Moloka'i field site for teacher trainings and starting in 2005, hosting students using the Kahea Loko (Call of the Fishpond) Curriculum. Project Kahea Loko is funded by the U.S. Department of Education and managed by the Pacific American Foundation. The project focuses on the development of culturally relevant curricula using the fishponds to teach

science, social studies and language arts to students in the fourth to twelfth grade that meet current Hawai'i Department of Education content and performance standards. After three years of development, field testing, and training over 300 teachers, the final curricula is available and being actively used in Hawai'i schools. On Moloka'i four schools have signed up to use the curriculum. As such we expect to host 150 school children bi-monthly during the school year.

Summary. We have gone from rebuilding ancient fishponds, learning to work with government agencies and testing and analyzing water quality within fishponds to growing fish, *limu*, live rock, hosing visitor from throughout the world and providing a cultural sanctuary to teach our *opio* youth about their rich culture, their environment and the rewards that come from hard work.

There is saying in Hawai'i---in doing come knowledge. The demonstration projects proves that. We have amassed much knowledge and have become experts in fishpond restoration and reuse. We intend to share this with anyone interested. For instance, in the Spring 2005, we will be training the people on Maui how to rebuild their fishpond, Ko'ie'ie Fishpond in Kihei.

We continue to forge ahead with our work to develop Keawanui as the hub for new and diversified uses for Moloka'i fishponds. To be a base of education, training and research. To host school children, host conferences and workshops. To develop a diverse range of aquaculture products and be a place of collaboration between community members, scientists, researchers, entrepreneurs and cultural practitioners. Everyday the fishponds teach us something new. We are truly rediscovering a whole body of lost knowledge; and with that comes trial and error—finding a way in this modern world that the fishpond can once again thrive through active reuse. We're finding that fishponds are and need to be many things to "work" --a place, a focal point, where science, education, tradition and hard work all come together to create a community of learners, teachers, researchers and producers.

5. Production and Marketing Strategies of Pond Reared Aquaculture Products

Production within fishponds include the cultivation of fish, *limu* seaweed and live rock. Our goal was to use the various fishponds we had at our disposal to investigate and document the grow out and marketing potential of various pond-reared products.

Fish.

Production. Under the direction of our UH partner, CTAHR, three 150 by 50 foot pens for nurseries and three round net pens of 7,500 square feet for fish grow out were constructed and stocked in 'Ualapu'e Fishpond (see page 64 for aerial picture of fishpond with net pens).

Species stocked within the net pens were mullet, *'ama'ama* (Mugil cephalic), milkfish *awa* (Chanos chanos). Edible seaweed *limu ogo* (Gracilaria sp.) was incorporated into the fish culture as a multi-cropping fishpond product.

Stocking density followed the extensive to semi-intensive stocking practices (approximately 800-1,200 lbs./acre/year), as suggested by aquaculture technical experts at the Oceanic Institute and UH-Grant.

PVC netting started at 1/4" mesh for fry from 1" to 2" and takes 3-4 months to reach fingerling (4 inch) size. The animals were transferred to a ½" mesh net pen at 6-inch size and then into 3/4" for final grow-out.

Seedstock was acquired from the Oceanic Institute on Oahu. About 6,000 fry were stocked in the net pens. It is important to note that the fry need to be at

Figure 60, Feeding the Fish at 'Ualapu'e.

Figure 61, Measuring Awa Length.

minimal size @ 25 to 35 mm. OI has always experienced better transfer and survival rates with larger fish.

Feed. The high protein recommended fish food Rangen was used for feeding animals. Newly stocked fry are fed 2 times per day at 5-6% body weight. Grow-out fish are fed once to twice a day at 3% body weight. Feed conversion efficiency (FCE) or food conversion ratio (FCR) studies identify as 1:1 (Ako) or the equivalent of 1 pound of feed for 1 pound of fish growth. This is a very efficient conversion equivalency.

It is also important to note that the feeding rates above represent a closed system, without the benefits of supplemental foods. The culture of fish in fishpond net pens provides a large variety of supplemental food, such as micro/macro phytoplankton and zooplankton.

Data Records. Daily recording of activities include water quality, feeding, net pen cleaning, weather and animal observations. Daily water quality data includes: dissolved oxygen, tide, temperature and salinity. Animals are sampled monthly for growth and general health. Feed rates are adjusted based on size, weight and total standing biomass calculations.

