The 1999 Hawai‘i Conservation Conference

July 27-28, 1999
Honolulu, Hawai‘i

Sponsored by the Secretariat for Conservation Biology

The annual Hawai‘i Conservation Conference is the largest gathering of people actively involved in the protection and management of Hawai‘i’s native species and ecosystems. The purpose of the conference is to facilitate interaction among resource managers and the scientific community. It is an opportunity to discuss and obtain up-to-date information on a variety of conservation activities in Hawai‘i. It is also a time to see old friends, meet new colleagues and form new partnerships. We all have something to gain when we when we gather together to share experiences and ideas.

Please join us in welcoming Senator Bob Nakata, Chair, Committee on Labor and Environment who will provide insight and useful advice on how we can be more effective and successful at the State Legislature. A well developed political strategy is essential if we are to forestall impending dramatic losses to Hawai‘i’s natural heritage. It is critical that we bring an appreciation of Hawai‘i’s natural resources to the attention of the appropriate policy makers.

At this year’s conference, members of the Secretariat for Conservation Biology’s Advisory Group will provide an overview of their collective effort to develop a shared conservation strategy, based on lesson learned from the past decade. Seven guiding concepts have been adopted by the group to serve as the underlying foundation for a conservation strategy, as well as a draft document that outlines specific recommendations. The conservation strategy highlights the importance of mobilizing diverse groups to work in partnership towards Hawaiian conservation. A first-hand look at some exciting examples of diverse and successful partnerships in Hawai‘i and elsewhere will be presented during the conference.

Following the lead of previous year’s conferences, plenary sessions and poster presentations focus on increased scientific understanding and management techniques. Concurrent panels are offered to discuss specific conservation issues. Panel moderators will introduce each issue, prior to dividing into the separate panels.

A list of current research projects in terrestrial conservation biology has been compiled and is provided in the conference booklet. We hope to update this list periodically and make it available on the Secretariat for Conservation Biology’s website. We encourage resource managers to contact researchers to relevant scientific information that will help them manage the natural areas under their care.

To help plan future conferences, there is an evaluation form in the conference booklet for participants to fill out. Please do so and turn it in before you leave. Mahalo for your support and participation.

Conference Organizing Committee:

Randy Bartlett, Maui Land and Pine Company
Joan Canfield, USGS Biological Resources Division
Coleen Cory, The Nature Conservancy of Hawai‘i
Betsy Gagne, State Department of Land and Natural Resources, Division of Forestry and Wildlife
Nancy Glover, Secretariat for Conservation Biology
Cathleen Hodges, Haleakalā National Park
Moani Pai, Secretariat for Conservation Biology
Maile Sakamoto, State Department of Land and Natural Resources, Division of Forestry and Wildlife
Carol Terry, State Department of Land and Natural Resources, Division of Forestry and Wildlife
Ron Walker, US Fish and Wildlife Service
Bruce Wilcox, Institute for Sustainable Development

MID PACIFIC CONFERENCE CENTER

Hilton Hawaiian Village

Plenary Sessions*:* Coral Ballroom III

Lunch: Coral Ballroom IV

Poster Session: Coral Lounge and Coral Ballroom II

Concurrent Panels:

Hawai‘i Conservation Initiative: **Coral Ballroom I**
Prioritizing Areas for Conservation Action: **Nautilus I & II**
Developing a Public Awareness and Outreach Coalition: **Ti Leaf**
The Hawai‘i Coral Reef Initiative: **Coral Ballroom III**
Fire Prevention, Behavior and Effects: **South Pacific Ballroom III**

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CONFERENCE PARTICIPANTS

HAWAII ALOHA

PLENARY PANEL

Working with Native Hawaiians and Local Communities: Lessons Learned

A community-based conservation strategy requires resisting the urgent apparent need to protect and manage important conservation areas directly, and instead act first by investing time in people and community organizations. Strategies and programs are needed that provide native people and communities with the means and decision making power that will enable them to take management of important conservation areas into their own hands, and to do this with confidence. To have the patience to formulate and implement conservation programs together with native people and communities is perhaps the major challenge for conservation management in the coming decades.

A number of innovative efforts are underway in Hawai‘i towards engaging and empowering native people and communities to make decisions, design and undertake conservation programs. Yet they face difficult challenges in fully engaging native people and communities in conservation decisions such as overcoming communication barriers, enhancing the distribution of information and resources, and finding ways to cope with inevitable conflicts.

The panel is composed of individuals who represent the wide variation in types and degrees of community-based conservation action. Panelists have been asked to briefly discuss the kind of conservation activities pursued but, more importantly, to provide insights on how to effectively work in partnership with native people and communities. Each panelist will share their experience, knowledge and thoughts on the skills needed to make native people and local communities the beneficiaries and custodians of conservation efforts.

Moderator:

Cynthia Rezentes, President, O‘ahu Resource Conservation and Development Council

Panelists:

Ed Misaki, The Nature Conservancy of Hawai‘i
John and Tweetie Lind, Kīpahulu Ohana
Mike Kido, UH Hawai‘i Stream Research Center

PROGRAM

Tuesday, July 27, 1999

8:00 a.m. *Welcome:* **Aulani Wilhelm**, Secretariat for Conservation Biology

OPENING SESSION

Moderator: Kathy Ewel, Secretariat Advisory Group Member, US Forest Service

8:10 a.m. *Opening Address:* **Tim Johns**, Chairperson, State Department of Land and Natural Resources

8:30 a.m. *Keynote Address:* Insights on Working Effectively and Successfully at the State Legislature
Senator Bob Nakata, Chair of the Committee on Labor and Environment

9:15 a.m. Guiding Concepts for Hawaiian Conservation: Moving Forward on a Shared Conservation Strategy
Secretariat Advisory Group Members: **Michael Buck**, State Department of Land and Natural Resources, Division of Forestry and Wildlife; **Sam Gon III**, The Nature Conservancy and **Robert Smith**, US Fish and Wildlife Service

9:45 a.m. Chicago Wilderness: A Partnership Model for Biodiversity Conservation
Debra Moskovits and **Laurel Ross**, The Field Museum and The Nature Conservancy Illinois

10:15 a.m. BREAK

11:00 a.m. *Panel:* Working with Native Hawaiians and Local Communities: Lessons Learned
Moderator: Cynthia Rezentes, O'ahu Resource Conservation & Development Council

Moloka'i Community Enterprise Watershed Project
Ed Misaki, The Nature Conservancy of Hawai'i

Kīpahulu 'Ohana and Haleakalā National Park: Working Together
John and Tweetie Lind, Kīpahulu 'Ohana

Hanalei American Heritage River Initiative
Mike Kido, University of Hawai'i, Hawai'i Stream Research Center

12:00 p.m. LUNCH

SUCCESSFUL PARTNERSHIPS

Moderator: Carol Terry, State Department of Land and Natural Resources, Division of Forestry and Wildlife

1:30 p.m. Mucking in the Mud: A Collaborative Conservation Effort amongst Educators, Landowners and Resource Managers.
Diana King, Hawai'i Nature Center

1:50 p.m. Research and Management Interaction on O'ahu Army Lands
Joby Rohrer, Mathew Burt, Alvin Char, Vince Costello, Jordon Jokiel, Kapua Kawelo, Mathew Keir and Steven Kim, US Army Garrison O'ahu, Environmental Division

2:10 p.m. Maui Nēnē: Working Together
Cathleen Hodges, John Medeiros and Barbara McIlraith. Haleakalā National Park, State Department of Land and Natural Resources Division of Forestry and Wildlife and The Peregrine Fund

2:30 p.m. BREAK

3:15 p.m. *"Under the Hawaiian Sky"* An environmental play by ʻŌhia Productions

4:00 p.m. Poster Session

5:30 p.m. Cocktail Reception: No-host bar and pupus

Wednesday, July 28, 1999

RECOVERY PLANS

Moderator: Joan Canfield, USGS Biological Resources Division, Pacific Island Ecosystems Research Center

8:15 a.m. Using the Intellectual Talents of Universities to Enrich Management and Policy: Case Studies in Analysis of Recovery Plans
Dee Boersma, University of Washington, Department of Zoology

8:40 a.m. Development of Participation-Based Recovery Programs
Margaret Dupree, National Marine Fisheries Service, The Pacific Islands Area Office

CONCURRENT PANELS

9:00 a.m. Introduction to Concurrent Panels

Hawaiʻi Conservation Initiative: Moving Forward on a Shared Conservation Strategy
Michael Buck, Secretariat Advisory Group Member, State Division of Forestry and Wildlife

Prioritizing Areas for Conservation Action
Sam Gon III, Secretariat Advisory Group Member, The Nature Conservancy of Hawaiʻi

The Partnership to Preserve Paradise: Developing a Public Awareness and Outreach Coalition
Aulani Wilhelm, Secretariat for Conservation Biology

The Hawaiʻi Coral Reef Initiative
Michael Hamnett, University of Hawaiʻi at Manoa, Social Sciences Research Institute

Fire Prevention, Behavior and Effects
Jack Ewel, US Forest Service, Institute of Pacific Islands Forestry

9:40 a.m. BREAK

10:00 a.m. Concurrent Panels

12:00 p.m. LUNCH
Presentation of the Secretariat for Conservation Biology's Distinguished Service Awards

ALIEN SPECIES

Moderator: David Duffy, Pacific Cooperative Studies Unit / UH Botany Department

1:30 p.m. Predicting Invasive Plants in the Hawaiian Islands
Curt Daehler and Debbie Carino, University of Hawai‘i, Department of Botany

1:50 p.m. Monitoring Weed Control Operations: Results, Outcomes and Decisions
Chris Buddenhagen and Julie Geritzlehner, Department of Conservation, New Zealand

2:10 p.m. Assessing the Impact of Biocontrol on Hawai‘i’s Koa Bug
Tracy Johnson, Peter Follett, Vince Jones and Andy Taylor. University of Hawai‘i, Departments of Entomology and Zoology, and USDA-ARS

RESTORATION

Moderator: Marie Bruegmann, US Fish and Wildlife Service

2:30 p.m. Mycorrhizae in Hawai‘i: Incidence in the Flora and Evolutionary Implications
Jane Gemma and Richard Koske, University of Rhode Island, Department of Biological Sciences

2:50 p.m. Mycorrhizae in the Hawaiian Flora: Implications for Restoration
Richard Koske and Jane Gemma, University of Rhode Island, Department of Biological Sciences

3:10 p.m. Dryland Forest Restoration at Puu-o-kali, Maui
Art Medeiros and Arik Arikaki, US Geological Survey, Biological Resources Division and Department of Hawaiian Home Lands

3:30 p.m. BREAK

FOREST BIRDS

Moderator: Paul Conry, State Department of Land and Natural Resources, Division of Forestry and Wildlife

4:00 p.m. Puaiohi: Captive Propagation and Release of an Endangered Hawaiian Solitaire
Alan Lieberman, Cyndi Kuehler, Peter Harrity, Marla Kuhn, Joop Kuhn, Lynne Neibaur, Paul Oesterle, Tracey Powers and John Turner, The Peregrine Fund

4:20 p.m. Behavior of a Reintroduced Population of the Critically Endangered Puaiohi
Erik Tweed, Jeff Foster and Bethany Woodworth, US Geological Survey, Biological Resources Division

4:40 p.m. Effects of Disease and Predator Removal on Demography of O‘ahu ‘Elepaio
Eric VanderWerf and David Smith. University of Hawai‘i, Department of Zoology and State DLNR Division of Forestry and Wildlife

5:00 p.m. Presentation of Student Award
CLOSING

Hawai‘i Conservation Initiative: Moving Forward on a Shared Conservation Strategy

Location: Coral Ballroom I

The Secretariat Advisory Group is committed to the challenge of securing an increase in federal funding for Hawaiian biodiversity conservation. To do so, a clear and concise conservation strategy is needed that outlines a collaborative vision and creates a sustainable argument for national participation in Hawaiian conservation issues. The strategy will seek to involve a broad coalition of government agencies and interface with current national initiatives. To begin developing a vision and strategy, the Secretariat Advisory Group took a look at the 10 action items outlined in the 1991 document “Hawai‘i’s Extinction Crisis: A Call to Action” and discussed accomplishments and lessons learned in the past eight years. Seven guiding concepts were adopted by the Secretariat Advisory Group to serve as the underlying foundation for a Hawaiian conservation strategy. The *Hawai‘i Conservation Initiative* has been drafted to facilitate discussion on a shared conservation strategy. It includes general recommendations on how additional federal funds could be used advance the protection and management of Hawai‘i’s native ecosystems. The Secretariat Advisory Group welcomes comments on the seven guiding concepts and solicits wider opinion on the draft *Hawai‘i Conservation Initiative* during this panel. Draft legislation that the Hawai‘i Congressional delegation is considering to fund conservation activities will also be discussed.

Secretariat Advisory Group Members:

Michael Buck, State Department of Land and Natural Resources, Division of Forestry and Wildlife
Kathy Ewel, US Forest Service, Institute of Pacific Islands Forestry
Bryan Harry, U.S. National Park Service
Ken Kaneshiro, University of Hawai‘i at Manoa, Center for Conservation Research and Training
Robert Smith, US Fish and Wildlife Service, Pacific Islands Ecoregion
Bill Steiner, USGS Biological Resources Division, Pacific Island Ecosystem Research Center

Prioritizing Areas for Conservation Action

Location: Nautilus I & II

Panelists will discuss the approaches that they have taken to set priorities for their recent conservation actions, describing the information base and decision support systems that were available to them, as well as how they weighed and interpreted the information to arrive at strategic decisions that set their organization/agency on its current path. Discussion of shared data sets and the importance of interagency meetings to enhance priority-setting will be presented. Advantages and problems of shared data sets will also be reviewed.

Moderator:

Sam Gon III, The Nature Conservancy of Hawai‘i

Panelists:

Sam Gon III, The Nature Conservancy of Hawai‘i
Jim Jacobi, USGS Biological Resources Division, Pacific Island Ecosystem Research Center
Randy Kennedy, State Department of Land and Natural Resources, Division of Forestry and Wildlife
Stephen Miller, US Fish and Wildlife Service

The Partnership to Preserve Paradise: Developing a Public Awareness and Outreach Coalition

Location: Ti Leaf

Conservation organizations in Hawai‘i have long recognized the need for a more unified and effective public awareness initiative. A better informed and educated public is essential if resource managers, researchers, and educators are to fulfill their collective mandate. But how do we make conservation relevant to people’s lives? And how do we build a broader public constituency that supports our efforts? As a first step toward achieving those ends, this panel session will present a model for establishing a multi-agency public awareness partnership. Special panel guests Debra Moskovits and Laurel Ross from Chicago Wilderness will share their experience on how they went about building an effective multi-agency conservation partnership in America’s urban heartland - and the lessons it may hold for Hawaii. Attendees should come prepared to provide input on the partnership model and to participate in an interactive discussion on how to move the public awareness initiative forward.

Moderator: Kim Payton, Organization Psychologist

Special Guests: Debra Moskovits and Laurel Ross, Chicago Wilderness

Panelists: Public Awareness Steering Committee

Aulani Wilhelm, Secretariat for Conservation Biology
Grady Timmons, The Nature Conservancy of Hawai‘i
Barbara Maxfield, US Fish and Wildlife Service
Neal Evenhuis, Bishop Museum
Leona Laniawe, USGS Biological Resources Division
Pauline Sato, The Nature Conservancy of Hawai‘i

The Hawai‘i Coral Reef Initiative

Location: Coral Ballroom III

In June 1998, the University of Hawai‘i established the Hawai‘i Coral Reef Initiative (HCRI) Research Program with the primary purpose to support monitoring and research activities aimed at building capacity to effectively manage Hawai‘i’s coral reef ecosystems. The moderator will give an overview of the HCRI, followed by presentations by panelists describing the various HCRI activities.

Moderator:

Michael Hamnett, University of Hawai‘i at Manoa, Social Sciences Research Institute

Panelists:

Coral Reef Assessment and Monitoring Program
Paul Jokiel, University of Hawai‘i at Manoa, Hawai‘i Institute of Marine Biology

Fish, Algal and Coral Ecology Team
Ernst Reese, University of Hawai‘i at Manoa, Department of Zoology

Genetic Variation and Status in Hawaiian Coral Species
George Roderick, University of Hawai‘i at Manoa, Center for Conservation Research and Training

Kāne‘ohe Bay Decision-Support System
Rikki Dunsmore, University of Hawai‘i at Manoa, Department of Geography

Strategic Planing, Collaboration and Project Management
Kristine Davidson Oh, University of Hawai‘i at Manoa, Social Sciences Research Institute

Fire Prevention, Behavior and Effects

Location: South Pacific Ballroom III

Moderator:

Jack Ewel, US Forest Service, Institute for Pacific Islands Forestry

Panelists:

Fire is a potent environmental factor in many Hawaiian ecosystems. It has the potential to be both an agent of destruction and a tool in protection. The five panelists who will contribute to this breakout session are **Dr. Jan Beyers**, Plant Ecologist (impacts of fire on threatened and endangered species), and **Dr. Francis Fujioka**, Meteorologist (fire danger and behavior), both of the US Forest Service's Pacific Southwest Research Station, Riverside Fire Laboratory; **Mr. Wayne F. Ching**, Protection Forester, State of Hawai'i Department of Land and Natural Resources, Division of Forestry and Wildlife; **Dr. Sara Hotchkiss** (paleo - and ecosystem – ecologist, Hawaiian ecosystems), Stanford University and University of Wisconsin (pending confirmation); and **Mr. Ray Quintanar** (fire prevention and suppression), Director, Fire and Aviation Management, US Forest Service, Region 5 (California, Hawaii, and other Pacific islands).

GUIDING CONCEPTS FOR HAWAIIAN CONSERVATION

DRAFT July 1999

The leadership of the Secretariat for Conservation Biology is committed to the following guiding concepts for conservation policy development and resource management in Hawai'i. We believe that the integration and application of these concepts is critical to the future success of our cooperative conservation efforts in Hawai'i. These concepts reflect a compilation of many years of experience in the field by an array of Federal, State, County and private agencies and concerned individuals. They also reflect the lessons learned since the release of the 1991 Extinction Crisis report and our efforts along the 10 major actions proposed therein. They underscore the challenging realities of some of the most daunting biodiversity recovery efforts in the nation and serve as the underlying foundation for the specific recommendations included in the draft Hawaiian Conservation Initiative.

1 CONSERVATION PARTNERSHIPS AT THE LANDSCAPE LEVEL

Small preserves and sanctuaries are not a viable long-term strategy for biodiversity preservation for Hawai'i. We will manage for endangered species recovery and native ecosystem maintenance at a landscape level, addressing not only core protected areas, but encouraging the full range of adjacent land uses that contribute to habitat needs. Working at the landscape level requires and enhances public-private partnerships for conservation. It also requires us to recognize a fuller range of landscape values (e.g., watersheds, culture, recreation) that may provide a more meaningful connection to the majority of Hawai'i's citizens, rather than only strict biodiversity values.

