CONSERVATION PRACTICES FOR NATIVE WILDLIFE HABITAT ON WETLAND TARO FARMS

FINAL REPORT
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Executive Summary

 Wetland taro or *kalo* (*Colocasia esculenta*) is cultivated in flooded terraces typically carved from rich alluvial soils. Five Listed Endangered (LE) waterbirds such as the Hawaiian Moorhen (Alae ula, *Gallinula chloropus sandvicensis*) and at least 25 species of migratory waterfowl and shorebirds use taro farms. Taro farming is an agricultural tradition of the people of Hawaii. Native fish and wildlife occupy an important aesthetic, cultural, and ecological niche. However, the fauna that remain are a remnant of the diversity of species that once inhabited these islands. My overall objective was to develop conservation practices that increase the chances of survival and reproduction of the Hawaiian and migratory species, and are compatible with farm goals.

Between October 2003 and May 2004, I interviewed 21 taro farmers on 3 Hawaiian Islands and 55 specialists in Hawaii and the Pacific including taro experts, wildlife biologists, extension agents, and environmental advocates. Interviews were valuable for identifying stakeholders, issues, and practices. I incorporated these practices into Practice Standard 646 (Shallow Water Development and Management for Wildlife) and new Biology Technical Note 12 (Native Wildlife Habitat on Wetland Taro Farms). I present a strategy that targets broad-based, long-term conservation goals, addresses top resource concerns of farmers and community, and makes sustainable practices (particularly wildlife conservation and endangered species management) economically viable for taro farmers. I conclude that programs for taro farmers that include these aspects would be more widely accepted than those that do not.

Project Objectives

The objectives were to develop conservation practices for native wildlife habitat on wetland taro farms, and prepare technical documents to support planning and implementation of Farm Bill programs. I accomplished this by:

1) Interviewing taro farmers, wildlife biologists, and other experts;

2) Identifying major resource concerns for taro farmers and native wildlife (particularly endangered species);

3) Finding common solutions to major problems at the taro × wildlife interface; and

4) Defining practices that enhance wildlife habitat and promote sustainable taro farming.

Methods

First, I reviewed literature on native wildlife and taro farming for Hawaii and the Pacific Islands. Second, I met with NRCS resource and field staff on Kauai, Maui, Oahu, and Hawaii to better understand issues and information needs. Third, I used non-probability snowball sampling to setup interviews and site visits with taro farmers on Kauai, Maui, and Hawaii, and meetings with specialists in taro culture, anthropology, planning, wetlands, and wildlife. Questions were not standardized due to the exploratory, multidisciplinary approach of the research. Finally, I summarized interview results by discipline, evaluated costs and benefits of increasing native wildlife on taro farms, and identified primary resource concerns of farmers and wildlife and related conservation practices.

Findings

Little has been published on native wildlife on taro farms. I encountered predominantly gray literature from Hanalei NWR (National Wildlife Refuge) on Kauai. Between October 8, 2003 and May 28, 2004, I interviewed 21 taro farmers on 3 Hawaiian Islands and 55 specialists in Hawaii, Guam, and American Samoa including taro experts, wildlife biologists, extension agents, and environmental advocates. The interviews were valuable in identifying stakeholders, issues, and practices. A summary of resource

concerns and commonalities for endangered waterbirds and taro farmers is presented in Table 1.

Table 1 Resource concerns for endangered waterbirds and taro farmers (note common concerns)

Endangered Waterbirds	Taro Farmers
o Water quality / sedimentation o Introduced competitors (e.g., domestic ducks?) o Invasive plants smother wetlands o Feral ungulates can trample nests o Introduced predators (e.g., dogs, cats, mongooses) o Limited habitat diversity o Limited suitable breeding areas o Fluctuating water levels during breeding may result in nest loss o Herbicide treatments during breeding can limit food and cover o Regular human activity	o Soil loss o Crop loss due to apple snail invasion o Expenses for weed control o Crop damage by feral ungulates o Livestock loss due to wild dogs and mongooses o Potential crop damage by endangered Hawaiian Coot (infrequent) o Taro pathogens (e.g., *Phytophthora, Pythium*) o Lack of infrastructure to meet water needs o Lack of land or open patches to meet production demands o Lack of land or open patches to fallow o Farmland conversion to non-agricultural uses o Potential increase in regulations on farm (e.g., Endangered Species Act, Clean Water Act)

Unexpectedly, I found several invasive species that not only threaten the future of the taro industry, but also are harmful or potentially so to native wildlife habitats and watershed functions (Table 2).