Figure 62, Awa in Holding Bin.

Figure 63, Mike Weeks Weighing Awa.

This type of net pen operation is intended to provide a yield not exceeding 1,500 pounds of fish per acre of water per year.[12] Typical of an extensive (more natural) fishpond system, growth data showed weight increase at a slower rate than contemporary land-based aquaculture systems. *Awa* growth reaching "market-size" rates occurred in about twelve months. *Mullet* growth has been characteristically slower with anticipated "market-size" rates at about 18 months. Survival rates varied widely between 20 and 60 percent of the original stock population. A typical stocking scenario per net pen enclosure would be an initial 3,000 *pua* fry that after 12 to 18 months would yield between 600 pounds of fish (low, 20 percent survival rate) to 1,800 pounds of fish (high, 60 percent survival rate).

Costs. The typical cost of materials for a 5,000 square foot net pen and *limu* production is about $2,500. Estimated labor to construct the pen is about 128 hours. The operation of the net pen for one year, including daily feeding and cleaning of the pen, monthly monitoring and annual harvests requires about 472 hours. Total labor for a one-year operation is about 600 hours. Feed costs are estimated to be about $1,300. Assuming a labor rate of $10.00 per hour, and a 10 percent contingency factor for miscellaneous operational expenses, the total capital, labor and operating cost for one net pen for Year One is approximately $9,680. As capital costs of net pen

[2]The historic Hawaiian pond has been estimated to have an average yield of about 300 pounds of fish per acre of water per year.

[3]Production rates of 1,500 pounds per year are low and are very unlikely to cause adverse impacts to surrounding water quality – avoidance of such impacts is one of the primary reasons for selecting a model of production which is sustainable under a variety of conditions and with low investment costs.

and limu growing equipment is not a factor, operating expenses for following years is about $7,000.

Assuming a sale price to the grower of $3.00 per pound, the annual gross income per net pen would be $1,800 for low yield (20 percent survival rate) and $5,400 for high yield (60 percent survival rate). Based on this, we estimate profit of about $900 is realized in year three.

Marketing. In typical Moloka'i style, most net pen reared fish have been shared among the workers, used as gifts, or if sold, done off the "back of the truck" at about $2.00 to $3.00 per pound.

Two on-island vendors have expressed interest in test marketing our mullet and milkfish catch. Friendly Market is interested in milkfish at $2.00 per pound wholesale, while Misak's Market is willing to purchase mullet at $3.00 per pound, wholesale. To do so, we require a aquaculture Facilities Permit (from DLNR-Department of Aquatic Resources) for the fishpond and a Aquaculture Dealers Permit as a vendor of fish products.

Limu.

Polyculture seaweed *limu* ogo (*Gracilaria)* production is grown in net pen systems by transplanting *limu* stock into net pens that contain fish stocks. *Limu* ogo is highly prized edible seaweed that grows well in the nitrogen-enriched conditions common in net pen fish production systems. Nitrogen, which is a by-product of fish cultures, is a critical nutrient to grow limu and thus as a side benefit, limu cultivation reduces the ambient nitrogen levels within the fishpond.

Limu seedstock was developed with the assistance of Ke Kua Aina Hanauna Hou at their hatchery in Puko'o. River rocks are collected and inoculated with spores that go through a nursery phase. Later, juvenile sporlings are be transported to each pen culture for grow-out.

We have found 'Ualapu'e is a perfect environment for the production of *limu*. *Gracilaria* favors low exposure to wind, wave action and water motion. Yields from this pond were competitive with tank-culture yields of *Gracilaria*.

The costs for *limu* production, including baskets, anchoring devises and sporlings is about $1,500. The *limu ogo* grow out rate has been about 50 lbs. per week. The cooperative Ke Kua Aina Hanauna Hou buys *limu* at a farm gate price ranging from $1.75-3.00 per pound.

Figure 64. Moloka'i raised limu ogo finds its way to The Tropical Fish and Vegetable Market on Oahu (Craig T. Kojima, Star-Bulletin).

Live Rock

Moloka`i Live Rock is manufactured from light-weight cinder and cement, placed in the ocean to obtain the necessary coverage of encrusted organisms, and then removed for sale. It is entirely man-made and can be shaped and designed to any shape or size. The rocks are grown in the fishponds which provide an exceptional culturing environment.