2 LOCAL COMMUNITY SUPPORT

The support of the Hawaiian people and local communities are needed to successfully recover Hawai'i's endangered species. Traditional uses and cultural concerns of native Hawaiians and members of the local community should be recognized, respected, and appropriately accommodated whenever possible. While leadership for and integration of resource management agendas is needed at the top, support for long term programs must come from below, driven by the values and concerns of local community members. Without ground-level support, we will not achieve long-term success.

3 OUTREACH STRESSING POSITIVE CONNECTIONS

An organized communication and outreach strategy is needed to build up understanding and support for recovery programs. Our organized communication strategy should stress what we are saving, not only what we are losing. Our conservation constituencies can be expanded by connecting biodiversity issues to quality of life issues with consistent messages delivered by a diverse range of messengers and media.

4 HABITAT MANAGEMENT GROUNDED IN SCIENCE

We will not be able to save all of Hawai‘i's unique species. While efforts are needed to save species on the brink, we believe the best long-term recovery strategy is expanded habitat management. Affecting ecosystem-level processes provides the greatest benefit to the largest number of native species. Predator control, and the control and prevention of invasion of damaging alien species are priorities. With limited resources, we will need to assure our efforts are coordinated and driven by good science. Science must combine the ecological, social, and economic components of land use if management systems are to remain viable in the long term. Many of our resource allocation decisions will be based on a comparative risk analysis that will need performance based measures that are sensitive to the uncertainty that will be faced.

5 RESEARCH, TRAINING AND EDUCATION

There is a need to offer locally focused, locally available education so the people of Hawai‘i can assume leadership roles in charting the future of Hawai‘i's natural resources. This can be achieved by enhancing, expanding, and integrating capabilities of research, training and education programs focused on conservation and natural resource management. Specific programs and curriculum improvements, relevant research, and training success should be used as focal points and catalysts for additional development of programs at all levels of education and within the training programs of all the participants in the conservation community.

6 PLANNING, INVENTORIES AND MONITORING

Our ability to monitor change and the effectiveness of our conservation management is not adequate. We need to further develop multi-resource inventories and monitoring programs of Hawai‘i's native and naturalized habitats (both resources and threats to those resources). There is a particular need to improve the design of inventory and monitoring systems to permit more efficient updating. A centralized system to coordinate and integrate resource information from the various agencies and organizations that collect resource data is desirable, as is an organized approach to promulgate the data to colleagues and ensure adaptive changes in management from that feedback.

7 CONSERVATION IN LAND POLICY

We need to develop and communicate the connections between conservation and economic goals, especially with Hawai‘i's tourism sector and watershed issues. These connections must underlie land use decisions in Hawai‘i rather than be viewed as peripheral or as obstacles. If endangered species and native ecosystems continue to be perceived as a liability, there will be little long-term recovery success, especially on private lands. Policy changes and incentive programs that encourage voluntary cooperation of private owners to protect native species and landscapes remain a priority. A foundation of native ecosystem protection in nascent Hawaiian sovereignty movements should be encouraged.

HAWAI‘I CONSERVATION INITIATIVE

DRAFT July 1999

LEGACY 2000: Preserving Hawai‘i’s Natural Heritage for Future Generations

Hawai‘i’s natural environment is the backbone of its economy. Our island’s white sand beaches, crystal clear waters, and clear blue skies draw millions of visitors each year. Forming the backdrop for this tropical paradise are our verdant green rainforests on each island. But these rainforests provide more than just a beautiful setting for beach-going tourists:

- they are the source of all of our island’s fresh water supply,
- they protect our world-class beaches and reefs from runoff and sediment,
- they help moderate our cool climate, and
- they provide habitat for one-third of our nation’s endangered plants and birds.

They are also some of the most threatened rain forests in the world.

As was outlined in the 1992 multi-agency report, “Hawai‘i’s Extinction Crisis: A Call to Action,” Hawai‘i has already lost two-thirds of its native forest cover, including half of its rainforests -- and with them, countless species of plants, animals, and insects found nowhere else in the world. More than one-third of our nation’s endangered plants and birds are Hawaiian species, and 75% of the extinctions ever recorded in the U.S. have been from Hawai‘i. While we will never know the value of what we have lost, we do know what it will take to save what remains. What follows is an ambitious conservation agenda, designed to stop the wave of extinction that is sweeping over the Hawaiian Islands, and ensure that future generations enjoy a natural quality of life in the islands equal to that of their forebears.

Despite the best efforts of Hawai‘i’s conservation organizations and government agencies to implement the Call to Action over the past seven years, budgets have been tight, and species continue to slide toward extinction. In order to successfully protect Hawai‘i’s unique natural heritage, we must profoundly accelerate the level of management reaching the ground. To do this, we must significantly increase the amount of funding and the number of people working for conservation. The $200 million, 5-year Legacy 2000 Initiative is designed to do just that.

The centerpiece of Legacy 2000 is a community-based conservation program that provides funding for landowners and communities who undertake highly-leveraged conservation projects in priority areas around the state. Complementing this program are five additional components designed to benefit all conservation sites and community partnerships by addressing issues that effect them all, including:

- Education and Outreach
- Building state conservation capacity
- Supporting our federal parks and refuges
- Alien species prevention
- Rare species rescue
- Research and information technology

Program Components

The Community Conservation Fund

The Community Conservation Fund is based on the recognition of the vital role that landowners and communities must play in any successful conservation program. Our successes with the East and West Maui Watershed, ‘Ōla‘a-Kīlauea, and East Moloka‘i Partnerships have convinced us that the future of conservation is dependent upon our ability to build meaningful partnerships with landowners and communities to protect the resources that we all depend upon for our high quality of life.

This community-based conservation program is designed to increase the number of community partnerships working

in key conservation areas around the state by providing technical assistance and matching funds to community partnerships which:

- Bring effective conservation to high-priority lands for native biodiversity.
- Are linked with the protection or restoration of key watersheds and adjoining coastal and marine systems.
- Are designed and implemented by partnerships of landowners, community members, and others effected by the targeted native habitats.
- Promote island-wide or district-wide strategies to restore systems and reduce threats (e.g., a Maui-wide strategy for alien pest prevention).
- Promote economic solutions to ecological problems (e.g., a sustainable koa forestry project that also successfully restores native biodiversity).
- Identify long-term funding strategies to carry the projects beyond the period of these grants.
- Demonstrate success which can be exported nationally and globally to promote community-based conservation partnerships.

Our goal is to establish a fund that can generate up to $5 million in grants per year. Grants will be distributed competitively, and administered by a designated federal agency (e.g., U.S. Fish and Wildlife Service), in partnership with the State and/or a local community foundation.

Education and Outreach

This approach of involving communities more deeply in conservation requires an informed and caring public. Yet, as Hawai‘i’s population becomes increasingly urbanized, engaging the public in problems of the natural environment requires more innovative and assertive approaches. The proposed Education and Outreach portion of Legacy 2000 includes three distinct components designed to increase public understanding of the issues and involvement in the solutions.

1. Public Awareness Program: This 5-year, $3 million initiative is designed to increase community-wide understanding of the need to protect native Hawaiian ecosystems through a variety of public service advertising, broad media campaigns, education programs, events, travelling displays and community outreach activities. It will also provide information to communities interested in participating in the grant program.
2. Environmental Community Learning and Technology Centers: A $5 million network of Environmental Community Learning and Technology Centers will involve students in after-school and summer programs to increase awareness and understanding of their natural environment, and improve overall academic performance. Adult education courses will also be offered to involve parents and community members. The Centers will focus on integrating environmental education with cultural, science, and technology education.
3. Environmental College Preparation and Awareness Program: This $3 million initiative will award multi-year grants to locally-designed partnerships among middle and high schools, colleges, universities, government agencies, nonprofit organizations and businesses to provide mentoring, counseling, internships and scholarships which encourage students to choose careers in environmental fields. Environmental related careers fall under a wide range of disciplines, including natural and social science, engineering, planning, policy, journalism, communications, etc.

Together, these three components are designed to build a general awareness level within the larger community of the global conservation issues facing us here in Hawai‘i, and then provide outlets for those individuals who want to learn and do more to protect our islands natural heritage.

Building State Capacity for Conservation

Building private sector conservation capacity will not be enough to reverse the tide of extinction if the state government cannot manage the nearly one million acres of natural lands under their care. In order to ensure that the state can undertake their share of Hawai‘i’s immense responsibility for protecting our nations natural treasures, the federal government must increase support for under-funded state conservation programs in the islands.

As stewards of nearly half of the state’s most important native habitat and over one-third of the nation’s threatened and endangered plants and birds, the State Department of Land and Natural Resources is the most important land manager in Hawaiian conservation. Many of the private lands targeted under the community partnerships are adjacent to critical state lands also in need of management. Yet, these lands aren’t adequately managed and the Department

remains woefully under-funded to meet its obligations. In recognition of the national importance of the Department's work, and of the State's limited financial capacity, the federal government must provide $5 million annually for critical state conservation programs, such as management of the Natural Area and Forest Reserves Systems, in order to ensure that the federal mandate of protecting our natural heritage is met nationwide. For if we fail in Hawai'i, we fail as a nation.

Federal Parks, Refuges and Military Training Areas

National parks and refuges protect some of Hawai'i's most treasured natural resources and are central to the larger-scale, community-based conservation programs envisioned by this initiative. Haleakalā National Park on Maui, for example, has been a catalyst for the East Maui Watershed Partnership which now involves all of the major landowners surrounding the park in collaborative conservation at a landscape scale. Keeping our Hawaiian national parks and refuges healthy is a first priority in the proposed Hawai'i conservation initiative. To do this, Congress must:

1. Provide $5 million annually for the next 5 years for acquisition of key private lands, including McCandless Ranch as an addition to the Kona Forest Unit of Hakalau NWR, the Waipi'o parcel establishing the O'ahu Forest NWR, and other priority lands on each island,
2. Fund the estimated $700,000 annual shortfall in Hawai'i's national wildlife refuge operating budget, and
3. Support the land acquisition, operating, and capital improvement needs described by the National Park Service for its units in Hawai'i.

Meanwhile, the U.S. Department of Defense relies heavily on Hawai'i facilities that include some of the most significant native ecosystems in the islands. Thanks to the efforts of Senator Daniel K. Inouye, the Army implemented an Ecosystem Management program in 1995 to protect threatened and endangered species and their habitats on Hawaiian training areas. The U.S. Marine Corps also carries out wetland restoration and a range of other conservation activities at Kāne'ohe Marine Base Hawai'i. It is essential that Congress support the continuation of these innovative and important military conservation programs at a level of $5 million annually.

Alien Species Prevention

The primary driver of Hawai'i's extinction crisis today is the continued invasion of the islands by harmful pest species: weeds, diseases, predators, and other foreign organisms that also threaten agriculture, human health and safety, and the wider economy. Our community conservation project areas, state natural areas and forest reserves, and national parks and wildlife refuges will never be safe until we can control the number of alien species threatening them. Protecting Hawai'i against new pests is also an investment in keeping the islands a clean gateway to the nation, and in building model programs that can be used by the rest of the nation now awakening to this serious environmental and economic threat. After making significant progress on this issue in recent years, it is time now to strengthen Hawai'i's pest prevention programs in three ways.

1. Building a More Effective State-Federal Quarantine and Inspection Partnership: The Hawai'i State Department of Agriculture (HDOA) and U.S. Department of Agriculture Animal and Plant Health Inspection Service (APHIS) are now collaborating on a set of joint actions intended to increase their combined capacity to stop new pests before they become established in the islands. Congressional support is needed to secure $600,000 for the construction of a shared federal-state canine training facility on O'ahu to increase the effectiveness of canine inspection of flights originating from Guam and other high-risk points of entry for brown tree snake prevention. The facility could also be shared by U.S. Customs Service and other agencies using dogs in Hawai'i. Annual operating costs are estimated at **$_____.** Federal funding of **$_____** is also needed to enable APHIS to train and equip HDOA to clearly identify gaps in current inspections, improve inspection effectiveness, and gather data to guide ongoing program improvement. [NOTE: HDOA/APHIS to provide estimated cost shortly].
2. Building the Capacity of Early Detection and Rapid Response Teams on Each Island: Experience with the high cost of controlling alien species such as miconia, gorse, and fountain grass after they are widespread has taught Hawai'i's resource managers to seize any opportunity to find and eradicate new pests before they are widely established. This initiative will establish public-private island teams modeled after the new Maui Invasive Species Committee (MISC) to identify and contain or eradicate those high-risk pests that have already become established in Hawai'i but have not yet expanded beyond control. A $2 million federal investment now will save hundreds of millions of dollars in future damages and control costs. Federal funding will be matched by state, private, and county funds to support teams on Kaua'i, O'ahu, Maui county, and Hawai'i.

3. Specific Control Programs for Targeted Pests: Brown tree snake prevention, non-native predator control, banana bunchy-top disease eradication, red imported fire ant prevention, lethal yellows of palms prevention, biting midge prevention, and programs for other especially-high-risk pests will require additional funding support beyond that described above. Congressional support is needed to encourage the U.S. Department of Interior, Department of Defense, and USDA to continue their brown tree snake work, and to identify appropriate federal sources for other pest-specific eradication programs. The estimated federal need beyond the current brown tree snake budget is $1 million per year.

Rare Species Rescue

Dozens of Hawai‘i’s most imperiled species require “intensive care” to save them from extinction. Large-scale ecosystem protection projects by their very nature will benefit these rare species, but in some cases, will not provide sufficient immediate attention to the on-the-brink species to prevent their disappearance.

The goals of the Rare Species Rescue program are 1) to prevent extinctions among Hawai‘i’s current list of threatened and endangered species, and 2) to accelerate learning about the causes of extinction so that we can prevent more species from approaching the brink. This program requires $4 million per year plus one-time funding of $1.9 million to pursue five integrated strategies:

1. $400,000 annually to find Hawai‘i’s rarest species which, by definition, are hard to find.
2. $1.5 million annually to protect the last individuals in the wild from known threats.
3. $1.9 million in capital funding and $1.3 million annually to enhance wild populations of Hawai‘i’s most endangered birds, plants, and snails through captive propagation.
4. $400,000 annually to create and staff a plant germplasm storage network in Hawai‘i to provide a genetic safety net and recover species that might otherwise become extinct or seriously depleted genetically.
5. $400,000 annually to establish new populations of rare species in protected biodiversity landscapes.

Research and Information Technology Initiative

Our understanding of Hawai‘i’s native species and ecosystems and of some of the threats to their survival has increased significantly over the past decade thanks to new research initiatives by federal agencies and important work in academia. Further insight is needed, however, into how to restore damaged ecosystems, the interactions and ecological roles of native and non-native species, and the relationship between our forests and other living systems and our water supplies and climate. Congress needs to support the continued growth of USFS and BRD research in Hawai‘i, and establish a $3 million annual competitive grants program to attract targeted academic research to the islands.

A second key to success for natural resource managers and for communities engaging in this work through the proposed Community Conservation Fund is access to accurate, reliable information on the resources they are trying to save. Hawai‘i is well advanced in this field, and is the only state with a comprehensive and accurate checklist of all plants, animals and other organisms. The state's natural communities have been classified and mapped, and extensive distributional data are available on plants, vertebrates, and selected invertebrate groups. What is lacking is the infrastructure to link these information systems into a single, accessible, public resource, and the staffing to maintain and steadily improve the data to keep up with what is happening on the land. Annual funding of $600,000 is needed to link and maintain these systems through the nascent National Biodiversity Information Infrastructure (NBII) administered by USGS, both to enhance its utility to the Hawai‘i community and to serve as a model for other parts of the country with high concentrations of endangered species (e.g., Florida, Texas, and California).

If implemented at the level outlined in this document, Legacy 2000 will ensure that our nation’s most valuable natural treasured that are housed in the Hawaiian Islands will be protected for the benefit and enjoyment of generations to come.

POSTER SESSION

CORAL LOUNGE

Chicago Wilderness: A Partnership Model for Biodiversity Conservation.
Debra Moskovits and **Laurel Ross**, Chicago Wilderness.

ʻŌhiʻa Productions: Conservation Education through the Theater Arts.
Michael Furuya and Maile Sakamoto, State Department of Land and Natural Resources, Division of Forestry & Wildlife.

CORAL BALLROOM II

1 The Life History of Normal and Fasciated Growth Forms of Mullein (*Verbascum thapsus*).
Shahin Ansari and Curt Daehler, University of Hawaiʻi at Mānoa, Department of Botany.

2 Setting Conservation and Management Priorities in an Endangered Freshwater Fish, *Galaxias gracilis*.
Simon Binzegger, Nick Ling, University of Waikato, Department of Biological Science, and Dianne Gleeson, Manaaki Whenua Landcare Research.

3 Management Oriented Research for Brown Treesnake (*Boiga irregularis*) Control on Guam.
Earl Campbell, Daniel Vice, Mike Pitzler, Richard Engeman, and Richard Bruggers, USDA APHIS National Wildlife Research Center.

4 Oʻahu Rare Plant Rescue Project.
Vickie Caraway and Jill Laughlin, Center for Plant Conservation Hawaiʻi, Harold L. Lyon Arboretum.

5 Acceptability of Alternative Hula Lei Material Sources in Hawaiʻi.
Linda Cox, Gary Vieth, Margaret Josephson and James Hollyer, University of Hawaiʻi at Mānoa, Department of Agricultural and Resource Economics.

6 An Internet Resource for Island Biologists.
Neil Davies, Rosie Gillespie, Miquel Arnedo, and George K. Roderick, University of Hawaiʻi at Mānoa, Center for Conservation Research and Training.

7 Biological Control of Mist Flower (*Ageratina riparia*): Transferring a Successful Program from Hawaiʻi to New Zealand.
Jane Fr★hlich, Simon Fowler, Alison Gianotti, Chris Winks, Manaaki Whenua Landcare Research, Richard Hill, Richard Hill & Associates, Eloise Killgore, Lionel Sugiyama, State Department of Agriculture, Biological Control Section and Louise Morin, CSIRO Entomology.

8 Progress Towards Biological Control of Gorse (*Ulex europaeus*) in New Zealand.
A. Hugh Gourlay, Simon Fowler, Manaaki Whenua Landcare Research and Richard Hill, Richard Hill & Associates.

9 Efforts to Conserve Hawaiʻi's Endemic Achatinelline Tree Snails.
Michael Hadfield and Brenden Holland, University of Hawaiʻi, Kewalo Marine Laboratory.

10 Ecosystems Management of the Pōhakuloa Plain, Island of Hawaiʻi.
Scott Henderson, Ian Cole, Steve Evans, Rosa Lum, Mark Ono, Kathleen Sherry, Laila Tamimi, and Lena Schnell, US Army Garrison Hawaiʻi, Environmental Office, Pōhakuloa Training Area.

11 Success of Miconia (*Miconia calvescens*) Control on the Island of Hawai‘i.
Nelson Ho and Kim Tavares, State Department of Agriculture, Big Island Melastome Action Committee.