Table 2 Direct and indirect effects of some invasive species on taro, wildlife, and watershed function

Invasive species	Taro Farms	Native Wildlife	Watershed Function
Apple Snails	D	I	I?
Crayfish	D	D	D
Feral Mallards		D	
Mallard Breeds	D	D?	
Cattle Egrets		D	
Feral Pigs	D	D	D
Feral Horses	D	D?	D
Feral Dogs	D	D	
Feral Cats	D	D	
Mongooses	D	D	
Phytophthora leaf blight	D	I?	I?
Pythium root rot	D	I?	I?
Weeds (e.g., *Egeria*)	D	D	D

D = Direct Impact (economic or ecological); I = Indirect Impact (economic, in species structure, water or soil quality, or secondary effects of taro being replaced by invasive plants); based on interview results

For example, voracious feeding apple snails (*Pomacea* spp.) have been implicated in the decline of native species and loss of ecosystem integrity in Southeast Asia (Cowie

2002). In Hawaii, “It has rapidly become the most serious pest of taro . . . “ (Lach et al. 2000). Control agents such as molluscicides or introduced snail predators may deplete food resources and further confound recovery of endangered Hawaiian waterbirds. Apple snails are agricultural pests in Southeast-Asia and the Pacific Islands - a regional concern.

Within the West Region, American Samoa is one area that may benefit from the information compiled for this project. Wetland birds include the candidate (C1) Spotless Crake (*Porzana tabuensis*), Purple Swamphen (*Porphyrio porphyrio*), and rare Gray Duck (*Anas superciliosa*). Aunuu in Tutuila and Tau, Ofu, and Olosega in the Manua group are major taro cultivation areas. In 1999, the territory produced 8.3 mil lbs (2.9 for sale, 5.4 for consumption) valued at $15.1 mil ($5.1 for sale, $10 mil for consumption) on 971 ac (NASS 2003). Farmers have the opportunity to enroll in the USDA/DOE School Lunch Program, which locks in a higher market value (0.60-0.90/lb). The American Samoa field staff is currently addressing nutrient and erosion problems of piggeries through EQIP, and other programs are limited (e.g., no territorial plan for WHIP in place); however, taro farming is an area worth exploring. The field staff may be able to build on a Hawaii model in the future (Wallace Jennings, Soil Conservationist, pers. comm.).

In Hawaii, the long-term trend for taro production is negative with a record low of 5 mil lbs in 2003, down 18% from 2002. However, price per lb (0.54) is at a record high and demand remains relatively stable. Martin (2004) attributes this to adverse weather, disease, and pests such as apple snails. Farmers and extension agents confirmed that taro farming has become more challenging in recent years due to more obstacles. Major obstacles appear to be invasive species, lack of infrastructure, and reduced yield (due to other 2 obstacles and smaller corm size). Native wildlife habitat was a priority for about 3 of the farmers I interviewed. The majority had many large issues on their minds but they expressed interest in improving wildlife habitat, and restoring wildlife back to what they experienced in childhood.

In March 2004, the Waimea field staff held an informational session on WHIP and other programs, potluck-style at the Mock Chew farm in Waipio Valley. The landowners that attended (about 13) asked thoughtful questions about conflicts with domestic ducks for apple snail control and increasing regulations. Farmers were interested in adopting a fallow rotation but said they did not have enough patches to fallow and fill orders. Though difficult to gauge at this stage, there is a good level of interest in assistance to open up more patches, rehab ditches, and concurrently improve habitat for Hawaiian fish and wildlife. In Waipio, there is a shortage of open patches (not land); whereas, on Kauai there is an apparent shortage of land for taro production. Two Waipio farmers offered their farms for future pilot studies. Likewise, 2 farmers (including a poi factory owner) on Maui and 1 large producer on Kauai volunteered their farms for research.

In addition, 2 poster presentations were made to the conservation community:

1) Invasions in Taro Lo`i: Issues for Farmers and Endangered Wildlife, presented at the Hawaii Conservation Alliance annual conference, Honolulu, Hawaii, June 28-30, 2004; and

2) Conservation Practices to Enhance Wildlife Habitat on Taro Farms in the Hawaiian Islands, presented at the Soil and Water Conservation Society annual conference, St. Paul, MN, July 25-27, 2004.

At the Hawaii conference, several people inquired about Farm Bill programs. Incidentally, it seems that working with taro farmers has conservation, socioeconomic, and cultural appeal that few other farming types carry (Not to imply that the taro and wildlife topic is free of controversy - it is not). From the comments received, I believe that future programs would be well supported by the Hawaii conservation community. This was also reflected in the peer review of Biology Technical Note 12 and related documents. A multi-disciplinary panel of 30 experts that included farmers reviewed documents.