Live Rock is an integral part of a saltwater aquarium ecosystem. It is used in aquariums of all shapes and sizes to create mini-reefs. Live rock is used by individual hobbyists with small tanks to public aquariums, hotels, and restaurants who maintain very large capacity tanks.

In 2000, The World Resources Institute and Reef Check reported that the international aquarium hobbyists continue to increase at 10–30% annually; consequently trade in wild live rock has increased nearly 1700% since 1988[5]. In our marketing of live rock we have identified three customers: (1) Hotels and Restaurants, (2) Pet Retailers, and (3) Individual Consumers.

To date we have sold over one ton of live rock at the current wholesale price $3.00 per pound. We have about eight tons of rock in the water "growing." Incubation time is about 4-6 months. All of our permits are in place. We anticipate the Moloka`i Live Rock business should turn a steady profit of over $35,000 in Year 4. A copy of the business plan can be found in Appendix H.

[5] "Threats to Coral Reefs", EMS.org – Environmental Media Services. [Online]. Available:www.ems.org.

Although not impressive by for-profit business standards, culturing products in a Hawaiian fishpond can provide a modest profit over the long-term. This is only one aspect or component of the overall historic Hawaiian pond restoration and operation process. In this context, equally beneficial outcomes accrue to the community and to pond owners (both private and public) because of the improved stewardship that occur because of the commitment by fishpond operators to maintain (and in certain instances, restore) the ponds. For Project Loko I'a this is in keeping with the ultimate goal of our non-profit for which production activities help support its mission of research, education, conservation and cultural preservation.

Fig. 65. 'Ualapu'e Fishpond. Note 3 Rectangle 5,000sq Ft. Nursery Net Pens and 3 Round 7,500sq. Ft Grow Out Pens.

Fig. 66, Collecting *Pua* Baby Fish in the Nursery Pond at Keawanui.

6. Staff Development and Training

Moloka'i Aquaculture Training Program.

Twelve young men and women from the Moloka'i community were selected to join the Kia'i Loko (guardians of the fishpond) a.k.a., The Moloka'i Fishpond Aquaculture Training Program (Trainees). Project Loko I'a staff and numerous partners organized and developed a program designed to teach skills related to the restoration and reuse of the Moloka'i fishponds.

The list of training activities include:

- Basic Aquaculture understanding
- Traditional Hawaiian aquaculture systems
- Water quality assessment
- Instrumentation
- Math-metric/conversions/measurements
- Finfish aquaculture
- Fishpond economics
- Loko i'a restoration assessment/design/construction
- *Limu s*eaweed production
- Regulatory permits relating to fishpond restoration
- Environmental Stewardship
- Seedstock and transfer technology
- Marketing and product distribution
- Entrepreneurship micro-enterprise training
- Cultural training
- Leadership training

(For the detailed list of training activities, please refer to Appendix G).

Aquaculture Training Program highlights include:

Trainees at Oceanic Institute. Oceanic Institute (OI) is a not-for-profit research and development organization dedicated to marine aquaculture, biotechnology, and coastal resource management. The Trainees spend a month at OI gaining hands-on experience using OI's extensive laboratory, maturation, hatchery, and pond facilities. OI has a 25-year

Fig. 67, Loko I'a Trainees at The Oceanic Institute.


Fig 68, Dr. Babcock and Guy Naehu in the lab.

history of work force training projects conducting training sessions for students and farmers from all over the world. The Trainees learned milkfish and mullet fry production; shrimp maturation, hatchery management and intensive grow out, and feed production and evaluation. They raised milkfish *awa* from the hatching stage--ready to serve as stock for the fishponds. Upon completion of the training, the Moloka'i students took back a portion of the fish they helped rear.

Water Quality Assessment Training. As part the QAP study we have a trailer that contains a water quality laboratory located at Keawanui Fishpond. We also have a boat to take the off-shore water samples. Three trainees received instruction on how to conduct water quality sampling, lab analysis of the samples and maintenance and upkeep of the lab. Dr. Roger Babcock, Professor at the University of Hawai'i in Environmental Engineer and a water quality specialist provided the training.