12 Restoration of Coastal Dunes at Keālia Beach, Maui, Hawai‘i.
Kitti Jensen, US Fish and Wildlife Service and Kathy Smith.

13 The O‘ahu Fountain Grass (*Pennisetum setaceum*) Working Group: an Inter-agency Effort to Combat Incipient and Noxious Species on O‘ahu.
Jordan Jokiel, US Army Garrison Hawai‘i, Environmental Division.

14 A “Stream-Bottoms Up” Approach to Managing the *ahupua‘a* on a Watershed Scale.
Mike Kido, University of Hawai‘i, Hawai‘i Stream Research Center and Chipper Wichman, The National Tropical Botanical Garden, Limahuli Garden.

15 Buckets & Rainslides: Improving Outplanting Success in Dry Ecosystems.
Bruce Koebele.

16 Population Abundance of the Two-Spotted Leafhopper (*Sophonia rufofascia*) in Managed and Adjacent Unmanaged Areas within Hawai‘i Volcanoes National Park.
Linda Lenz, University of Hawai‘i at Mānoa, Department of Botany.

17 Diet and Home Range of Feral Cats (*Felis catus*) in Hawai‘i.
Gerald Lindsey, Ty Smucker, and Stephen Mosher, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center.

18 Photosynthetic Capacity of Invasive Mangroves (*Rhizophora mangle* and *Bruguiera sexangula*) in He‘eia State Park, O‘ahu: Implications for Management.
Mónica Mejía-Chang, Teresa Garcia Restom, University of Hawai‘i at Mānoa, Department of Botany, and Michael Guilbeaux, University of Hawai‘i at Mānoa, Department of Geography.

19 The Secretariat for Conservation Biology: Mission, Goals, and Activities.
Moani Pai and Nancy Glover, Secretariat for Conservation Biology, University of Hawai‘i at Mānoa.

20 Natural Resources Conservation Grantmaking Program.
Pi‘ikea Miller, Hawai‘i Community Foundation.

21 O‘ahu Resource Conservation and Development Council’s Community Opportunity Assessment.
Pamela Mills-Packo, US Department of Agriculture, Natural Resources Conservation Service, and Kristine Davidson Oh, University of Hawai‘i at Mānoa, Social Science Research Institute.

22 Nesting Ecology of the Nightingale Reed-Warbler (*Acrocephalus luscinia*) on Saipan, Micronesia.
Stephen Mosher, University of Idaho, Department of Fish and Wildlife and Steven Fancy, National Park Service.

23 Nesting Success of ‘Apapane (*Himatione sanguinea*) Along an Altitudinal Gradient of Night-Biting Mosquitoes (*Culex quinquefasciatus*).
Bonnie Nielsen, University of Idaho, Department of Fish and Wildlife Resources, Carter Atkinson, US Geological Survey, Biological Resources Division and J. Michael Scott, University of Idaho, Idaho Fish and Wildlife Cooperative Research Unit.

24 A Volunteer Stewardship Network for Hawai‘i’s Natural Resources.
Nathaniel Pak, Andrew Palmore, and Ryan Jackson, The Nature Conservancy of Hawai‘i.

25 Systematics of the Hawaiian Damselfly Species (*Megalagrion hawaiiense)* and Implications for Conservation.
Barbara Parsons, Steve Jordan and Chris Simon, University of Connecticut, Department of Ecology and Evolutionary Biology.

26 Hybridization Among Endemic and Naturalized Species of Raspberry (*Rubus*) in the Hawaiian Islands.
Rebecca Randell, University of Hawai‘i at Mānoa, Department of Botany, Donald Gardner, University of Hawai‘i at Mānoa, Cooperative Park Studies Unit, Clifford Morden, University of Hawai‘i at Mānoa, Department of Botany and University of Hawai‘i at Mānoa, Center for Conservation Research and Training.

27 Population Status of the Endangered Laysan Duck (*Anas laysanensis*).
Michelle Reynolds, Mark Vekasy, US Geological Survey, Biological Resources Division, Pacific Islands Ecosystem Research Center, and Elizabeth Flint, US Fish and Wildlife Service, Pacific Remote Islands NWR Complex.

28 U.S. Fish and Wildlife Service's Conservation Partnerships Program.
Craig Rowland, US Fish and Wildlife Service.

29 Restoration of a Native Lowland Forest, Manukā, Hawai‘i.
Bryon Stevens and Nick Agorastos, State Department of Land and Natural Resources, Division of Forestry and Wildlife.

30 Micropropagation as a Tool for Plant Genetic Conservation in Hawai‘i.
Nellie Sugii, University of Hawai‘i at Mānoa, Harold L. Lyon Arboretum.

31 The Hawai‘i Ecosystems at Risk Project: Tracking Status and Trends of Alien Species at Multiple Scales to Assist Prevention, Eradication, and Containment.
Philip Thomas, Lloyd Loope, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, and Clifford Smith, University of Hawai‘i at Mānoa, Pacific Cooperative Studies Unit, Department of Botany.

32 Molecular Mechanisms Used in the Conservation of Hawai‘i’s Avifauna.
Shelly Truszkowski and Sabrina Clark, University of Hawai‘i at Mānoa, Department of Genetics and Molecular Biology.

33 GIS Map of the Current Range of O‘ahu ‘Elepaio (*Chasiempis sandwichensis ibidis*).
Eric VanderWerf, University of Hawai‘i at Mānoa, Department of Zoology, and David G. Smith, State Department of Land and Natural Resources, Division of Forestry and Wildlife.

34 Initial Results for Prescribed Burning to Increase a Native Grass in a Community Dominated by Alien Bunch Grasses.
Mindy Wilkinson and Curt Daehler, University of Hawai‘i at Mānoa, Department of Botany.

35 Molecular Sexing of Hawaiian Birds Using the CHD Gene and Applications to Problems in Bird Conservation.
Kristen Yen, Sarah Burgess, Shelly Troszkowski, Pia Untalan, Fred Duenneiber, and Rebecca Cann, University of Hawai‘i at Mānoa, Department of Genetics and Molecular Biology.

36 Storing Seeds of Native Hawaiian Plants.
Alvin Yoshinaga, University of Hawai’i at Mānoa, Center for Conservation Research and Training.

Shahin Ansari and Curtis C. Daehler

University of Hawai'i at Mānoa, Department of Botany, 3190 Maile Way, Honolulu, HI 96822

THE LIFE HISTORY OF NORMAL AND FASCIATED GROWTH FORMS OF MULLEIN *(Verbascum thapsus)* IN HAWAI'I. Mullein (*Verbascum thapsus*), native to Eurasia, is a weed on the island of Hawai'i that poses concern for conservation of native habitats. It is a monocarpic perennial with each plant producing 100,000 to 180,000 seeds which can remain viable in the soil for more than 100 years, giving it a great potential to disperse over time and space. A phenomenon apparently unique in Hawai'i is that some mullein plants develop grotesquely distorted flower heads (fasciation). This study is part of an ongoing experiment to compare the normal and fasciated growth forms to determine whether growth forms differ in life history, growth rate and potential to invade in the Hawaiian Islands. Seeds from normal and fasciated individuals were sown under common greenhouse conditions. The percent germination of fasciated plants (95.3%) was significantly higher than that of normal plants (89.2%) suggesting higher viability among seeds of fasciated individuals. No significant differences were found in the percent survival, size (rosette diameter) and number of leaves between offspring of fasciated and normal plants. However, significant variation in these traits among maternal plants suggests either heritable genetic variation in growth characters among mullein plants or maternal effects due to environmental differences among mothers. Further work will determine whether the fasciated growth form is heritable. Understanding the life histories and growth habits of these two growth forms in Hawai'i will help managers better control this weed.

Simon U. Binzegger[1], Dianne M. Gleeson[2] and Nick Ling[1]

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SETTING CONSERVATION AND MANAGEMENT PRIORITIES IN AN ENDANGERED FRESHWATER FISH, *Galaxias gracilis*. The 'dwarf inanga' (*Galaxias gracilis*) McDowall (Osteichthys: Galaxiidae) is a rare and endangered endemic fish species restricted to two groups of sand dune lakes within an 80 km stretch of coastline on the west coast of the North Island of New Zealand. Its abundance has declined in most (>80%) of the dune lakes where they are endemic. Dwarf inanga are classified as a second priority threatened species under the guidelines set by DOC (Department of Conservation) for the conservation of New Zealand's threatened biota. Complete extinction threatens due to its severely restricted habitat which is being subjected to increasing environmental perturbation. These include agricultural and exotic forest practices and competition and/or predation due to the introduction of exotic species such as mosquito fish (*Gambusia* sp.) and rainbow trout (*Oncorhynchus mykiss* Richardson). In addition there is increasing pressure from local groups to use these habitats in order to establish an eel fishery. Eels are naturally absent from these waters and are known to impact on dwarf inanga, hence the need to establish conservation priorities for this. The aim of this research is to use molecular and morphological methods to determine the population genetic structure, enabling the conservation effort for dwarf inanga to be concentrated on the specific unique genetic units uncovered.

Dee Boersma

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USING THE INTELLECTUAL TALENTS OF UNIVERSITIES TO ENRICH MANAGEMENT AND POLICY: CASE STUDIES IN ANALYSIS OF RECOVERY PLANS. We are flooded with conservation theory and ideas, but when it comes to conservation practice we suffer a deficit of synthetic analyses. Too often debates about decision-making become mired in a war of anecdotes. Existing laws, financial constraints, and limited personnel, and time constraints hamper experimentation and reflection on natural resource management and policy. Universities are one of the few institutions where in depth analysis can be done, however, the short time frame and immediacy of the need for a management or policy decision often preclude their use. With some forethought the resources available at universities can be put to better use in teaching and public service. Twenty graduate seminars at 19 universities analyzed approximately 200 recovery plans. The analysis shows high consistency between threats to a species and implementation tasks to address these threats. Threats to species have changed little over time with the exception on exotic species. Recovery teams that include a species expert appear to be of higher quality than plans without one.

The results show that large-scale analyses in the spirit of meta-analysis can provide insights to both short and long-term management and policy questions that would improve decision-making.

Chris Buddenhagen and Julie Geritzlehner

Science Technology and Information Services, Department of Conservation, Science and Research Unit, PO Box 10-420, Wellington, New Zealand

MONITORING WEED CONTROL OPERATIONS: RESULTS, OUTCOMES AND DECISIONS. Monitoring the outcomes of weed control operations may shed light on weed impacts. Weed management is undertaken on the assumption that native communities benefit from weed control. In reality the impact of weeds on native species and communities has rarely been quantitatively demonstrated. Typically field staff do not monitor weed control operations. Too often management decisions rely on recollections and subjective assessments. Monitoring requires scientists and managers to work together. While monitoring may be costly, the cost of not monitoring may be higher. The Department of Conservation (DOC) undertakes weed control: (1) to maintain or enhance natural values at ecologically valuable sites (site-led), or (2) to eradicate or contain an incipient or localized weed population (weed-led) to prevent its spread and future impacts. The success of weed-led control operations can be measured by monitoring the effects of control on the target weed species. Whereas, monitoring a site-led program also requires an assessment of the changes to the ecological values at a site. Monitoring will therefore determine whether the control has protected a rare species or achieved the desired response in the native community. Standard methods for assessing the success of weed control operations are scarce. DOC is developing a monitoring protocol so that field staff can quantify the success of weed control operations. We are focusing on vegetation monitoring. This requires a straightforward approach that is accessible to people with different levels of experience in the area of monitoring. The manual will cover the how, when, where and why of monitoring weeds and control operations.

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MANAGEMENT ORIENTED RESEARCH FOR BROWN TREESNAKE (*Boiga irregularis*) CONTROL ON GUAM. Since its introduction in the late 1940's, the brown treesnake (*Boiga irregularis*) has caused significant ecological, economic, and human health impacts to the island of Guam. The nocturnal and secretive habits of the snake, coupled with the extensive flow of outbound air and surface cargo from Guam, make brown treesnake dispersal to other Pacific Islands a serious concern. In response to these concerns, USDA-APHIS-Wildlife Services was contracted to initiate an interdiction program aimed at stopping the spread of the snake. The federal mandate of Wildlife Services is to provide leadership in managing problems caused by wildlife. Wildlife Services has two operational branches (the Eastern and Western United States, respectively) and a research branch (the National Wildlife Research Center) that work closely to accomplish the agency's mandate. Due to the close relationship between these branches, research can quickly be directed toward various management questions. On Guam, Wildlife Services operations staff control snakes at all commercial and military ports and airports using trapping, spotlight searches, and specially trained detector dogs. Through direct funding and "on-the-ground" assistance, Guam-based Wildlife Services operations staff support research that is specifically related to current management needs. Wildlife Services operations staff are presently supporting National Wildlife Research Center research evaluating the efficacy of low cost snake traps and a continued evaluation of the efficacy of snake detector dogs. Past management-driven research has included an assessment of trapping methods and strategies and an initial evaluation of detector dog efficacy.

Vickie Caraway and Jill Laughlin

Center for Plant Conservation Hawai‘i, Harold L. Lyon Arboretum, 3860 Mānoa Road, Honolulu, HI 96822

OAHU RARE PLANT RESCUE PROJECT. As the diversity of Hawai‘i’s natural plant populations rapidly diminishes, it becomes vitally important to capture the remaining genetic variation of every remaining individual of threatened plant species. This strategy assists in preventing extinction and maximizes the genetic foundation for reestablishing new populations. The O‘ahu Rare Plant Rescue Project was initiated by CPC-Hawai‘i and the Hawai‘i Rare Plant Restoration Group (HRPRG) to prevent the extinction of the most critically endangered plants on the island. Funded by Hawai‘i’s Division of Forestry and Wildlife, the Cooke Foundation, and US Fish and Wildlife

Service, this program was also aimed to expand the search for Oahu taxa thought to be extinct but possibly still existing in remote areas of the plants' natural habitat. Professional botanists and conservation volunteers gathered basic information (demography, habitat, threats, vigor, phenology) for 53 separate populations of 32 rare plant taxa using data forms developed by the Monitoring/Collection committee of HRPRG. These teams also collected seeds and cuttings from 21 and 13 populations of these taxa, respectively, for Lyon Arboretum's micropropagation laboratory. Seven unrecorded populations were discovered but four historical locations of rare species were not found and considered extirpated at these sites. A prototype relational database was developed to link historical information, biological data, and current monitoring information for the rarest plants on O'ahu. Ultimately, this database will enable users to track plant propagules from collection to reintroduction into secure, wild habitats. Although the project funding is completed, numerous conservation volunteers are continuing the monitoring of rare plants on all islands.

Linda J. Cox, Gary R. Vieth, Margaret Josephson and James Hollyer

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ACCEPTABILITY OF ALTERNATIVE HULA LEI MATERIAL SOURCES IN HAWAI'I. Common property resources such as Hawai'i's forests are often over used because users consider them free. Over use of Hawai'i's forests have led conservationists, forest users and land managers to express concern about possible extinction of some indigenous plant species. The concern is particularly acute on densely populated O'ahu. Hula (native Hawaiian dance) practitioners have received particular attention as an user group because of the cultural significance associated with collecting plant materials lei (necklaces and garlands) adornments directly from the forest. The *kumu* hula were considered the decision-makers and used as the respondents for the conjoint analysis. The alternative lei material sources considered in this study were commercial purchase and cooperative forest garden. The cooperative forest garden alternative exists only on a trial basis at this time. The forest garden and commercial purchase sources became more desirable as the likelihood of finding the desired material by forest gathering decreases, or the amount of search time required to find it increases. The *kumu* hula are willing to switch to the forest garden as a source if work time is low enough, and to the commercial purchase alternative if price is low enough. The forest garden could be made more acceptable by incorporating aspects to make them more culturally acceptable or less costly in terms of time. Commercial production of the desired species could be subsidized to make them available at acceptable market prices.

Curtis C. Daehler and Debbie A. Carino

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PREDICTING INVASIVE PLANTS IN THE HAWAIIAN ISLANDS. With the exception of habitat destruction, invasive alien species pose the greatest threat to native biodiversity. Many of the plants that are currently invasive pests were introduced intentionally for horticulture or other purposes, and rates of deliberate plant introductions to Pacific Islands continues to be high. If we could predict the behavior of a plant prior to its introduction, then we could minimize introductions of invasive plants. Over the past 5 years, several models have been independently developed for predicting which plant species will be invasive. These models have usually been constructed for use in specific habitats or geographic regions. However, some models may have a more general predictive power. We assessed the ability of screening systems by Pheloung (Australia), Tucker and Richardson (South Africa), and Reichard and Hamilton (North America) to predict invasive plants in the Hawaiian Islands. Of these three systems, Pheloung's screening system worked best, attaining over 90% accuracy in predicting invaders in Hawai'i, despite having been designed for use in Australia. We expect that adoption of this screening system in Hawai'i would substantially reduce future invasive plant introductions. Our results indicate that Pheloung's screening system shows promise as a template for developing a global model for predicting invasive plants.

Kristine Davidson Oh and Michael Hamnett

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STRATEGIC PLANNING, COLLABORATION, AND PROJECT MANAGEMENT. A series of strategic planning workshops have been organized to develop a long-range plan for the Hawai'i Coral Reef Initiative Research Program. The results will be published and made available on the internet, in order to serve as a guide for future activities of the Hawai'i Coral Reef Initiative Research Program. Most of the planning team's emphasis thus far has been devoted

to (1) developing a memorandum of understanding (MOU) between the State Division of Aquatic Resources and the University of Hawai‘i, (2) assisting with the development of a data management system and GIS for the Coral Reef Assessment and Monitoring Program (CRAMP), (3) participating in the US Coral Reef Task Force, (4) establishing working relationship among state agencies for the US Coral Reef Task Force, and (5) creating a solicitation and review processes for the second round of funding from the National Ocean Service. As a provision of the MOU between the University of Hawai‘i and the State Division of Aquatic Resources, the Hawai‘i Coral Reef Initiative Research Program’s Management Committee establishes program priorities annually. For the 1999-2000 fiscal year, the Management Committee has prioritized the following management concerns: (1) expanding monitoring activities in Hawai‘i; (2) assessing the impact of nearshore fisheries and aquarium fish collection upon Hawaiian coral reef ecosystems; and (3) investigating the effect of alien and invasive species upon Hawai‘i’s coral reef ecosystems.

Neil Davies, Rosie Gillespie, Miquel Arnedo, and George K. Roderick

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AN INTERNET RESOURCE FOR ISLAND BIOLOGISTS. We have built a web site for island biologists in Hawai‘i and other archipelagos around the world. The site is multifaceted but one of its principle aims is to provide information for researchers concerning the island localities where they would like to do fieldwork. Managers are encouraged to contribute permit requirements, camping and accommodation details, and other information that might be useful for researchers planning to do field work at their site. Not only will this facilitate planning a field trip, hence saving researchers a lot of time, it will also benefit managers who will have fewer questions to deal with, and can simply refer queries to the web-site. Managers will also benefit because researchers are encouraged to publish their findings on the site. Both managers and researchers will thus have ready access to a wealth of information provided by both the research and management communities for their mutual benefit.