Conclusions and Recommendations

To meet my original objectives and address the unique challenges at the taro × wildlife interface, I modified standards and specifications for Practice 646 Shallow Water Development and Management for Wildlife and developed 2 Biology Technical Notes to

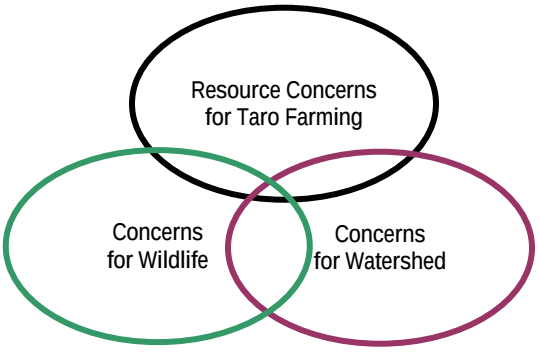
provide the background and justification for the practices. I also outlined a program strategy, which could be implemented via Farm Bill Programs such as EQIP or WHIP, that promotes taro farming, wildlife conservation, and watershed health as well as supports the cultural heritage of the Pacific Islands.

Documents Prepared for Taro and Wildlife Programs

1) Practice Standard for Shallow Water Development and Management for Wildlife (646)
2) Practice Specifications for Shallow Water Development and Management for Wildlife (646)
3) Biology Technical Note 12 - Native Wildlife Habitat on Wetland Taro Farms
4) Biology Technical Note 13 - Endangered Hawaiian Waterbird Distribution Maps
5) Program Concept for Implementation of Practice 646

Based on Hanalei NWR research, a wet fallow for taro farming and wetlands habitat management for wildlife have several attributes in common. Practice 646 is well suited to promote the common benefits. Under Practice 646, for example, the farmer could adopt a fallow rotation and agree to wet fallow a small portion of the farm (5-25%). The agreed portion would be fallowed for a 6-month to 3-year period when water levels and vegetation would be managed for habitat (includes a dry fallow and disking every 1-2 years). After this fallow period, the portion would be put back into taro production and an adjacent portion fallowed, so the agreed upon acreage would remain fallow. At the end of each year the farmer would be compensated for managing the fallow portion for native waterbirds (See Program Concept).

Wildlife Benefits
- More diversity of habitat types
- Increase forage
- Increase breeding opportunities
- Offer resting and feeding areas will less human disturbance



Farm Benefits
- Rest fields
- Regenerate competitive soil microbes
- Help break disease cycles
- Incorporate nutrients into soil
- Waterbirds reduce weed seed and other pests
- Reduce management costs

Other Recommendations:

1) Work closely with farmer co-ops and associations in conservation planning and allow smaller farms to pool acreages and resources;

2) Assist farmers with watershed level management (e.g., water management, ditch rehabilitation, invasive species) through Federal/State programs;

3) Address resource problems that will result in the greatest benefit for taro farming, native wildlife, and watershed functions (e.g., fencing, pest control, underground pipelines; see Technical Note 12 - Wildlife Habitat on Wetland Taro Farms);

4) Promote sustainable pest control methods (e.g., avoid use of invasive species to control invasive species);

5) Establish a crop disaster program that would reimburse taro growers for crop loss from endangered wildlife, if and when it occurs;

6) Modify NRCS engineering specs to allow some flexibility for taro systems;

7) Explore setting up a Programmatic Section 7 Safe Harbor Agreement for NRCS-landowners concerned about increased regulation due to increased presence of endangered species on the enrolled property (Fish and Wildlife Service voluntary program that encourages landowners to benefit endangered species while giving landowners assurances from additional restrictions);

8) Make wildlife conservation economically viable for taro farmers with Farm Bill and other programs; and

9) Develop outreach materials;

Research Needs

- Long-term sustainable control methods for apple snails
- Wildlife-friendly conservation cover, cover crop, green manure
- Practical methods to control mammalian predators on farmlands
- Effective wildlife monitoring programs for farmers
- Cause and effect of crop depredation by coots
- Compatibility of organic certification program with fallow rotation and wildlife habitat
- Fair compensation rates for habitat “services” provided by good stewards
- Pilot study on 2 islands for Practice 646

REFERENCES

Cowie, R. 2002. Apple snails (Ampulariidae) as agricultural pests: their biology, impacts and management. In Barker, G. M. ed. Molluscs as Crop Pests. p. 145-192.

Lach, L., Britton, D. K., Rundell, R. J. and R. H. Cowie. 2000. Food preferences and reproductive plasticity in an invasive freshwater snail. Biological Invasions 2: 279-288.

Martin, D. A. 2004. Hawaii Taro. Hawaii Agricultural Statistics Service. http:/www.naass.usda.gov/hi/vegetble/xtaro02.pdf.

National Agricultural Statistics Service (NASS): American Samoa Statistics – Yearbook Series, 2000 Statistical Yearbook. American Samoa Government, Department of Commerce. http:/www.amsamoa.com/2000YB/2000yearbookwebsite.htm.