University of Hawai'i Native Hawaiian Leadership Program. The Native Hawaiian Leadership Program (NHLTP) is funded by the U.S. Department of Education, Native Hawaiian Higher Education Act. The program advocates that leadership is essential for success and education represents one key to becoming a successful leader. Through counseling, mentoring and community service, NHLTP strives to develop leadership skills in program participants. Manu Kaiama, Principal Investigator, strongly supported the fishpond endeavor by flying in qualified trainers to Moloka'i monthly from March-September 2001 to teach our young adults leadership and community involvement skills.

Cultural Training. Experts from throughout the State came to Moloka'i to provided instruction in various aspects of Hawaiian cultural traditions. These include taro cultivation, *uala* sweet

potato cultivation, rock wall building, woodworking, *lomi lomi* massage, *lauhala* plaiting and cordage, tattooing.

Fig. 79, Traditional Hawaiian Implements Crafted by Project Loko I'a Trainees.

Business Training. Professor Wayne Tanna, Chaminade University, visited Moloka'i to provide business training that focused on starting a small business in Hawai'i. He has offered to help the Panahaha Fishpond group to set up their initial business structure. The Panahaha Hui also met with Barry Gay of Maui Economic Opportunity, Inc., to apply for micro loans and to establish a good credit history.

Oahu Field Trip. In February 2002 ten Trainees spent a week on Oahu for aquaculture and business training and general industry "networking" opportunities. Itinerary included State and County government officials and permit regulators, The Oceanic institute, Coconut Island (University of Hawai'i Institute of Maine Biology), Honolulu Aquarium, Anuenue Fisheries, He'eia Fishpond on Kaneohe Bay, Business training at HACBED (Hawai'i Alliance for Community-based Economic Development) and Native Hawaiian Legal Counsel Training.

Maui Ocean Center. In April 2002 the Trainees spent 5 days as interns at the Maui Ocean Center. The Trainees worked alongside staff at this stat-of-the-art aquarium facility learning about fish and reef ecology, aquarium tank maintenance, fish and sea life propagation, feeding and maintenance and water quality analysis.

Moloka'i Community Outreach. As detailed in Section 1, staff and Trainees conducted community outreach through school visits, hosting Loko I'a Night, writing news articles, visiting government officials and elected representatives and holding position on local boards and commissions. These activities gave the Project Loko I'a staff valuable experience in public speaking, writing skills and community leadership.

Other training highlights include attending the Coral Reef Ecosystems of the Northwestern Hawaiian Islands seminar at Kulana 'Oiwi, Moloka'i; attending the Hawai'i Aquaculture Conference, Honolulu; clam cultivation training with Lui Kwan on the Big Island; master

Fig. 80, 81; Hands-on Dry Stack Rock Wall Building Class at Kulala O'Iwi.

stone builder Billy Fields' three-day dry stack rock wall building class and scuba training and certification in Kihei, Maui.

Three of the Aquaculture Trainees, Josh Kalua, Hano Naehu and Kalaniua Ritte are currently enrolled at Maui Community College taking courses with the goal of obtaining a Certificate from the UH Oceanography Department's Marine Options Program.

Fig 82, Kalaniua Ritte, Guy Naeha, Josh Kalua at Moloka'i Education Center, Maui Community College.

Fig 83, Loko I'a Crew with Maui Mayor Kimo Apana.

Fig. 84, Bill Kekahuna, Josh Kalua, Guy Naehu, Kalaniua Ritte, Walter Ritte, Scott Adams and Jason Gamiao visiting with Senator Kalani English.

Fig 85, Hawaii Institute of Marine Biology at Coconut Island, Oahu. Outdoor Tanks.

Fig 86, Project Loko I'a Crew Investigates the *Makaha* at He'eia Fishpond, Oahu.

Fig. 87, Project Loko I'a Visits with Honolulu Mayor Jeremy Harris.

Fig 88, Loko I'a Crew on Coconut Island.

Fig 89, Guy Naehu and Joe Farber at Maui Ocean Center.

Fig 90, Teamwork Building Class at HACBED (Hawai`i Alliance for Community-Based Economic Development) Oahu.

Fig 91, Tour of Anuenue Fisheries Indoor Facilities, Oahu.

Fig 92, Tank Raised *Limu* - Anuenue Fisheries.

Fig. 93, Kalaniua Ritte, Brandon Lima, Josh Kalua, Bill Kekahuna, Scott Adams, Guy Naehu, Walter Ritte and Melody Kahinu visit with Representative Ronald Davis at the Hawai'i State Capitol.