Rikki Dunsmore, Mark Ridgely and Liem Tram

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KĀNE‘OHE BAY DECISION-SUPPORT SYSTEM. This project is investigating one mechanism to unite coral reef scientist’s research with the decision-making requirements of resource managers. Through the application of a “decision support system” methodology, this team illustrates necessary trade-offs that occur given different future scenarios. Management strategies should be developed using techniques that incorporate resource limitations, conflict, and uncertainty. Using Kāne‘ohe Bay as a case study, the team introduces a methodology designed to both mitigate these obstacles, as well as to foster communication amongst stakeholders. Through scenario planning, this study integrates scientific knowledge about coral reefs with the formulation and evaluation of actions and policies in a participatory manner. So doing improves resource management under conditions of uncertainty and conflict, and sets the stage for the development of the decision support system.

Margaret M. Dupree

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DEVELOPMENT OF PARTICIPATION BASED RECOVERY PROGRAMS. The National Marine Fisheries Service (NMFS) has an affirmative obligation to promote the recovery of sea turtles under the Endangered Species Act (ESA) together with the US Fish and Wildlife Service (USFWS) which has jurisdiction for nesting sea turtles and nesting habitat. Green, hawksbill, leatherback, loggerhead, and the olive ridley turtles occur in the Pacific basin. With so many species and so vast a marine environment, the recovery of these species requires cooperative and coordinated efforts amongst the Pacific Island governments and peoples. The ESA mandates that the Services develop recovery plans for most listed species. Recovery plan goals for the six turtle species in the U.S. Pacific include: 1) protection of turtles in the nesting environment; 2) protection and management of populations in the marine environment; 3) proper care in captivity; and 4) support for international agreements and conventions to ensure that turtles are protected in foreign waters. In 1994, NMFS and USFWS issued a joint policy defining a methodology for implementing programs that meet recovery objectives. This methodology includes the facilitation of participation plans that embrace a collaborative effort between federal and local governments responsible for the protection, management, conservation and recovery of the species. Participation plans are area specific and include specific projects/programs. A series of workshops in Hawai‘i and meetings with local managers in the Pacific Islands, non-government organizations, biologists, educators, and enforcement personnel were held to begin the development of participation plans within the

region. The NMFS is working to facilitate the participation and leadership of local interests and sharing of resources; both knowledge and funds to promote local recovery efforts. Currently, the participation plans are in development within the local government level. The NMSF will continue to work with the U.S. affiliate Pacific Islands, and will collaborate when appropriate with regional neighbors and conservation organizations such as SPREP, FAO and UNEP to recover and management sea turtle species in the region. This presentation will cover the process and current status of the development of participation plans and will include information on the Hawai‘i participation plan, as well as other Pacific Island participation plans.

Jane Fr✱hlich[1], Simon Fowler[1], Alison Gianotti[1], Richard Hill[2], Eloise Killgore[3], Louise Morin[4], Lionel Sugiyama[3] and Chris Winks[1]

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BIOLOGICAL CONTROL OF MIST FLOWER (*Ageratina riparia*): TRANSFERRING A SUCCESSFUL PROGRAM FROM HAWAI‘I TO NEW ZEALAND. Mist flower (*Ageratina riparia*), or Hāmākua pāmakani, is an invasive weed that is widespread in the tropical and warm temperate regions of the world. It was introduced to New Zealand around 1931 and has since become a serious problem in native forests in the North Island, where it forms dense masses that displace and smother indigenous vegetation and limits regeneration. Effective management using physical or chemical means is extremely difficult given the nature of the areas affected. A highly successful biological control program for mist flower was developed and implemented in Hawai‘i, where the weed had become a major problem in conservation areas. This program involved three natural enemies: a white smut fungus (*Entyloma ageratinae*), a plume moth (*Oidaematophorus beneficus*) and a gall fly (*Procecidochares alani*). Government agencies responsible for weed control and conservation in New Zealand are supporting Landcare Research to undertake a biological control program for mist flower using the two agents that were most successful in Hawai‘i: the white smut fungus and the gall fly. Additional host range testing of plants significant to New Zealand have provided further evidence that both agents are highly host specific. The white smut fungus was released in New Zealand in November 1998 and has successfully produced secondary infections at all release sites. The gall fly was imported into quarantine in December 1998, and permission for its release has been requested. A monitoring program has been established to determine the effectiveness of this biocontrol program as a management strategy.

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‘ŌHI‘A PRODUCTIONS: CONSERVATION EDUCATION THROUGH THE THEATER ARTS. Successful conservation education is reliant on the ability to communicate messages in a manner which are receptive by the audience on an emotional as well as intellectual basis. ‘Ōhi‘a Productions is a local performing troupe that presents conservation education in the form of musical theater for children. Using song, dance, puppetry, and creative costumes, the messages are delivered with a distinctive local flair that has created a demand for their performances from audiences of all ages across the state. The poster will feature costumes and puppets from the shows, as well as videos from "Voices of the Rainforest" and "In the Clear Blue Sea."

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MYCORRHIZAE IN HAWAI‘I: INCIDENCE IN THE FLORA AND EVOLUTIONARY IMPLICATIONS. Arbuscular mycorrhizal fungi (AMF) form symbiotic associations with the roots of more than 90% of all flowering plant species in Hawai‘i, and it is estimated that more than 85% of endemic species have an absolute requirement for AMF to grow in native soils. The high incidence of mycorrhizae in the present day flora suggests that AMF were present in Hawaiian soils when angiosperms first colonized the emerging islands in the archipelago. Based upon extensive sampling, it is estimated that 195 of the original 272 angiosperm colonizers (72%) were dependent upon AMF to become established in Hawai‘i. Ferns appear to have played a critical role during evolution of the angiosperm flora by serving as host plants for the AMF, allowing populations of AMF to build up in soils in

association with ferns prior to invasion of sites by angiosperms. The large spores of AMF are formed underground, and they are not so readily dispersed over long distances as are other fungi. Recent observations and experiments suggest that AMF may have arrived in Hawai‘i in drifting vegetative fragments of dune-colonizing plants or have been carried by birds.

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PROGRESS TOWARDS BIOLOGICAL CONTROL OF GORSE (*Ulex europaeus*) IN NEW ZEALAND. Gorse (*Ulex europaeus*) has been a serious weed in New Zealand for over 100 years, and continues to invade pastoral land, forest plantations, and vulnerable natural habitats. Gorse seed weevil (*Exapion ulicis*) was released in 1931, and destroys about 35% of the annual seed crop. Research recommenced in 1978, and the decision to mount a full-scale biological control program was confirmed only in 1988. Gorse pod moth (*Cydia succedana*) was introduced in 1992. Assessment at one site shows that the two seed-feeding insects now destroy about 90% of the annual seed crop. Gorse spider mite (*Tetranychus lintearius*) was introduced in 1989 and 1990, and has established widely. Outbreaks severely damage plants and reduce flowering, but populations large enough to kill mature gorse over wide areas cannot be sustained, probably because of predation. Gorse thrips (*Sericothrips staphylinus*), introduced from England in 1990, are established, but spreading slowly. Experimental studies indicate that gorse thrips are capable of significant damage to gorse plants. The gorse soft shoot moth (*Agonopterix ulicetella*) and the gorse colonial hard shoot moth (*Pempelia genistella*) have been released, but firm establishment is not yet certain. This paper provides the first detailed report of the release of the scythridid gorse hard shoot moth, (*Scythris grandipennis*). Development of a bioherbicide augments this classical approach to biological control of gorse. The New Zealand program has provided information and control agents to similar programs now established in Hawai‘i.

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EFFORTS TO CONSERVE HAWAI‘I’S ENDEMIC ACHATINELLINE TREE SNAILS. Of 41 nominal species of the endemic genus (*Achatinella)*, only 8 are certain to survive in 1999. Most remaining snail populations are small and isolated. Data from long-term field studies indicate that all populations are shrinking due to predation by rats and the snail *Euglandina rosea* and perhaps other undefined causes. Populations of snails in the other large achatinelline genus (*Partulina)*, followed on Moloka‘i, showed growth from 1983 through 1995, when rat predation drastically reduced their numbers. In none of our study sites for achatinelline snails, on five Hawaiian Islands, have we found populations to be large or stable enough to assure survival over future decades. Populations of achatinelline snails maintained in the laboratory as a hedge against extinction in the field probably contain the only survivors for two species. Current captive populations include 7 (*Achatinella)* spp. and 4 (*Partulina)* spp. Populations of captive snails continue to show wide fluctuations in numbers, which could quickly lead to extinction, given the low numbers of which most are composed. It has become critically important to determine if most extant populations of achatinelline snails, in field and lab, are suffering from greatly reduced genetic variation due to both bottleneck events and subsequent inbreeding. Current efforts are aimed at examining variation at multiple microsatellite loci in order to determine the amount of genetic heterogeneity within populations. Finding extremely low genetic heterogeneity in populations would be an impetus to translocate snails between populations, guided by genetic data, so as to increase breeding and survivorship.

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THE HAWAI‘I CORAL REEF INITIATIVE RESEARCH PROGRAM. The University of Hawai‘i (UH) established the Hawaii Coral Reef Initiative (HCRI) Research Program in June 1998. Its primary purpose is to support monitoring and research activities aimed at building capacity to effectively manage Hawai‘i’s coral reef ecosystems. That same month, the State Division of Aquatic Resources (DAR) hosted a workshop to identify specific monitoring

needs and methods for Hawai'i's coral reefs. Based on discussions at this and other workshops and on efforts to improve monitoring over the last year, the HCRI Research Program has developed priorities for future projects that should be undertaken by the program. Since October 1998, the HCRI Research Program has included projects that address problems identified at the June 1998 workshop. These projects have built on previous efforts by research scientists, environmental groups, and resource management agencies to address threats to its coral reef ecosystems. The program has formalized research and monitoring programs and contributed to the identification of strategies for mitigating impacts to reef ecosystems. In December of 1998, the State DAR and UH entered into a MOU to jointly manage the HCRI Research Program. The purpose was to institutionalize the cooperative relationship. The management structure agreed to in the MOU provides an equal voice for managers and research scientists in planning and overseeing the work of the Program.

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ECOSYSTEMS MANAGEMENT OF THE PŌHAKULOA PLAIN, ISLAND OF HAWAI'I. An environmental staff work force of 12 personnel continues to manage US Army Ecosystem Management Program projects that provide effective stewardship of natural and cultural resources on the 109,000-acre Pōhakuloa Training Area on the island of Hawai'i. One highlight of efforts over the last year has been the successful propagation of seven federally-listed species of dryland plants in the 2,000 square-foot greenhouse. Several species of common native plants resident to the area are also being propagated. Eventually, both rare and common propagated stock will be outplanted to appropriate locales to support plant habitat and population restoration. In another significant effort, three areas of relatively-intact dryland habitat, totaling nearly 2,000 acres, have recently been fenced. Restrictions on human access into portions of the fenced areas have led to the use of baiting techniques in conjunction with one-way gates for removal of feral pigs from the areas.

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SUCCESS OF MICONIA (*Miconia calvescens*) CONTROL ON THE ISLAND OF HAWAI'I. Spread of Miconia (*Miconia calvescens)* has been aggressively reduced by Big Island Melastome Action Committee (BIMAC) efforts. Mature trees have been hunted down and controlled on almost 4,500 acres utilizing helicopters, 4x4 vehicles and field team efforts. Contaminated areas and added buffer zones were swept with BIMAC, DLNR, HDOA, Alu Like and community volunteer crews. Nearly 19,000 trees and 74,000 younger plants have been treated through 4/99. The total cost of treatment is about $720,000. Funding for this multi-agency effort has come from federal matching grants, county funds and state in-kind contributions. In 1999, county officials will reduce their financial contribution, making state funding crucial in securing the federal matching funds, currently about $150,000. The consequences of failing to eliminate miconia from the Big Island will be felt state-wide. Hawai'i's agricultural economy and it's natural resources could both face a grim future infested with miconia. Treated areas that harbored mature plants and seedlings need annual monitoring and control work or would soon resume seed production and again expand into forest reserves, abandoned cane fields, residential and agricultural lots. Miconia control is an ambitious undertaking that needs years of well-organized effort and funding.

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MAUI NĒNĒ: WORKING TOGETHER. Nēnē were once extinct from the Island of Maui. From 1960 to 1977, the State Division of Forestry and Wildlife (then known as the State Division of Fish and Game) released about 500 Nēnē into Haleakalā Crater. To manage the Haleakalā Nēnē population, Haleakalā National Park and the Department of Land and Natural Resources entered into a Memorandum of Agreement in the 1960's. The Memorandum identifies logistical responsibilities of each agency, but does not identify management responsibilities. The Maui Nēnē Team was formed in 1988 as part of the Nēnē Recovery Action Group (NRAG). NRAG was formed because of a need to determine limiting factors of wild Nēnē populations, and to revise the Nēnē Recovery Plan. The Maui Nēnē Team includes staff from the State Division of Forestry and Wildlife, the National Park Service and The Peregrine Fund.

Like many inter-agency groups, the Maui Nēnē Team had a “rocky beginning”. After years work, the Team now operates productively. Through successful cooperation, the Team has identified limiting factors of adult and gosling Nēnē, implemented management recommendations resulting from research, and identified areas for new releases. The Team developed an Adopt-A-Nēnē program to encourage community involvement. Members of the team believe that the keys to successful inter-agency cooperation are: 1) clear identification of agency responsibilities; 2) longevity and continuity of team members; 3) respect for differences in agency missions; 4) respect for team members and affiliates; 5) respect for opinions, suggestions and other recommendations; and 6) open communication.

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RESTORATION OF COASTAL DUNES AT KEĀLIA BEACH, MAUI, HAWAI‘I. This project was initiated as a result of the vehicular death of a nesting hawksbill sea turtle (*Eretmochelys imbricata*), the second death in three years, on a State Highway, at the head of Ma‘alaea Bay, Maui, Hawai‘i. A meeting of government agencies, conservation groups, and concerned citizens was organized by the US Fish and Wildlife Service to discuss the turtle mortality problem associated with rapidly eroding sand dunes and the off-road vehicle trails connecting the highway and beach. The group agreed to pursue restoration of the degraded coastal dunes and establish a barrier to keep vehicles off the beach and disoriented turtles off the road. An interim step in this restoration process was installation of a sand drift or "dune restoration" fence which serves the purposes of rebuilding dunes and protecting turtles. Keālia Beach is now protected from off-road vehicles, and nesting hawksbills are prevented from wandering onto the highway. By preventing further vehicle induced erosion of the beach and disturbance of protective ground cover, the wood slat and wire restoration fence is allowing the sand dunes to rebuild themselves. Revegetation efforts by volunteers are underway along the severely impacted former roadways that bisect the dunes, and interpretive signs explain the project to the public. Although a more permanent barrier to vehicles is needed along this beach, and much work remains to be done to restore quality nesting habitat, this project has been successful in preventing additional hawksbill mortalities and has involved the community in restoration of their coastline.

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ASSESSING THE IMPACT OF BIOCONTROL ON HAWAI‘I’S KOA BUG (*Coleotichus blackburniae*). Concern over the environmental safety of biological control focuses on its potential impact on nontarget insects and plants. This debate is especially relevant in Hawaii, where biocontrol is a valuable tool for managing problems with alien species, but where conservation of native species is also vital. We have been studying the specific case of biocontrol of Southern green stink bug (*Nezara viridula*) to assess its impact on the endemic koa bug (*Coleotichus blackburniae*), and to see what lessons can be learned to improve safety of biocontrol in the future. In the 1960’s, two species of parasitoids were established in the Hawaiian Islands to control a newly arrived agricultural pest, the Southern green stink bug. These natural enemies, the egg parasitoid (*Trissolcus basalis)* and the tachinid fly *(Trichopoda pilipes)*, have been implicated in the apparent decline of the native koa bug. However, our study is the first attempt to carefully examine the interaction of these species. Both parasitoids were found attacking koa bugs in the field on four islands, but life table studies indicate that other introduced natural enemies, including spiders and ants, currently have greater overall impact on koa bug populations. Laboratory tests and historical data suggest that both the tachinid and the egg parasitoid were pre-adapted to successfully locate and utilize koa bugs as hosts. Our case study confirms the relevance of screening nontarget hosts and understanding the ecology of natural enemies before their introduction for biological control.

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THE O‘AHU FOUNTAIN GRASS (*Pennisetum setaceum*) WORKING GROUP: AN INTER-AGENCY EFFORT TO COMBAT INCIPIENT AND NOXIOUS SPECIES ON O‘AHU. The O‘ahu Fountain Grass Working Group is a voluntary partnership of private, government, and non-profit organizations created to remove the threat of fountain grass (*Pennisetum setaceum*) on O‘ahu, and to assess the status of and prioritize control efforts for additional invasive species on O‘ahu. Members include representatives from The Nature Conservancy, State Department of Agriculture, US Fish and Wildlife Service, US Department of Defense, State Department of Land and Natural Resources, Mt. Ka‘ala Learning Center and the University of Hawai‘i at Mānoa Botany Department. The Group measures progress in terms of fountain grass infestations prevented, contained or eradicated. The long-term goal is to eradicate ountain grass from O‘ahu and expand efforts to include other invasive species threats to native biodiversity, agriculture, industry, human health, and the quality of life on O‘ahu. To accomplish this goal the group has met quarterly since April of 1998. Field surveys of incipient and/or noxious weeds were conducted and priorities for control and long-term management were determined. In addition, hundreds of field hours have been spent controlling target species which include fountain grass (*Pennisetum setaceum*), Himalayan blackberry (*Rubus discolor*), New Zealand Tea (*Leptospermum scoparium*) and rose myrtle (*Rhodomyrtus tomentosa*). The Group has been very deliberate in its effort to minimize unnecessary bureaucratic processes and other complications inherent in interagency cooperative efforts by minimizing overhead costs and focusing on small, “achievable” field successes. Tools, herbicide and equipment for FGWG projects have been provided by the various participating agencies. In May, 1999 funding for a small FGWG tool and equipment cache was provided by the O‘ahu State Natural Area Reserve program. A request has also been made to the US Fish and Wildlife Service for some additional funding. Many of the other small costs associated with the projects have been paid for “out of pocket” by the volunteers that have participated in the group’s activities. It is the hope of the O‘ahu Fountain Grass Working Group that efforts to control and better manage incipient weed populations will expand and eventually evolve into a more coordinated state-wide effort involving policy makers, educators, resource managers, the business community and the general public.

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CORAL REEF ASSESSMENT AND MONITORING PROGRAM (CRAMP). Twenty-one designated research sites have been chosen from throughout the State of Hawai‘i with input from managers and scientists. These sites provide a good cross section of reefs throughout the main Hawaiian Islands and will allow testing of hypotheses involving the impact of factors noted above. Data taken in a standard and precise manner in a wide range of habitats will allow project staff to describe the biology and ecology of reefs throughout the high islands. This will also allow them to develop and test basic scientific theories concerning factors controlling the structure and function of coral reefs. Sites included in this program have been selected on Kaua‘i, O‘ahu, Maui and Hawai‘i based on type of environmental stress, historical data availability, degree of environmental degradation or recovery, and degree of wave exposure. The Hawaiian Islands form an archipelago that extends over a six-thousand square-mile area of the Pacific Ocean. This geographic constraint has been addressed through a UH system-wide collaborative effort. UH has excellent coral reef research groups presently operating at the Hawaii Institute of Marine Biology (O‘ahu), Maui Community College, and at University of Hawai‘i at Hilo. Faculty and staff share a common computer network, and administrative and fiscal system. All three groups are already working collaboratively with each other and with the State Division of Aquatic Resources.

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A “STREAM-BOTTOMS UP” APPROACH TO MANAGING THE *ahupua‘a* ON A WATERSHED SCALE. The ancient Hawaiian *ahupua‘a* provides modern day ecosystem managers with a holistic functional model which encompasses the values and impacts of people on terrestrial and marine ecosystems via freshwater connections with streams. The biotic integrity of streams as judged by the robustness of its native macrofauna is a comprehensive ecological indicator of terrestrial, marine, and freshwater ecosystem health. A long-term ecological monitoring study established on Limahuli Stream, Hā‘ena, Kaua‘i, as a joint project between the Center for Conservation Research and Training (University of Hawai‘i), Limahuli Garden (National Tropical Botanical Garden), and the State Division of Aquatic Resources (Department of Land and Natural Resources), is providing a unique long-term view of natural Hawaiian stream ecosystem functioning on the watershed scale. Planned expansion of this investigation in future years will examine land-water interfaces at the terrestrial and marine connections with the stream to improve understanding of functional linkages and the implications of management actions on these inter-connected ecosystems.

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MUCKING IN THE MUD: A COLLABORATIVE CONSERVATION EFFORT BETWEEN EDUCATORS, LANDOWNERS, AND RESOURCE MANAGERS. In 1993, the Hawai‘i Nature Center, the US Fish and Wildlife Service, and the Estate of James and Abigail Campbell launched an innovative effort to address long-term conservation of Hawaiian wetlands. In Hawai‘i and across the country, wetlands and the species they support have been degraded or replaced altogether. Research indicates that the issues adults care about today were first introduced to them as children, and that direct experience is the most effective way to influence an impressionable child. Recognizing the importance of making wetlands personally meaningful to children in Hawai‘i, the US Fish and Wildlife Service agreed to allow the Hawai‘i Nature Center to bring children into a closed wetland refuge for a probationary period. Campbell Estate, the neighboring landowner, supported the project financially. The field test was successful, and now six years later, over 15,000 students, teachers, and chaperones have personally seen the endangered Hawaiian Coot (*Fulica alai*) or ‘Alae ke‘oke‘o, Hawaiian Duck (*Anas wyvilliana*) or Kōloa, Hawaiian Stilt (*Himantopus mexicanus*) or ‘Ae‘o and Hawaiian Moorhen (*Gallinula chloropus*) or ‘Alae‘ula. They have investigated sedges and reeds and weeds. They have tracked scat and fur and footprints of predators, and understand the importance of fencing and trapping. And they have gone mucking in the mud to uncover the hidden food chain that supports wetland birds. The program is effective and popular. It has been duplicated at Keālia Pond on Maui, and will be tested next year at the Ki‘i Refuge in Kahuku. Through cooperation and a shared vision, three diverse groups from private, public, and non-profit sectors have successfully demonstrated an important strategy for long-term conservation in Hawai‘i.

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BUCKETS & RAINSLIDES: IMPROVING OUTPLANTING SUCCESS IN DRY ECOSYSTEMS. One of the most significant problems when outplanting in dry lowland ecosystems is new plant desiccation. A new transplant can often take months or even years to grow a root system adequate for unassisted survival. This study examined two methods of improving outplant survival and growth: 1) enclosing new transplants in open-bottom buckets to reduce transpirational water loss; and 2) positioning a 1 m^2 plastic “rainslide” upslope of the new plant that directs rainwater to the base of the bucket. From 7-28-98 to 4-4-99, 28 seedlings (6-10 cm tall) of seven native species were outplanted in a dry forest site (northern Wai‘anae Mountain Range; elevation 200 m). Fourteen of these plants were fitted with a bucket and rainslide; 14 plants served as controls (no bucket or rainslide). Each plant received 12 L of water when outplanted but have not been watered since. Rainfall from 7-28-98 to 4-4-99 was 221 mm (8.7 in). While results are still preliminary, measurements and observations taken at three months and six months after outplanting reveal that the bucket and rainslide have significantly increased growth or survivorship for at least three of the species outplanted. The difference between some treated and control plants is dramatic, with some bucket and rainslide plants now over twice the size of their paired control plants. Unexpectedly, in addition to reducing transpirational water loss,

buckets have another advantage -- protecting the plant from incidental damage caused by falling branches, sliding rocks or hikers' boots.

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MYCORRHIZAE IN THE HAWAIIAN FLORA: IMPLICATIONS FOR RESTORATION. The vast majority of Hawaiian plant species appear to have evolved from ancestors that had an absolute dependence upon arbuscular mycorrhizal fungi (AMF) to grow in native soils. As a result, most of the present-day species essentially are unable to grow in native soils if AMF are absent (e.g., in unvegetated, disturbed habitats). Successful restoration of habitats using native species depends upon the presence of AMF in the root zone. In sites lacking AMF, plant species that are able to establish are typified by invasive, weedy grasses such as buffelgrass (*Cenchrus ciliaris*) and fountain grass (*Pennisetum setaceum*), species that can grow well in the absence of AMF. Experiments on the response of native species to inoculation with AMF in native soils have shown significant increases in growth and survival. Mycorrhizal plants were 2-13 times larger than non-inoculated plants. Inoculation was effective on plants started as seeds or cuttings and on established plants maintained in the greenhouse. Species responding to AMF included: (*Abutilon eremitopetalum)*, koʻoloaʻula (*Abutilon menziesii*), koa (*Acacia koa*), hame (*Antidesma pulvinatum*), koʻokoʻolau (*Bidens sandvicensis* and *B. asymmetrica* x *sandvicensis*), ʻahakea lau nui (*Bobea elatior*), ʻakoko (*Chamaescyce remyi*), kauila (*Colubrina oppositifolia*), ʻaʻaliʻi (*Dodonaea viscosa*), naʻenaʻe *(Dubautia scabra*), nanu (*Gardenia remyi*), *Hedyotis* sp., aloalo (*Hibiscus clayi*), kokiʻo keʻokeʻo (*Hibiscus waimeae*), *Lysimachia glutinosa*, ʻōhiʻa lehua (*Metrosideros polymorpha*), *Munroidendron racemosum*, *Remya kauaiensis*, naupaka kuahiwi (*Scaevola gaudichaudiana*), naupaka kahakai (*Scaevola sericea*), ʻohai (*Sesbania tomentosa*), ʻilima (*Sida fallax*), māmane (*Sophora chrysophylla*), ʻohe (*Tetraplasandra hawaiensis*), and kolokolo kahakai (*Vitex rotundifolia*).

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POPULATION ABUNDANCE OF THE TWO-SPOTTED LEAFHOPPER (S*ophonia rufofascia*) IN MANAGED AND ADJACENT UNMANAGED AREAS WITHIN HAWAIʻI VOLCANOES NATIONAL PARK. In 1988, Park managers first noted the dieback of the non-native fire tree (*Myrica faya*) along the Hilina Pali Road in Hawaiʻi Volcanoes National Park. In the years that followed, the area of dead and declining trees increased and it became apparent that the dominant native tree, the ʻōhiʻa lehua (*Metrosideros polymorpha)* was also dying back in this affected area. Current research indicates that the non-native two-spotted leafhopper (*Sophonia rufofascia*), whose first appearance in this area coincided with the first signs of decline, is the largest factor involved in this dieback phenomenon. Park managers are interested in whether continued fire tree control could reduce the population abundance of the two-spotted leafhopper thus mitigating the adverse affects of this leafhopper on the native flora. To address this question, the abundance of two-spotted leafhoppers was monitored on ʻōhiʻa lehua trees by means of yellow sticky cards. Monitoring took place within three Special Ecological Areas (SEAs), where all fire trees had been removed a number of years prior, as well as in areas immediately adjacent which still have a fire tree component. Results thus far show significantly higher numbers of the two-spotted leafhopper in all three non-SEA sites as compared with their respective SEA sites. In addition, a vegetation survey was conducted at these sites to compare the available host abundance.

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PUAIOHI (*Myadestes palmeri*) - CAPTIVE PROPAGATION AND RELEASE OF AN ENDANGERED HAWAIIAN SOLITAIRE. The Puaiohi (*Myadestes palmeri*), is an endangered thrush, endemic to the island of Kauaʻi and restricted to the Alakaʻi Wilderness Area above elevations of 3,000 feet. Since 1995, this Hawaiian solitaire has been the focus of an aggressive recovery effort that has incorporated the funding, field efforts and the captive propagation and release expertise of several governmental and private agencies. These agencies include, US Fish and Wildlife Service, State of Hawaiʻi Divisions of Forestry and Wildlife and Parks and Recreation, US Geological Survey-Biological Resources Division, Kamehameha Schools Bishop Estate, the Kokeʻe Museum Association, the Civil Air Patrol, and The Peregrine Fund, as well as several private individuals. Each of these conservation partners has made a significant contribution to the recovery effort that has included field surveys,

netting, banding and transmittering, nest monitoring, predator control, public education, egg collection, captive propagation, and finally "soft releases" of captive-reared birds into suitable habitat. The conservation synergy generated by multiple-agency cooperation has created a model that may similarly benefit other species of endangered Hawaiian forest birds. In 1996 and 1997, 15 Puaiohi eggs were collected from the wild by The Peregrine Fund, hatched and reared at the Keauhou Bird Conservation Center; becoming a breeding flock in 1998, and producing 23 chicks. In early 1999, fourteen of these captive-reared chicks were transported to Kaua‘i and released from two release sites in the Alaka‘i Wilderness Area. All 14 birds are independent and survived for at least 30 days. Two pairs were observed exhibiting reproductive behavior.

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DIET AND HOME RANGE OF FERAL CATS (*Felis catus*) IN HAWAI‘I. Few studies in Hawai‘i have focused on self-sustaining populations of feral cats (*Felis catus*), and little is known about the role these predators play in affecting endemic terrestrial fauna in Hawaiian forest ecosystems. Between 1992 and 1997, we collected 101 feral cat scats in three habitats - ‘ōhia (*Metrosideros polymorpha)*/koa *(Acacia koa*) wet forest on the eastern slope of Mauna Kea, māmane (*Sophora chrysophylla)*/naio *(Myoporum sandwicense*) dry forest on the southwest slope of Mauna Kea, and Kaho‘olawe Island - to determine the incidence of rodent, bird, and invertebrate remains in their diet. Three male and two female cats, captured within the ‘ōhia/koa wet forest and fitted with radio transmitters, were monitored over a 1-year period to determine diurnal home ranges. Feral cats were distributed throughout the three habitats. Rodents constituted the largest portion of the feral cat diet in all three habitats, with a frequency of occurrence in scats of 0.88 to 0.91. The frequency of occurrence of bird remains found in scats was Kaho‘olawe Island 0.21, māmane/naio dry forest 0.53, and ‘ōhia/koa wet forest 0.68. Proportions of prey items in the diet appeared to reflect the relative abundance of prey populations within and between study areas. Diurnal home ranges averaged 5.74 ± 1.57 km^2 for male cats and 2.23 ± 0.31 km^2 for female cats. Daytime activity of radio-tagged cats was always within the wet forest, indicating they were avoiding adjacent open grassland pastures.

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STATUS AND CONSERVATION POTENTIAL OF LOWLAND DRYLAND FOREST REMNANTS AT PU‘U-O-KALI, MAUI. Diverse dryland forests and shrublands are among the most endangered of Hawaiian plant communities. Non-native ungulates, wildfire, and weeds have acted to completely eliminate native species from most lowland, leeward lands throughout the state. The Pu‘u-o-kali lava flows on southwestern Haleakalā volcano above Kīhei at 500-1500 feet elevation are among the most diverse and intact lowland dryland forest ecosystems remaining in the Hawaiian Islands and comprise by far the best remnant of lowland dryland forest vegetation on Maui. Because of the rough lava substrate, the area escaped sweet potato cultivation and burning by early Hawaiians. In modern times, the area’s native vegetation persisted because of continued protection from fire (sparsity of fuel), lack of serious plant invaders on the lava flows, and until recently, absence of goats and axis deer. The area is subject to cattle grazing, but cattle rarely wander on to the lava flows. In the early 1980s, axis deer were present in the area but their impact appeared to be modest. Unfortunately, this situation has changed drastically in the 1990s with increasing axis deer populations in the area. Deer browsing, chewing, and bark girdling during the 1997-1998 El Nino-induced drought had catastrophic effects, with high mortality of *Achyranthes splendens*, kulu‘i (*Nototrichium sandwicense*), ‘akoko (*Chamaesyce celastroides* var. *lorifolia*), and other native plant species of the Pu‘u-o-kali flows. A multiagency partnership is developing for emergency fencing and ecosystem protection. Plans for a 200-acre fenced exclosure are progressing.

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PHOTOSYNTHETIC CAPACITY OF INVASIVE MANGROVES (*Rhizophora mangle* and *Bruguiera sexangula*) IN HE'EIA STATE PARK, O'AHU: IMPLICATIONS FOR MANAGEMENT. Invasive mangroves have become dominant on coastal habitats in all major Hawaiian Islands. The negative impacts of mangroves range from degradation of endangered water bird habitat to extreme alteration of coastal ecosystem function and structure. This study is the first attempt to explain, based on physiological measurements, the establishment and growth potential of invasive mangroves. Changes on mangrove coverage in He'eia from 1902-1991 were estimated using GIS. The results show an increase in the coverage from 0 to 124,041 m^2 in 1971, and a decrease to 123,664 m^2 by 1991. This decrease is a result of mangrove control and removal by He'eia State Park. However, intensive re-colonization by seedlings has been observed. Photosynthetic capacity of seedlings and saplings of red mangrove (*Rhizophora mangle*) and *Bruguiera sexangula* in one artificial gap was measured using gas exchange technique. Red mangrove showed higher values of photosynthetic saturation point (6.3 µmol CO_2 $m^{-2}s^{-1}$) when compared to *B. sexangula* (3.2 µmol CO_2 $m^{-2}s^{-1}$). On the other hand, *B. sexangula* saplings were more efficient under low light conditions than red mangrove saplings (quantum efficiency = 0.042 and 0.201, respectively). These results suggest high acclimation potential of red mangrove (which represents 90% of the trees) to gap formation and can partially explain the rapid and continual re-colonization of mangrove propagules after clearing. Gap formation seems to favor growth of already established mangrove seedlings. Other strategies such as control of propagule dispersal and additional seedling establishment should also be a necessary component of any effective management effort.

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NATURAL RESOURCES CONSERVATION GRANTMAKING PROGRAM. The health of Hawaii's natural resources and native ecosystems will largely define the quality of life for Hawaii's people, now and in the future. Given the mission of the Hawai'i Community Foundation (HCF) to improve and enrich Hawaii and the lives of its people, it is imperative that the Foundation take an active role in supporting the protection of Hawai'i's natural resources. Guidelines for the newly established HCF Natural Resources Conservation Grantmaking Program will be available. The program is intended to enhance the quality of life for Hawaii's communities by promoting the conservation and restoration of Hawai'i's native terrestrial and marine ecosystems. Preference will be given to projects that: 1) involve the local community in planning, decision-making and implementation; 2) protect or restore native ecosystems; and 3) promote partnerships.

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O'AHU RESOURCE CONSERVATION AND DEVELOPMENT COUNCIL'S COMMUNITY OPPORTUNITY ASSESSMENT. The O'ahu Resource Conservation and Development Council is a not-for-profit, community-based organization formed to enable community groups to undertake activities that meet O'ahu's needs. To begin identifying activities to undertake, the O'ahu Resource Conservation and Development Council has undergone a "community opportunities assessment" process to document and prioritize O'ahu's natural and human resource concerns on a watershed basis. It involves a systematic, orderly methodology emphasizing grassroots knowledge and participation. This process has involved the following steps: (1) formulate the process – that is, agencies provide technical support and funding; (2) review existing information by gathering documents and contacting community leaders; (3) prioritize concerns identified in step 2 for each O'ahu Resource Conservation and Development Council district; (4) validate prioritized concerns using quantitative and qualitative methodologies; and (5) prepare report and present the results visually using a geographic information system database. The final products of the Community Opportunities Assessment will serve as a foundation for the ten-year strategic plan for the O'ahu Resource Conservation and Development Council, as well as their annual plan of work.

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COMMUNITY OUTREACH STRATEGIES: BRIDGING THE GAP BETWEEN AN AMERICAN CONSERVATION ORGANIZATION AND THE MOLOKA‘I ISLAND COMMUNITY. Moloka‘i is often recognized as the last “Hawaiian” Island. About half of the approximately 7,000 residents on Moloka‘i are of Hawaiian Ancestry. The island’s relative low population density has perpetuated the cultural and traditional lifestyle that was reminiscent in “old” Hawai‘i. In 1983, the Kamakou Preserve became the first Nature Conservancy of Hawai‘i’s actively managed preserve in Hawai‘i. Resources in the early years were limited and focused on threat abatement. Community outreach was restricted to monthly hikes and slide shows geared towards intermediate school-aged students. In the early 1990’s, the State’s Natural Area Partnership funding became available, enabling the Conservancy to do extensive long-range planning, including building the organization’s ability to do community outreach and environmental education effectively. Many strategies were recognized as priorities to implement on Moloka‘i: 1) involve community leaders and partners with decision making through advisory and working groups, 2) involve and build capacity of the community members to help with stewardship programs through volunteer and docents programs, 3) keep supporters informed through a local newsletter, 4) hire staff from the local community, and 5) educate future generations, primarily school children, through slide shows and field trips to create long-term support for conservation. Today the Conservancy has three preserves on Moloka‘i (nearly 10,000 acres), a staff of six, an office and baseyard and is still engaging the strategies it developed during the long-range planning process of the early 1990’s. These strategies have help tremendously to bridge the gap between the Nature Conservancy and the local Moloka‘i Community. This is most evident by the community’s recent invitation to the Conservancy to join in the strategic planning process for the USDA Empowerment Zone (EZ) Initiative application. During the discussions, TNCH proposed creating a Kamalō/Kapualei Watershed project to increase the management of key watershed areas on Moloka‘i. This project is one of the top priorities in the EZ strategic plan and application.