Figure 94, Walter Ritte Meets with Dr. Gary Pruder (far left) and Jim Muratsuchi (far right) at the Oceanic Institute.

7. Neighbor Island Outreach

As Project Loko I'a has progressed we have gained the skills and knowledge to be a resource for others who wish to rehabilitate fishponds. We see it as our responsibility to collaborate with other communities throughout the state. Our goal is to share what we know and network with others to form a strong alliance of fishpond users and advocates. To that end, Project Loko I'a has done the following neighbor island outreach:

Maui. In October 2000 Project staff visited Ko'ie'ie and Hana Fishponds performing wall and water quality assessments, and at Hana, participating in a community workday to repair a section of the fishpond wall. In addition, the staff conducted presentations on Project Loko I'a for Lahainaluna High School's Alternative Learning Center and a community workshop in Hana. The staff also received training on native fish species at the Maui Ocean Center Aquarium (in 2002 the Trainees interned at the Maui Ocean Center for five days).

These visits were well received by the Maui community and were publicized in the local Maui newspaper (see Appendix A). More importantly, the trip served as an opportunity for the staff to share their knowledge and experience with other groups and communities who have an interest in fishpond restoration and operation. It was a growing experience for the Trainees to share their knowledge with others, enabling them to realize the depth and breadth of the knowledge they had gained.

A particular highlight of the Maui outreach has been networking with the Ko'ie'ie Fishpond

Fig. 95, Project Loko I'a at Ko'ie'ie Fishpond, Maui.

Fig. 96, Site Assessment and Water Quality Analysis.


Fig. 97 Site Assessment at Ko'ieie Fishpond.


Fig. 98, Mike Weeks Conducting Water Quality Analysis.

group. This non-profit 501c3, Ao ao Na Loko I'a o Maui, is in the process of obtaining their permits to restore Ko'ie'ie Fishpond for educational and cultural purposes. Project Loko I'a has formed a strong working relationship with this group. In 2004 Ao ao o Na Loko I'a o Maui hired the Trainees to conduct periodic water quality checks, perform beach profiles and do a fishpond wall assessment. In the spring of 2005 the Moloka'i Trainees will be instructing the core group of people who will be rebuilding the fishpond wall the art of dry-stack rock wall construction.

Hawai'i Island. Consulted with Edith Kanakaole Foundation and surveyed Keokaha (Hilo) fishponds. Meet with community members and help put together a strategic planning session in Ka'u with those interested in restoring one of their fishponds. Visited with the master wall builders and their on-going restoration project at Kaloko Fishpond (part of Kaloko-Honokohau National Historical Park). We also visited the ponds at Punaluu, Ninole and Honuapo.


Fig 99, Master Stone Workmanship at Koloko Fishpond, Hawai'i Island.

Kaua'i. Consulted with the Waipa Foundation, a community-based non-profit organization dedicated to stewardship and restoration of their *ahupuaa* watershed that contains a fishpond.

Oahu. In January 2001 we visited and collaborated with fishpond practitioners at Waikalua, He'eia and Moli'i Fishponds. We also made a presentation to a community working group that was formed as part of the revitalization of He'eia by the owner of the pond, Kamehameha Schools. As a result of this trip, Kamehameha Schools and Project Loko I'a agreed to explore opportunities for a partnership to develop He'eia Fishpond as an educational resource.

Fig. 100, The Fishpond as Outdoor Classroom. School Kids at Waikalua Loko Fishpond, Oahu.

Since that trip in 2001 we have established a strong working relationship with *Paepae 'o He'eia*, the non-profit organization that is restoring He'eia Fishpond, growing fish and limu and has established a curriculum program for students visiting the site. Currently, they have three Hawai'i public charter schools visiting He'eia Fishpond weekly in addition to hosting children from Kamehameha Schools.

Along with *Paepae 'o He'eia* we co-sponsored a statewide fishpond conference by and for fishpond operators at He'eia Fishpond in Sept 2004. Over 70 people representing fishpond operators, non-profit foundations, government officials, educators, scientists, entrepreneurs, and interested community members attended the two day event.

Fig 101, Under the Mango Tree at He'eia Fishpond.

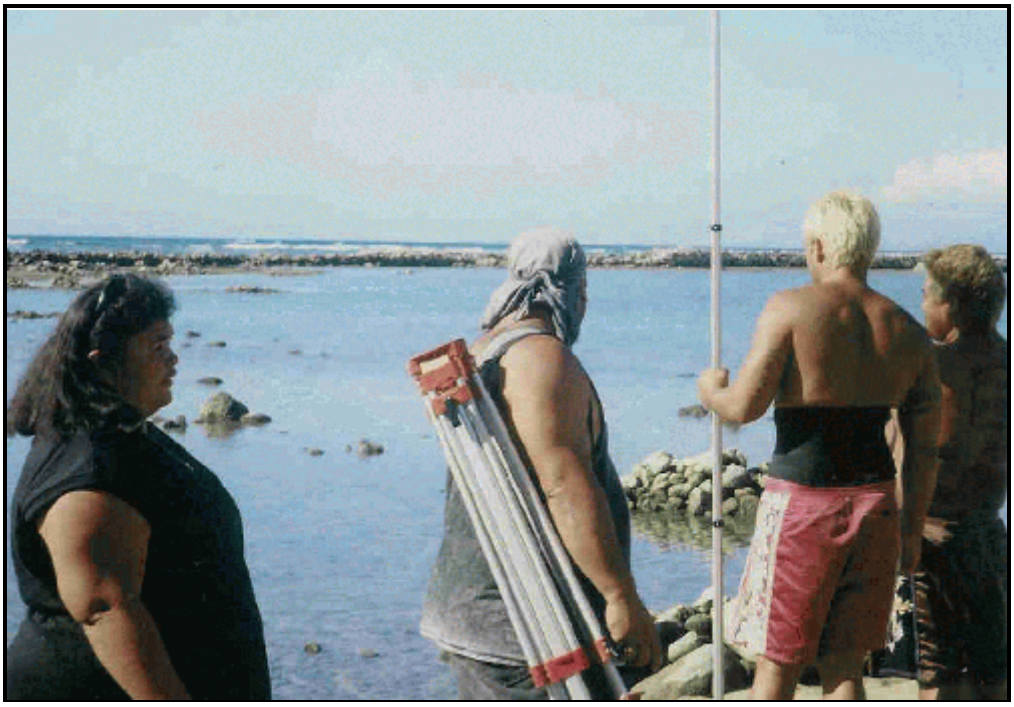


Figure 102, Ancient Fishpond, Modern Tools. Rebuilding Kahinapohaku Fishpond.

Conclusion

We envision a Moloka'i that leaves for its children a visible legacy: an island momona (abundant) with natural and cultural resources, people who kokua (help) and look after one another, and a community that strives to build an even better future on the pa 'a (firm) foundation left to us by those whose iwi (bones) guard our land.

The Moloka'i Vision Statement
Moloka'i Rural Enterprise Community

Through Project Loko I'a we have advanced the desires and vision of the People of Moloka'i. We have created the physical infrastructure and trained the human resources to:

> Focus on the capacity building of the Moloka'i Community.
> Provide educational benefits for all age groups.
> Contribute traditional and scientific knowledge to the already existing body of knowledge concerning Native Hawaiian fishponds.
> Provide a venue for economic and employment diversification on Moloka'i.
> Restor and reuse fishponds that serve as a model for other fishpond initiatives.

Most importantly we have changed the perception of fishponds and their value in today's world. We have turned around public and government perception that fishpond were a thing of the past. Through restoration we have created awareness: That culture is important. We have changed government and have changed the Community.

Planning studies sponsored by the State in 1987 recommended that a number of fishponds be zoning-reclassified from conservation to rural and redeveloped as recreational boat harbors, a public swimming lagoon and for rural development.[6] Today this could never happen. We now have a community that no longer views these ponds as rubble but as an important link the Hawaiians have to their elders and as valuable cultural treasures; much

[6] DHM Planners, Inc. and Public Archaeology Section, Applied Research Group, Bernice Pauahi Bishop Museum 1989. *Hawaiian Fishpond Study: Islands of Oahu, Moloka'i and Hawai'i*.

like taro cultivation, Hawaiian language, hula and navigation—Hawaiian things that are to be rediscover as they have resonance and meaning to our lives today.

All our efforts move forward the vision to create a fishpond industry on the island, provide jobs and contribute and strengthen the core values of a traditional subsistence lifestyle that is cherished by the Moloka'i community.

Figure 103, Keawanui Fishpond, Ka'amola.