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NESTING ECOLOGY OF THE NIGHTINGALE REED-WARBLER (*Acrocephalus luscinia*) ON SAIPAN, MICRONESIA. The first nest of the Nigthingale Reed-warbler (*Acrocephalus luscinia*) was described by Marche (1887) on the island of Guam. Baker (1951) reported a nest on Guam, but gave no description. Engbring et. al. (1986) and Craig (unpublished) each found a nest on Saipan, but did not collect for examination. Prior to this study very little was known about the nesting ecology of the reed-warbler. Subsequent research documented egg and nestling descriptions, as well as incubation periods, nestling periods, and fledging periods. We located 100 nests in various stages of activity. Eighty-four percent of the nests were located in introduced upland tangantangan (*Leucaena leucocephala*) forest, 15% in Mangrove (*Bruguiera gymnorrhiza*) wetland forest, and 1% in karisu (*Phragmites karka*) wetland. Nesting substrates consisted of eight non-native and native plant species. The incubation period for three nests was 14 to 16 days. The average nestling period for seven nests was 17.4 days. Nesting success for 50 active nests was 44% with a total of 43 fledglings from 22 nests. Of the 28 active nests that failed, 93% failed due to predation by rats (*Rattus norvegicus* and possibly *Rattus exulans*), feral cats (*Felis catus*), and Golden white-eye (*Cleptornis marchei*), 3.5% to abandonment, and 3.5% to super-typhoons. The reed-warbler is adapted to non-native habitat, but is impacted by non-native predators. The number one priority is to ensure the integrity of habitat and to institute a predator removal program over the remaining habitat (~60 km^2).

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CHICAGO WILDERNESS: A PARTNERSHIP MODEL FOR BIODIVERSITY CONSERVATION. In 1996, a coalition of diverse and determined organizations launched *Chicago Wilderness*. Our vision? A thriving mosaic of natural areas (200,000 acres of protected land connected by greenways and wildlife corridors) embedded in the landscape of the nation’s third largest metropolis. In this vision, the region’s human communities reclaim a cultural tradition of restoring, protecting, and managing the globally outstanding natural communities that enrich our lives. The larger-than life goal of Chicago Wilderness is nothing less than to rescue the precious natural areas by transforming the *culture* of the people and agencies responsible for them. In its first three years, the coalition of

dozens of complementary institutions has woven a strong fabric of strategies and actions. With scientifically rigorous approaches to inventory, restoration and monitoring, and with creative advances in planning, policy, education and communications, the accomplishments of Chicago Wilderness are building a living legacy for the future. As understanding and appreciation of local ecosystems becomes an integral part of this culture, Chicago will be known as a place whose citizens have a passion for wilderness, as well as the foresight, ingenuity and resources to save their piece of it.

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NESTING SUCCESS OF 'APAPANE (*Himatione sanguinea*) ALONG AN ALTITUDINAL GRADIENT OF NIGHT-BITING MOSQUITOES (*Culex quinquefasciatus*). Range reductions, extinctions, and population declines have been documented of Hawaiian honeycreepers (Passeriformes: Fringillidae: Drepanidinae) inhabiting low-elevation forests. Particularly interesting in considering the altitudinal trend of these declines is the opposite trend in abundance of the introduced night-biting mosquito (*Culex quinquefasciatus*), the primary vector of avian malaria (*Plasmodium relictum*). We monitored nesting success of an endemic Hawaiian honeycreeper, 'Apapane (*Himatione sanguinea*), and abundance of night-biting mosquitoes between 610 and 1,829 m on the Kona Forest Unit of the Hakalau Forest National Wildlife Refuge, Hawai'i Island, during 1998 and 1999. 'Apapane nest fates were not related to the abundance of night-biting mosquitoes caught below each nest over 7 trap nights, starting within 1 week of nest termination. Surprisingly, there was a slight trend towards more mosquitoes at successful nests than at unsuccessful nests. We found no relationship between 'Apapane nest fates and elevation. Our preliminary correlative data suggest that the presence of night-biting mosquitoes and their potential transmission of avian malaria do not have an important influence on 'Apapane nesting success. We recommend focusing research and management on juvenile and adult survival and on other aspects of reproduction in further investigations of the causes of low-elevation declines of Hawaiian honeycreepers.

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A VOLUNTEER STEWARDSHIP NETWORK FOR HAWAI'I'S NATURAL RESOURCES. The Nature Conservancy of Hawai'i has begun efforts to develop a Volunteer Stewardship Network modeled on a program of the same name organized in 1983 by the Nature Conservancy and the Illinois Nature Preserves Commission as a resource for citizen conservationists looking for a way to help nature. The prototypes were "grassroots" ecological restoration projects, started by community volunteers to protect wildlife habitats around the Chicago region. The Volunteer Stewardship Network model is one that enlists and empowers volunteers to protect and restore natural areas with the approval and assistance of land managing organizations and landowners. It is based on the idea of site stewardship in which volunteer stewards assume responsibility for managing a site in cooperation with the landowner. At the same time, a volunteer network maximizes the impact of casual volunteers by providing a much wider range of opportunities than can be offered by a single organization acting alone and coordinating the deployment of volunteers to areas where they are needed most. A Volunteer Stewardship Network can be an effective mechanism for bringing management to understaffed and underfunded sites, and has a proven track record in Illinois where more than 5000 volunteers help maintain and restore more than 200 high quality natural habitats throughout northern Illinois.

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SYSTEMATICS OF THE HAWAIIAN DAMSELFLY SPECIES (*Megalagrion hawaiiense)* AND IMPLICATIONS FOR CONSERVATION. Recognizing species is necessary to protect them. The lack of recognition by legislation can lead to extinction as it nearly did in the case of the New Zealand tuataras (*Sphenodon putatus* and *S. guntheri).* Here we demonstrate that the potential for a similar situation exists in the Hawaiian damselflies currently classified as *Megalagrion hawaiiense.* The Hawaiian damselfly genus *Megalagrion* contains 22 species. Some authors have recently proposed that the species *M. hawaiiense* is actually two distinct species, *M. hawaiiense* and *M. mauka.* The distribution of *M. hawaiiense* is fairly broad. It is found on each of the Hawaiian Islands except Kaua'i. *Megalagrion mauka*, in contrast, is found only on the island of Kaua'i. Because the two species are very similar in appearance,

some scientists dispute whether they are actually a separate species. We have examined members of populations of *M. hawaiiense* and *M. mauka* to address the issue of species identity. Specimens varied in age, from several months to several years, preserved in 95% ethanol and frozen until use. The entire mitochrondrial COII gene was sequenced for several individuals from each population. Phylogenetic analysis of the sequence data suggests that *M. mauka* has a distinct evolutionary history from that of *M. hawaiiense*. In fact, *M. mauka* is more closely related to other Kauaʻi species such as *M. vagabundum* and *M. paludicola* than it is to *M. hawaiiense*. It is important to recognize *M. mauka* as a distinct species from *M. hawaiiense* to ensure the species is not ignored in conservation efforts as the *S. guntheri* once was.

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HYBRIDIZATION AMONG ENDEMIC AND NATURALIZED SPECIES OF RASPBERRY (*Rubus*) IN THE HAWAIIAN ISLANDS. A population of putative hybrids between an endemic ʻakala (*Rubus hawaiiensis*) and a naturalized thimbleberry (*Rubus rosifolius*) was discovered in Kīpahulu Valley, on the island of Maui. Although hybridization between endemic and naturalized species has been performed artificially, this project provides the first documented evidence of a naturally occurring case in Hawaiʻi. The goal of this study was to characterize this natural hybridization event, investigate the mode of hybridization and determine the male fertility of the F1 hybrids. By examining this hybrid event, we are able to directly examine an important evolutionary process, determine whether the hybrids pose an ecological threat and highlight the importance of maintaining active alien species control programs in Hawaiʻi. Intermediate morphological characteristics shared by these plants. Randomly Amplified Polymorphic DNA (RAPD) analysis indicated genetic similarity within species is high and between species is low. Similarity of the hybrids to each species is intermediate to parent populations. Presence of alleles in hybrid individuals was additive. Sequence analysis of the chloroplast gene ndhF suggests that *R. rosifolius* was the maternal parent in the cross, whether this occurred either as a single hybridization event with seeds spread to both colonies or as multiple events is unknown.

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FISH, ALGAL, AND CORAL ECOLOGY TEAM (FACET). A shift toward algal dominance typically characterizes degraded or declining coral reefs. This research project identifies (1) major organisms involved in these shifts (*i.e.,* turf and macroalgae) and (2) specific conditions that effect biological processes involved in controlling reef stability or decline. Field research by Jennifer Smith has thusfar identified over 100 algal species, including a new red alga (*Laurencia molokiniensis*) that may be endemic to Hawaiʻi or perhaps even Molokini. Long-term plots at Puakō, West Hawaiʻi measure how algal biomass, succession, diversity, dominance, and community development vary when exposed to increased nutrient levels and reduced herbivory. Turf algae present a number of obstacles to genetic analyses. The presence of polysaccharides and phenolic compounds associated with various algal species have made DNA extractions traditionally difficult. We have obtained high quality, high molecular weight DNA in all extractions using a protocol from species providing less than 0.4 mg of tissue. Tests of the preferences of herbivorous fishes for several species of macroalgae present in the Bay have also been conducted. They have shown that many of the invasive macroalgal species are highly preferred food sources. This suggests that, if present in sufficient numbers, the herbivore community would graze heavily upon the invasive macroalgal species and could therefore control their abundance.

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POPULATION STATUS OF THE ENDANGERED LAYSAN DUCK (*Anas laysanensis*). The last wild population of Hawai'i's endemic Laysan duck (*Anas laysanesis*) exists on Laysan Island, Hawai'i Islands National Wildlife Refuge. Laysan's ducks are a relict population and at high risk of extinction due to severe weather, disease, accidental introductions, and habitat degradation. An alarming population decline occurred on Laysan in 1993. Poor recruitment in 1998 (n = 4 fledglings) was due to starvation and parasite infestation of limited water resources by the nematode *Echinuria uncinata*. Drought conditions during El Ninos and alien insects including the big headed ants (*Pheiodole megacephala*) are suspected of reducing the duck's food abundance. The Lincoln-Petersen Index was used to estimate population size from mark-recapture and resight data. We estimate the 1999 adult population is 322 ducks (95% C.I. 290 – 355). On going population dynamics and foraging ecology research will be applied to restoration and conservation planning for Laysan Island and *Anas laysanesis.*

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GENETIC VARIATION AND STATUS IN HAWAIIAN CORAL SPECIES. The population biology of Hawaiian coral species is poorly understood and the resulting uncertainty in species-level taxonomy greatly undermines both management and research efforts. The characterization of intraspecific variation is critical for successful management and conservation strategies. The difficulty associated with underwater research, however, means that marine species probably harbor unrecognized population structure, and that many cryptic species remain to be described. These questions have significant management implications, for example, a coral species with a large, polymorphic, and genetically contiguous population throughout the Hawaiian islands probably has a good chance of surviving human impacts. Conversely a coral species with a limited habitat or geographic range will be much more vulnerable. An accurate assessment of population parameters is vital for the successful implementation of protected marine reserves. With widespread and polymorphic species there is a good chance that damaged reefs will be re-seeded form another part of the species' range. Many species, however, may be more specialized and geographically restricted. Where connectivity among reef populations is low, a dense network of protected areas and a more sophisticated monitoring strategy is required.

Joby Rohrer, Mathew Burt, Alvin Char, Vince Costello, Jordan Jokiel, Kapua Kawelo, Mathew Keir and Steven Kim

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RESEARCH AND MANAGEMENT ON O'AHU ARMY LANDS. The Army's Natural Resource Staff have been working for four years managing both rare and common resources on O'ahu training lands. In many of our efforts we have been fortunate to cooperate with researchers focusing on topics related to these resources. These partnerships have guided aspects of our management including species monitoring, threat control, weeding invasive species, and revegetation with common native species. Dr. Ruth Aguraiuja from the University of Uppsala cooperating with the National Tropical Botanical Garden, is working on *Diellea* (the only endangered fern on Army lands) and has installed plots in which populations will be intensively monitored. She will make management recommendations. Dr. Michael Hadfield from UH has helped us develop our rare snail management strategy. Three of our staff are registered to handle snails under his permit. Through a cooperative effort with the O'ahu State Natural Area Reserves System, we constructed a rat/*Euglandina* exclosure modeled after enclosures Dr. Hadfield had visited in Tahiti. Dr. Leonard Freed from UH has facilitated rare bird monitoring. Two of our staff members are permitted to handle birds under his guidelines. Eric Vanderwerf, a doctoral student working with Dr. Freed, has directed Army staff in implementing predator control techniques around nesting O'ahu 'Elepaio (*Chasiempis sandwichensis ibidis*). Dr. Shelia Conant from UH and her graduate student Kate Johnson, along with Arlene Pangelinan of the US Fish and Wildlife Service, have been instrumental in helping the Army design and implement a plan to translocate and monitor the endangered Orange-Black Damselfly (*Megalagrion xanthomelas*). Graduate students Elizabeth Stampe and Rebecca Randell, enrolled in an Ecology, Evolution and Conservation Biology class at UH, installed vegetation plots which helped to define how weed invasion is occurring in a mesic forest environment. This in turn helps Army staff define effective weeding approaches. Ethan Shiinoki, an undergraduate at UH, conducted a study on revegetation

techniques under Dr. Jacquelin Miller in the Environmental Studies Department. His technique may be employed on a larger scale pending results. All of these cooperative relationships have greatly improved the Army's management. The Army's relationships with researchers have begun in a number of ways but mainly can be attributed to a staff which is motivated to seek out researchers and students with expertise, flexible scheduling to accommodate research ability to provide adequate staff time, and close cooperation with other agencies facilitating referrals.

Craig Rowland

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U.S. FISH AND WILDLIFE SERVICE'S CONSERVATION PARTNERSHIPS PROGRAM. The Pacific Islands Ecoregion Conservation Partnerships Program seeks to implement landscape scale conservation efforts for the benefit of native ecosystems by working cooperatively with private landowners, conservation organizations, community groups, and other government agencies. The Pacific Islands Ecoregion's great diversity of ecosystems, huge number of trust species, and the high level of biodiversity provide a wide range of habitat restoration opportunities. The nature of restoration projects in Hawai'i and the Pacific necessitates a longer term commitment than may be needed in other parts of the country. Our primary challenge is controlling the effects of alien species (feral ungulates, invasive alien plants, mammalian predators, insect pests, etc.). Addressing some of these threats will require a long-term, multi-phased approach that involves working cooperatively with conservation partners including local communities. The different elements of the Conservation Partnerships Program are described and selected projects highlighted.

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RESTORATION OF A NATIVE LOWLAND FOREST, MANUKĀ, HAWAI'I. Manukā State Natural Area Reserve holds one of the largest tracts of undisturbed native lowland dry forest remaining in Hawai'i. Within the reserve is a kīpuka containing a unique and diverse forest dominated by ancient 'Olopua (*Nestegis sandwichensis*) trees. The Natural Area Reserve staff began intensive management of this kīpuka in 1996. Several species of invasive weeds were targeted for control, and pig-proof fencing was installed around the kīpuka perimeter. Subsequent monitoring has shown a dramatic decline in the abundance of targeted weed species. Future plans include reintroduction of rare plant species and further restoration of disturbed areas.

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MICROPROPAGATION AS A TOOL FOR PLANT GENETIC CONSERVATION IN HAWAI'I. Plant micropropagation, or the propagation of small pieces of plant tissue *in vitro*, has become an indispensable tool for plant genetic conservation especially where conventional propagation efforts have failed or proven to be difficult. Micropropagation is particularly useful in situations where seed propagules are collected immature, small, recalcitrant, short-lived, do not store well, or are rare. The seeds are germinated *in vitro* and stored as living germplasm collections or prepared for future restoration projects. When seed are unavailable, clonal propagules can be initiated, propagated, and maintained *in vitro*. In the micropropagation of Hawaiian natives, it is of utmost importance to preserve the integrity of the original plant genotype. Therefore any variables which may jeopardize genetic stability and normal plant regeneration during the culturing process must be minimized. The selection of suitable plant material and explants in the field, proper surface disinfestation, plant medium and culture conditions are all considered crucial for successful establishment of *in vitro* cultures. Approximately one half of all Hawaiian vascular plants are biologically at risk, and have been reduced so far that normal regenerating capabilities have been impaired or rendered nonfunctional. The objectives of the Lyon Arboretum micropropagation rare Hawaiian plant project is to assist in the prevention of further extinction of Hawaiian plant taxa, propagate plants for use in restoration and reintroduction, and to initiate and maintain an *in vitro* germplasm collection.

Philip A. Thomas[1], Lloyd L. Loope[1], and Clifford W. Smith[2]

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THE HAWAI‘I ECOSYSTEMS AT RISK PROJECT: TRACKING STATUS AND TRENDS OF ALIEN SPECIES AT MULTIPLE SCALES TO ASSIST PREVENTION, ERADICATION, AND CONTAINMENT. The Hawai‘i Ecosystems at Risk (HEAR) project started in 1995, with the goal of providing resources (technology, methods, and information) to help managers address invasive alien species problems. Although statewide in scope, working primarily with vascular plants, HEAR has evolved to work most closely in data collection with the Maui Invasive Species Committee (MISC), a partnership committed to preventing establishment of new pest species and to stop newly established pests from spreading. MISC and Hawai‘i need tools to 1) identify and eradicate newly emergent alien species with potential for damage, before they become uncontrollable, and 2) develop a strategy for exclusion of new invasive species from the state. Internet-based information (http://www.hear.org) is made widely and quickly available to a large audience, who can pass information to others who lack internet access. These needs are shared with other island groups and continents throughout the world. There is increasing recognition that the best predictor of invasiveness for most taxonomic groups is a record of invasiveness in similar climates elsewhere in the world. As a result, HEAR has made enormous strides recently through involvement with international working groups addressing alien species problems, including the IUCN Invasive Species Specialist Group and the Global Invasive Species Program. An international system will allow workers involved with alien species worldwide to contribute to and benefit from contributions of others in a way never before possible.

Shelly Truszkowski and Sabrina Clark

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MOLECULAR MECHANISMS USED IN THE CONSERVATION OF HAWAI‘I’S AVIFAUNA. Here we present the results of three ongoing research projects headed by Dr. Rebecca Cann and Dr. Leonard Freed at the University of Hawai‘i at Mānoa. These projects, undertaken by several students in our laboratory involve the use of molecular mechanisms used in the conservation of Hawai‘i’s avifauna. One of the endeavors that will be presented is the characterization of microsatellite loci of the Hawaiian ‘Akepa (*Loxops coccineus coccineus).* This project was developed from field observations of the female ‘Akepa coloration in relation to male sexual selection. The purpose of this project is to determine a genetic marker for the ‘Akepa as a way of following the parentage of individuals and to test the hypotheses that bright females are displaying a badge of fitness and may be subject to male sexual selection. The second endeavor that will be presented is the use of genetic markers in sexing various species of Hawaiian birds. This technique uses a W-linked gene. This gene is highly conserved and has been found in a variety of bird species. The discovery of a second non-W linked gene has allowed the detection of these genetic markers to be used in the determination of sex in birds. The final project that will be presented is the use of a polymerase chain reaction based test in the detection of avian malaria. The assay identifies rRNA genes of *Plasmodium.* The results of these on going projects have important conservation implications for Hawai‘i’s avifauna.

Erik Tweed[1]**,** Jeff Foster[1] and Bethany Woodworth[2]

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BEHAVIOR OF A REINTRODUCED POPULATION OF THE CRITICALLY ENDANGERED PUAIOHI (*Myadestes palmeri*). The population of the Puaiohi (*Myadestes palmeri*), a thrush endemic to the island of Kaua‘i, is estimated to consist of 200-300 individuals. The majority of these birds are concentrated in a single drainage in the Alaka‘i State Wilderness Preserve. Current recovery efforts by The Peregrine Fund, USGS Biological Resources Division, US Fish and Wildlife Service, and the State Division of Forestry and Wildlife are focused on expanding the limited range of the species by reestablishing a population where they had historically been known to exist. Fourteen captive-bred Puaiohi were fitted with radio transmitters and released by The Peregrine Fund into the Alaka‘i swamp from January to March 1999. As of April 1999, seven birds had remained in the immediate vicinity of the release site

and six of the eight released females had begun to nest. We are researching the fate of the released birds, their dispersal and home ranges, foraging behavior, and breeding habits. In particular, we are examining the roles of predation, food resources, and disease in influencing the survival and productivity of the reintroduced birds. These efforts will be essential in determining the factors that allow the success or failure of this landmark reintroduction effort, and the extent to which these techniques are applicable to other endangered forest birds in Hawai'i. Although it will take years to determine if release efforts will successfully reestablish a self-sustaining population of Puaiohi, current efforts look promising.

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EFFECTS OF DISEASE AND PREDATOR REMOVAL ON DEMOGRAPHY OF O'AHU 'ELEPAIO (*Chasiempis sandwichensis ibidis*). The O'ahu 'Elepaio (*Chasiempis sandwichensis ibidis*) is a forest bird endemic to O'ahu, and recently was proposed for listing as endangered. We investigated factors suspected of causing the decline of O'ahu 'Elepaio by monitoring demography of a banded population in southeastern O'ahu from 1995-1999. Annual survival of birds with active poxvirus infections (58%) was lower than survival of healthy birds (88%) or birds with healed poxvirus lesions (77%). To document the cause of low reproductive success, we placed automatically-triggered cameras at artificial nests with quail eggs; each of 10 photographs showed an introduced black rat (*Rattus rattus*) preying on the eggs. From 1997-1999, we attempted to increase reproductive success by removing rats with snap traps and diphacinone bait stations. Compared to control areas, rat removal increased number of fledglings per pair from 0.37 to 0.70, or 89%, and nest success increased from 41% to 60%. The rate of population growth (lambda) was 0.77 without rat removal and 1.02 with removal. Currently there is no practical method of controlling mosquitoes that carry poxvirus, but rat removal is a promising management technique that hopefully will help prevent further decline of 'Elepaio and other Hawaiian forest birds. With support from the Secretariat for Conservation Biology, we began collaborations in 1999 with the US Army Garrison Environmental Division, the Natural Area Reserve System, and The Nature Conservancy of Hawai'i to manage 'Elepaio populations by removing rats in Kahanahāiki Valley, Schofield Barracks West Range, Pāhole State Natural Area Reserve, and Honouliuli Preserve.

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GIS MAP OF THE CURRENT RANGE OF O'AHU 'ELEPAIO (*Chasiempis sandwichensis ibidis*). The O'ahu 'Elepaio (*Chasiempis sandwichensis ibidis*) is a forest bird endemic to O'ahu, and was recently proposed for listing as endangered. Its current distribution and abundance are poorly documented, and this information is vital for identifying where and how populations should be managed. We compiled 'Elepaio observations in the literature and from databases maintained by The Nature Conservancy of Hawai'i and Bishop Museum, and we surveyed most of O'ahu specifically for 'Elepaio from 1993-1999. We plotted observations on digitized USGS topographical maps and used them to draw a current range map with Arcview GIS software. There currently are approximately 1500 individuals distributed in 7 isolated populations. Large populations occur in the Wai'anae Mountains on Schofield Barracks West Range and in Honouliuli Preserve, and in the southern leeward and central leeward Ko'olau Mountains. Smaller populations remain in Mākaha and Wai'anae kai Valleys, Pāhole State Natural Area Reserve and Kahanahāiki Valley, and Waiāhole and Waikāne Valleys. Large areas of the northern Ko'olau range contain suitable habitat that is currently unoccupied by 'Elepaio. Area of the current range is 11,592 acres, only 3.7% of the original prehistoric range. Native vegetation dominates 41% of the current range, introduced vegetation dominates 59%. Most 'Elepaio are found in valleys, not on ridges. 98% of the current range is on land designated for conservation, and 18% is within protected areas. Management of as many populations as possible is urgently needed to prevent further declines and extirpation of smaller populations.

Mindy Wilkinson and Curt Daehler

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INITIAL RESULTS FOR PRESCRIBED BURNING TO INCREASE A NATIVE GRASS IN A COMMUNITY DOMINATED BY ALIEN BUNCH GRASSES. Managers at Hawai‘i Volcanoes National Park began a program of prescribed burns to promote native grasslands following a study of naturally occurring fires. The objective of this study is to explain the causes of cover changes of the native Pili grass (*Heteropogon contortus)* and two alien bunch grasses Natal redtop (*Melinis repens*) and thatching grass (*Hyparrhenia rufa*) following fire. During the first year, survival for marked individuals of Natal redtop was less than 5% in both the burn area and at a neighboring control site while Pili experienced 50% survival rates in the burn area and 100% survival in the control area. Thatching grass is expanding its distribution in the area. This species had 60% survival in the control area and similar survival rates to Pili in the burn area. Recruitment in the burned area was limited by seed survival. Soil samples determined that seed densities of Pili and thatching grass were similar to pre-burn levels while Natal redtop dropped to less than 5% of pre-burn abundance. Pili and thatching grass had similar levels of recruitment and regained their pre-burn densities within the first growing season while Natal redtop decreased to 10% of its pre-burn density. Burning decreases the cover of Natal redtop but may not be effective in reducing the cover of thatching grass in Pili grasslands. Alternate strategies should be developed to control this alien grass.

Kristen Yen, Sarah Burgess, Shelly Troszkowski, Pia Untalan, Fred Duenneiber and Rebecca Cann

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MOLECULAR SEXING OF HAWAIIAN BIRDS USING THE CHD GENE AND APPLICATIONS TO PROBLEMS IN BIRD CONSERVATION. Recent controversies over the best management action to take with the 3 known remaining Po‘ouli (*Melamprosops phaesoma*) at Hanawī NAR on Maui highlight the uncertainty that conservationists must often deal with in extreme situations. Evaluation of reasonable alternatives depends on accurate information. For some of our rarest avian species, so few individuals are left in the wild that behavioral observations may be difficult to interpret. Knowing the correct sex of a bird in a species where plumage is monomorphic, where plumage maturation may take years, morphological signs of breeding are seasonal, or where juveniles represent the best stage to manipulate the population biology of a species all point to the need to develop better, non-invasive techniques for sexing individuals. We report here our progress in using the CHD (Chromatin Helicase Domain) gene to sex 7 species of Hawaiian forest birds, including three endangered species. Total genomic DNA from blood of individual color-banded birds, mist-netted at Hakalau Forest Wildlife Refuge on the island of Hawai‘i and two other sites on O‘ahu was amplified using the Polymerase Chain Reaction and the DNA primers identified for the CHD gene by Griffiths et al. (1986) in the UK. Amplification products were sequenced to confirm both their identity as homologous to published CHD sequences and the presence of unique restriction endonuclease cleavage sites used as the basis for assigning the CHD gene copy to either the Z or the W sex chromosome.

Alvin Y. Yoshinaga

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STORING SEEDS OF NATIVE HAWAIIAN PLANTS. Research programs at the USDA National Seed Storage Laboratory and the University of Hawai‘i Center for Conservation Research show that seeds of many native plants can be stored successfully using simple, inexpensive methods. For some species, projected storage lives of several years, or decades, are practical. Data for 200+ species are now available. So far, almost all small, dried seeds have been stored successfully under desiccation. The great majority of desiccation-tolerant seeds also tolerate freezing. Such seeds can be readily processed for storage in an ordinary refrigerator and stored in a home freezer. The poster will give a list of the species for which storage recommendations are available, describe storage procedures in detail, and explain how to obtain updated online information on native plant seed storage from the Secretariat for Conservation Biology's World Wide Web page (http://www2.hawaii.edu/scb/).

RESEARCH IN PROGRESS

The Secretariat for Conservation Biology seeks to maintain a list of current research projects in Hawai‘i. We hope to update this list periodically and make it available on the SCB website. We encourage resource managers to contact researchers to obtain up-to-date scientific information that will help them manage the natural areas under their care. We realize that this list is far from comprehensive and welcome additions, corrections and any suggestions you may have to improve this list.

NATIVE RESOURCES

Native Species: *Birds*

Title: Initiating recovery of the critically endangered honeycreeper, the Po‘ouli
Contact Information: Thane Pratt, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai‘i National Park, HI 96718; Thane_Pratt@usgs.gov
Research Sites: Hanawī State Natural Area Reserve, Maui; Haleakalā National Park, Maui
Timeframe: 1995 to 1999

Title: Breeding behavior and population ecology of ‘Akohekohe and Maui Parrotbill on Maui
Contact Information: Thane Pratt, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai‘i National Park, HI 96718; Thane_Pratt@usgs.gov
Research Site: Hanawī State Natural Area Reserve, Maui
Timeframe: 1993 to 1999

Title: Reproduction and survival of ‘Akiapola‘au, Hawai‘i ‘Akepa, Hawai‘i Creeper, and other native forest birds along a gradient of native bird density in wet forests of windward Hawai‘i
Contact Information: Bethany Woodworth, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai‘i National Park, HI 96718; Bethany_Woodworth@usgs.gov
Research Site: Hakalau Forest National Wildlife Refuge, Big Island
Timeframe: 1994 to 1999

Title: Establishment of additional breeding populations of the critically endangered Puaiohi in Kaua‘i's Alaka‘i Wilderness Area
Contact Information: Erik Tweed, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai‘i National Park, HI 96718; Erik_Tweed@usgs.gov
Research Site: Alaka‘i State Wilderness Area, Kaua‘i
Timeframe: 1995 to 2000

Title: Palila (*Loxioides bailleui*) restoration
Contact Information: Paul Banko, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai‘i National Park, HI 96718; Paul_Banko@usgs.gov
Research Site: US Army Pōhakuloa Training Area and Mauna Kea State Forest Reserve, Big Island
Timeframe: 1995 to 2000

Title: Palila (*Loxioides bailleui*) foraging ecology
Contact Information: Paul Banko, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai‘i National Park, HI 96718; Paul_Banko@usgs.gov
Research Site: Mauna Kea State Forest Reserve, Big Island
Timeframe: October 1991 to October 2000

Title: ʻAlalā restoration
Contact Information: Paul Banko, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawaiʻi National Park, HI 96718; Paul_Banko@usgs.gov
Research Site: South Kona District, Big Island
Timeframe: October 1992 to October 1999

Title: Effects of predator removal and disease on demography of Oʻahu ʻElepaio
Contact Information: Eric VanderWerf, University of Hawaiʻi at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; vanderwerf@zoology.hawaii.edu and David Smith, State Department of Land and Natural Resources, Division of Forestry and Wildlife, 2135 Makiki Heights Drive, Honolulu, HI 96822; viking@hgea.org
Research Sites: Honolulu State Forest Reserve, Schofield Barracks, Mākua Valley Military Reservation and Pāhole State Natural Area Reserve, Oʻahu
Timeframe: January to July 1999

Title: The importance of old-growth rainforest in explaining patterns of abundance of the endangered Hawaiʻi ʻAkepa
Contact Information: Patrick Hart, University of Hawaiʻi at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; pjhart@hawaii.edu
Research Site: Hakalau Forest National Wildlife Refuge, Big Island
Timeframe: 1995 to 1999

Title: Conservation biology of the Laysan Finch
Contact Information: Andrew McClung and Sheila Conant, University of Hawaiʻi at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; amcclung@hawaii.edu, conant@hawaii.edu, and Marie Morin; mpmorin@ibm.net
Research Sites: Hawaiian and Remote Islands National Wildlife Refuge, Northwestern Hawaiian Islands
Timeframe: 1983 and continuing

Title: Population viability analyses of endangered Northwestern Hawaiian Islands passerines
Contact Information: Andrew McClung and Sheila Conant, University of Hawaiʻi at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; amcclung@hawaii.edu, conant@hawaii.edu, and Marie Morin; mpmorin@ibm.net
Research Sites: Hawaiian and Remote Islands National Wildlife Refuge, Northwestern Hawaiian Islands
Timeframe: 1996 to 2001

Title: Endangered Hawaiian dark-rumped petrel biology and population monitoring
Contact Information: Cathleen Hodges, Haleakalā National Park, PO Box 369, Makawao, HI 96768; cathleen_hodges@nps.gov
Research Site: Haleakalā National Park, Maui
Timeframe: ongoing

Title: Endangered Nēnē biology and population monitoring
Contact Information: Cathleen Hodges, Haleakalā National Park, PO Box 369, Makawao, HI 96768; cathleen_hodges@nps.gov
Research Site: Haleakalā National Park, Maui
Timeframe: ongoing

Title: Habitat use in Hawaiian waterbirds
Contact Information: Christian Melgar and Adam Asquith, Kauaʻi National Wildlife Refuge, PO Box 1128, Kīlauea, HI 96754; Melgar@gte.net, Adam_Asquith@mail.fws.gov
Research Site: Hanalei National Wildlife Refuge, Kauaʻi
Timeframe: January 1998 to January 2001

Title: Loss of invertebrate biodiversity in Hawai'i Volcanoes National Park
Contact Information: David Foote, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718;
Research Site: Hawai'i Volcanoes National Park, Big Island
Timeframe: 1995 to 2000

Title: Population genetic analysis of the maintenance and generation of biodiversity in native picture-winged *Drosophila*
Contact Information: Donald Price, University of Hawai'i at Hilo; Biology Department; 200 W. Kawili St., Hilo, HI 96720; donaldp@hawaii.edu
Research Sites: Big Island
Timeframe: 1999 to 2003

Title: Evolutionary biology, genetics, ecology and behavior of Hawaiian Drosophilidae
Contact Information: Ken Kaneshiro, University of Hawai'i at Mānoa, Center for Conservation Research and Training, 3050 Maile Way, Honolulu, HI 96822; kykanesh@hawaii.edu
Research Sites: Kamakou Nature Conservancy Preserve, Moloka'i (plus sites on other islands)
Timeframe: 1963 to present

Title: Conservation biology of the orange and black damselfly
Contact Information: Catherine Johnson, University of Hawai'i at Mānoa, Department of Zoology, 2538 The Mall, Honolulu, HI 96822; Yakabee@aol.com
Research Sites: Tripler Army Medical Center and Army lands in Northern Wai'anae Mts., O'ahu
Timeframe: 1998 to 2000

Title: Effects of resources and predators on an 'ōhi'a-lehua (*Metrosideros polymorpha*: Myrtaceae) phytophagous arthropod community
Contact Information: Dan Gruner, University of Hawai'i at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; dgruner@hawaii.edu
Research Site: Upper Waiākea State Forest Reserve, Big Island
Timeframe: June 1998 to December 2000

Title: Survey of *Metrosideros polymorpha* arthropod fauna across a long substrate age gradient in the Hawaiian Islands
Contact Information: Dan A. Polhemus, Department of Entomology MRC 105, National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560; bugman@bishop.bishop.hawaii.org
Research Site: Kamakou Nature Conservancy Preserve, Moloka'i (plus other sites on other islands)
Timeframe: 1996 to present

Title: Taxonomic revision of endemic species of *Theridion* and *Sandalodes* spiders
Contact Information: Miquel Arnedo, University of Hawai'i at Mānoa, Center for Conservation Research and Training, 3050 Maile Way, Honolulu, HI 96822; miquelan@hawaii.edu
Research Sites: Kamakou Nature Conservancy Preserve, Moloka'i (plus sites on other islands)
Timeframe: 1998 to present

Title: Systematics and evolution of Hawaiian planthoppers (native and non-native)
Contact Information: Manfred Asche and Dr. Hannelore Hoch, Department of Entomology, Institute of Systematic Zoology, Museum of Natural History, Berlin, Invalidenstrasse 43, D-10115 Berlin, Germany; manfred.asche@rz.hu-berlin.de, hannelore.hoch@rz.hu-berlin.de
Research Sites: Kamakou Nature Conservancy Preserve, Moloka'i (plus sites on other islands)
Timeframe: 1997 to at least 2000

Title: Adaptive Radiation in the Genus *Tetragnatha*
Contact Information: Rosemary Gillespie, University of Hawai‘i at Mānoa, Center for Conservation Research and Training, 3050 Maile Way, Honolulu, HI 96822; gillespi@hawaii.edu
Research Sites: Honouliuli Nature Conservancy Preserve, Wai‘anae Mts., O‘ahu
Timeframe: ongoing

Title: Plant/herbivore co-speciation and host switching in the Hawaiian silversword alliance and associated Nesodyne planthoppers and Trupanea flies
Contact Information: Rosemary Gillespie, University of Hawai‘i at Mānoa, Center for Conservation Research and Training, 3050 Maile Way, Honolulu, HI 96822; gillespi@hawaii.edu
Research Sites: Many sites
Timeframe: ongoing

Title: Ecology, behavior, distribution, and phylogeny of kleptoparasitic spiders (*Argyrodes*) and their host spiders (*Labulla*)
Contact Information: Rosemary Gillespie, University of Hawai‘i at Mānoa, Center for Conservation Research and Training, 3050 Maile Way, Honolulu, HI 96822; gillespi@hawaii.edu
Research Sites: Many sites
Timeframe: ongoing

Title: Distribution, abundance, ecology, and identification keys for native Hawaiian *Scotorythra* moths
Contact Information: Rosemary Gillespie, University of Hawai‘i at Mānoa, Center for Conservation Research and Training, 3050 Maile Way, Honolulu, HI 96822; gillespi@hawaii.edu
Research Sites: Many sites
Timeframe: ongoing

Title: Evolutionary relationship between native arthropods and *Dubautia laxa* and *Dubautia plantaginea* host plants
Contact Information: Luke Hasty, University of Hawai‘i at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; glhasty@hawaii.edu
Research Sites: Honouliuli Nature Conservancy Preserve, Wai‘anae Mts., O‘ahu (plus sites on other islands)
Timeframe: 1998 to 2002

Title: Surveys of carabid beetles, *Megalagrion*, heteropterans, hemipterans, and dipterans for taxonomic revisions
Contact Information: James K. Liebherr, Cornell University, Department Entomology, 2144 Comstock Hall, Ithaca, NY 14853; JKL5@Cornell.edu
Research Sites: Kamakou Nature Conservancy Preserve, Moloka‘i
Timeframe: 1991 to present

Title: Distribution, phylogeny, and feeding preferences of *Nesoprosopis* (yellow-faced) bees
Contact Information: Karl Magnacca, Cornell University, Department Entomology, Ithaca, NY 14853; knm5@cornell.edu
Research Sites: Honouliuli Nature Conservancy Preserve, Wai‘anae Mts., O‘ahu; Kānepu‘u Nature Conservancy Preserve, Lāna‘i; Kamakou and Mo‘omomi Nature Conservancy Preserves, Moloka‘i
Timeframe: 1999 to 2004

Title: Evaluation of native invertebrates for listing under the endangered species act
Contact Information: Steven Lee Montgomery, 94-610 Palai Street, Waipahu, Hawai‘i 96797-4535; manning@lava.net
Research Sites: Mo‘omomi Nature Conservancy Preserve, Moloka‘i; Honouliuli Nature Conservancy Preserve, O‘ahu (plus sites on other islands)
Timeframe: 1997 to present

Title: Baseline arthropod survey of Kahului Airport
Contact Information: Francis G. Howarth, Bishop Museum, Department of Natural Sciences, 1525 Bernice St., Honolulu, HI 96817; fhowarth@bishop.bishop.hawaii.org and Fred D. Stone, Hawai'i Community College, Department of Math and Natural Sciences, 200 W. Kawili St., Hilo, HI 96720; fred@hawaii.edu
Research sites: Kahului airport and surroundings, Maui
Timeframe: July 1999 to July 2000

Native Species: *Snails*

Title: Evolution and ecology of endemic Hawaiian succineid land snails
Contact Information: Rebecca J. Rundell, University of Hawai'i at Mānoa, Department of Zoology, 2538 The Mall, Honolulu, HI 96822, rundell@hawaii.edu; Robert H. Cowie, Bishop Museum, 1525 Bernice Street, Honolulu, HI 96817; rhcowie@bishop.bishop.hawaii.org
Research Sites: Many sites, mostly in State Natural Area Reserves on Kaua'i, O'ahu, Moloka'i, Maui, Lāna'i and Big Island
Timeframe: 1998 to 2000

Title: Evolution and ecology of native Hawaiian land snail faunas
Contact Information: Robert H. Cowie, Bishop Museum, 1525 Bernice Street, Honolulu, HI 96817; rhcowie@bishop.bishop.hawaii.org
Research sites: Many sites on all islands
Timeframe: 1990 - ongoing

Title: Long-term field assessment of the demography and population biology of the federally endangered Hawaiian tree snail *Achatinella mustelina*
Contact Information: Michael G. Hadfield, University of Hawai'i at Mānoa, Pacific Biomedical Research Center and Department of Zoology, Kewalo Marine Laboratory, 41 Ahui Street, Honolulu, HI 96813; hadfield@hawaii.edu
Research Site: Pāhole State Natural Area Reserve, O'ahu
Timeframe: ongoing since 1983

Title: Long-term field assessment of the conservation status of the threatened tree snail *Partulina redfieldi* (Subfamily Achatinellinae)
Contact Information: Michael G. Hadfield, University of Hawai'i at Mānoa, Pacific Biomedical Research Center and Department of Zoology, Kewalo Marine Laboratory, 41 Ahui Street, Honolulu, HI 96813; hadfield@hawaii.edu
Research Site: Kamakou Nature Conservancy Preserve, Moloka'i
Timeframe: on-going since 1982

Title: Survivorship status of the threatened tree snail *Newcombia cumingi* (Subfamily Achatinellinae) on West Maui
Contact Information: Michael G. Hadfield, University of Hawai'i at Mānoa, Pacific Biomedical Research Center and Department of Zoology, Kewalo Marine Laboratory, 41 Ahui Street, Honolulu, HI 96813; hadfield@hawaii.edu
Research Site: Pu'u Kukui Watershed, Maui
Timeframe: April 1999 to March 2000

Title: Survivorship status of the federally endangered snails, *Achatinella* spp., in the northern Ko'olaus on O'ahu
Contact Information: Michael G. Hadfield, University of Hawai'i at Mānoa, Pacific Biomedical Research Center and Department of Zoology, Kewalo Marine Laboratory, 41 Ahui Street, Honolulu, HI 96813; hadfield@hawaii.edu
Research Sites: Ko'olau Mountains, O'ahu
Timeframe: ongoing since 1990

Title: Captive propagation of the Hawaiian *Achatinella* tree snail species
Contact Information: Michael G. Hadfield, University of Hawai'i at Mānoa, Pacific Biomedical Research Center and Department of Zoology, Kewalo Marine Laboratory, 41 Ahui Street, Honolulu, HI 96813; hadfield@hawaii.edu
Timeframe: ongoing since 1986

Title: Population genetics of endangered Hawaiian tree snails: a guide to management strategies
Contact Information: Michael G. Hadfield, University of Hawai'i at Mānoa, Pacific Biomedical Research Center and Department of Zoology, Kewalo Marine Laboratory, 41 Ahui Street, Honolulu, HI 96813; hadfield@hawaii.edu
Timeframe: January 1999 to December 1999

Native Species: *Plants*

Title: Population biology of rare species of *Abutilon* (Malvaceae)
Contact Information: Andrew Hansen and Clifford Morden, University of Hawai'i at Mānoa, Department of Botany, 3190 Maile Way, Honolulu, HI 96822; ahansen@hawaii.edu, cmorden@hawaii.edu
Research Sites: All Hawaiian Islands
Timeframe: March 1999 to December 2001

Title: Population genetics of koa (*Acacia koa*)
Contact Information: Candace Felling and Clifford Morden, University of Hawai'i at Mānoa, Department of Botany, 3190 Maile Way, Honolulu, HI 96822; felling@hawaii.edu, cmorden@hawaii.edu
Research Sites: All Hawaiian Islands
Timeframe: January 1999 to June 2001

Title: Effects of the black twig borer (*Xylosandrus compactus*) and its ambrosia fungus on *Acacia koa*
Contact Information: Curtis C. Daehler, University of Hawai'i at Mānoa, Department of Botany, 3190 Maile Way, Honolulu, HI 96822; daehler@hawaii.edu
Research Sites: Maunawili and 'Ōpae'ula Valleys, O'ahu
Timeframe: ongoing

Title: Koa (*Acacia koa*) dieback
Contact Information: Don Gardner, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, 3190 Maile Way, Honolulu, HI 96822; dgardner@hawaii.edu
Research Sites: Hawai'i Volcanoes National Park, Big Island
Timeframe: January 1996 to January 2002

Title: Reproductive biology of *Brighamia insignis*
Contact Information: Adam Asquith, Kaua'i National Wildlife Refuge, PO Box 1128, Kīlauea, HI 96754; Adam_Asquith@mail.fws.gov
Research Site: Kīlauea Point National Wildlife Refuge, Kaua'i
Timeframe: ongoing

Title: Population genetics of kauila (*Colubrina oppositifolia* and *Alphitonia ponderosa*)
Contact Information: James Kwon and Clifford Morden, University of Hawai'i at Mānoa, Department of Botany, Ecology, Evolution and Conservation Biology Program, 3190 Maile Way, Honolulu, HI 96822; kwon@hawaii.edu, cmorden@hawaii.edu
Research Sites: All Hawaiian Islands
Timeframe: January 1995 to August 1999

Title: Population dynamics, life cycle studies and conservation of *Diellia* spp.
Contact Information: Ken Wood, National Tropical Botanical Garden, PO Box 340, Lāwa'i, HI 96765; kenwood@ntbg.org
Research Sites: Hawaiian Islands
Timeframe: ongoing

Title: Evolutionary relationship between native arthropods and *Dubautia laxa* and *Dubautia plantaginea* host plants
Contact Information: Luke Hasty, University of Hawai‘i at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; glhasty@hawaii.edu
Research Sites: Honouliuli Nature Conservancy Preserve, Wai‘anae Mts., O‘ahu (plus sites on other islands)
Timeframe: 1998 to 2002

Title: Conservation genetics of wiliwili (*Erythrina sandwicensis*)
Contact Information: Maya Legrande and Clifford Morden, University of Hawai‘i at Mānoa, Department of Botany, 3190 Maile Way, Honolulu, HI 96822; legrande@hawaii.edu, cmorden@hawaii.edu
Research Sites: All Hawaiian Islands
Timeframe: January 1999 to June 2001

Title: Habitat fragmentation and genetic bottleneck among populations of native Hawaiian plant species, *Haplostachys haplostachya* (Lamiaceae)
Contact Information: Clifford Morden and Wisteria Loeffler, University of Hawai‘i at Mānoa, Department of Botany, 3190 Maile Way, Honolulu, HI 96822; cmorden@hawaii.edu, wistywisty@hotmail.com
Research Site: Pōhakuloa Plateau, Big Island
Timeframe: June 1997 to July 1999

Title: Effects of fire, nutrients and water on competition between pili grass (*Heteropogon contortus*) and introduced African grasses in dryland habitats
Contact Information: Curtis C. Daehler, Erin Goergen and Mindy Wilkinson, University of Hawai‘i at Mānoa, Department of Botany, Ecology, Evolution and Conservation Biology Program, 3190 Maile Way, Honolulu, HI 96822; daehler@hawaii.edu, goergen@hawaii.edu, mwilkens@hawaii.edu
Research sites: Pu‘ukoholā Heiau National Historic Site, Big Island; Hawai‘i Volcanoes National Park, Big Island; Lanikai, O‘ahu
Timeframe: ongoing

Title: Population dynamics of invasive grasses and the native pili grass (*Heteropogon contortus)* in a dryland community
Contact Information: Mindy Wilkinson and Curtis C. Daehler, University of Hawai‘i at Mānoa, Department of Botany, Ecology, Evolution and Conservation Biology Program, 3190 Maile Way, Honolulu, HI 96822; mwilkens@hawaii.edu, daehler@hawaii.edu
Research Site: Hawai‘i Volcanoes National Park, Big Island
Timeframe: May 1997 to August 2000

Title: The conservation of *Kokia* species through *ex situ* conservation , *in situ* enhancement, including an investigation into the genetic variability of individuals and populations through molecular analysis
Contact Information: Ken Wood, National Tropical Botanical Garden, PO Box 340, Lāwa‘i, HI 96765; kenwood@ntbg.org
Research Sites: Kaua‘i: Pa‘aiki, Mahanaloa, Kuia, Hipalau, Kawaiiki, Koai‘e, Kalalau, & Pōhakuao; Big Island: Ka‘ūpūlehu
Timeframe: ongoing

Title: The conservation of *Pritchardia* species
Contact Information: Ken Wood, National Tropical Botanical Garden, PO Box 340, Lāwa‘i, HI 96765; kenwood@ntbg.org
Research Sites: Hawaiian Islands
Timeframe: ongoing

Title: Hybridization of the native and invasive alien species *Rubus hawaiensis* and *Rubus rosifolius*, respectively
Contact Information: Rebecca Randell and Clifford Morden, University of Hawai'i at Mānoa, Department of Botany, Ecology, Evolution and Conservation Biology Program, 3190 Maile Way, Honolulu, HI 96822; rrandell@hawaii.edu, cmorden@hawaii.edu
Research Site: Kīpahulu Valley, Maui
Timeframe: January 1998 to December 1999

Title: Conservation biology of *Sesbania tomentosa*
Contact Information: David Hopper, University of Hawai'i at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; Dave_Hopper@fws.gov
Research Site: Ka'ena Pt. State Natural Area Reserve, O'ahu
Timeframe: 1994 to 2000

Title: Molecular phylogenetic systematics of *Clermontia*, *Hedyotis*, *Scaevola*, *Tetraplasandra*, *Stenogyne* and *Chamaesyce*
Contact Information: Timothy J. Motley, New York Botanical Garden, Bronx, NY 10458
Research Sites: Kamakou TNC Preserve, Moloka'i (plus other sites)
Timeframe: 1992 to present

Title: Lowland rare native plant restoration methods
Contact Information: Tim Tunison, Hawai'i Volcanoes National Park, PO Box 52, Hawai'i National Park, HI 96718; tim_tunison@nps.gov
Research Site: Hawai'i Volcanoes National Park, Big Island
Timeframe: ongoing

Title: The biogeography of Hawaiian threatened and endangered plant species
Contact Information: Ken Wood, National Tropical Botanical Garden, PO Box 340, Lāwa'i, HI 96765; kenwood@ntbg.org
Research Sites: Hawaiian Islands
Timeframe: ongoing

Title: Longevity and storage of native plant seeds
Contact Information: Alvin Y. Yoshinaga, Center for Conservation Research and Training, 3050 Maile Way, Honolulu, HI 96822; alviny@hawaii.edu
Timeframe: 1997 to 2002

Title: Plant disease and hybridization threats to native plants
Contact Information: Don Gardner, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, 3190 Maile Way, Honolulu, HI 96822; dgardner@hawaii.edu
Research Site: Hawai'i Volcanoes National Park, Big Island
Timeframe: January 1995 to June 2002

Ecosystem Dynamics: *Forests*

Title: Investigation of the relationships between natural disturbances and the prehistoric dynamics of Hawaiian forests, and a historical account of conservation activities in Hawai'i over the past decade
Contact Information: Peter Vitousek, Stanford University, Department of Biological Sciences, Stanford, CA 94305; vitousek@leland.stanford.edu
Timeframe: started in 1999

Title: Developing a listening post in the tropical Pacific: sensitivity of Hawai'i high-elevation and aquatic ecosystems to global change

Contact Information: Lloyd L. Loope, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, Haleakalā Field Station, P.O. Box 369, Makawao, HI 96768; Lloyd_Loope@usgs.gov
Research Site: Maui and Big Island
Timeframe: 1999 to 2004

Title: Water utilization of forest ecosystems in the reforested watershed of Honouliuli Preserve, Hawai‘i
Contact Information: Teresa Restom, University of Hawai‘i at Mānoa, Department of Botany, Ecology, Evolution and Conservation Biology Program, 3190 Maile Way, Honolulu, HI 96822; restom@hawaii.edu
Research Site: Honouliuli Nature Conservancy Preserve, O‘ahu
General Timeframe: July 1998 to July 2000

Ecosystem Restoration: *Forests*

Title: The role of alien tree plantations and avian seed-dispersers in native forest restoration in Hawai‘i
Contact Information: Jennifer Garrison and Sheila Conant, University of Hawai‘i at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; garrison@hawaii.edu, conant@hawaii.edu
Research Site: Honouliuli Nature Conservancy Preserve, O‘ahu
Timeframe: Sept 1997 to Dec 2000

Title: Investigation of alien plant control and native species augmentation techniques for restoration of highly degraded Hawaiian lowland wet forests
Contact Information: David Bender, National Tropical Botanical Garden, Limahuli Garden and Preserve, PO Box 808, Hanalei, HI, 96714; lghaena@ntbg.org and Robert Cabin, USDA Forest Service, Institute of Pacific Islands Forestry, 23 E. Kawili Street, Hilo, HI 96720; cabinr@aloha.net
Research Site: Lower Limahuli Valley, Kaua‘i
Timeframe: July 1998 to July 2002

Title: Investigation of alien plant control (with special emphasis on *Clidemia hirta*, Melastomataceae),and native species augmentation techniques for restoration of semi-intact Hawaiian mid-elevation wet forests
Contact Information: David Bender, National Tropical Botanical Garden, Limahuli Garden and Preserve, PO Box 808, Hanalei, HI, 96714; lghaena@ntbg.org
Research Site: Upper Limahuli Valley, Kaua‘i
Timeframe: June 1997 to June 2001

Title: Biological inventory and conservation of Kaua'i Diverse Mesic Forest within the Nā Pali Coast State Park, Kaua'i
Contact Information: Ken Wood, National Tropical Botanical Garden, PO Box 340, Lāwa‘i, HI 96765; kenwood@ntbg.org
Research Site: Kalalau Valley, Kaua‘i
Timeframe: on going

Title: Forest fragmentation and seedling ecophysiology on Kānepu‘u dry forest preserve: implications for regeneration and restoration
Contact Information: Mónica Mejía, University of Hawai‘i at Mānoa, Department of Botany, Ecology, Evolution and Conservation Biology Program, 3190 Maile Way, Honolulu, HI 96822; mmejia@hawaii.edu
Research site: Kānepu‘u TNC Preserve, Lāna‘i
Timeframe: 1998 to 2000

Title: Dryland forest restoration on leeward East Maui: Auwahi and Pu‘u-o-Kali
Contact Information: Arthur C. Medeiros and Lloyd L. Loope, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, Haleakalā Field Station, P.O. Box 369, Makawao, HI 96768; artmedeiros@juno.com, Lloyd_Loope@usgs.gov
Research Sites: Auwahi and Pu‘u-o-Kali, Maui
Timeframe: ongoing since 1998

Title: Evaluate vegetation recovery after ungulate control
Contact Information: Tim Tunison, Hawai‘i Volcanoes National Park, PO Box 52, Hawai‘i National Park, HI 96718; tim_tunison@nps.gov
Research Site: Hawai‘i Volcanoes National Park, Big Island
Timeframe: ongoing

Title: Lowland ecosystem restoration methods
Contact Information: Tim Tunison, Hawai‘i Volcanoes National Park, PO Box 52, Hawai‘i National Park, HI 96718; tim_tunison@nps.gov
Research Site: Hawai‘i Volcanoes National Park, Big Island
Timeframe: ongoing

Title: Study fire effects
Contact Information: Tim Tunison, Hawai‘i Volcanoes National Park, PO Box 52, Hawai‘i National Park, HI 96718; tim_tunison@nps.gov
Research Site: Hawai‘i Volcanoes National Park, Big Island
Timeframe: ongoing

Title: Influence of mycorrhizae and specific mycorrhizal species on plant community structure
Contact Information: Elizabeth Stampe, Curtis C. Daehler and Mindy Wilkinson, University of Hawai‘i at Mānoa, Department of Botany, Ecology, Evolution and Conservation Biology Program, 3190 Maile Way, Honolulu, HI 96822; estampe@hawaii.edu, daehler@hawaii.edu, mwilkens@hawaii.edu
Research sites: Hawai‘i Volcanoes National Park, Big Island; Maunawili Valley, O‘ahu
Timeframe: ongoing

Ecosystem Restoration: *Wetlands*

Title: Freshwater wetland restoration
Contact Information: Adam Asquith, Kaua‘i National Wildlife Refuge, PO Box 1128, Kīlauea, HI 96754; Adam_Asquith@mail.fws.gov
Research Site: Hanalei National Wildlife Refuge, Kaua‘i
Timeframe: ongoing

Title: Wetland management for foraging productivity in Hawaiian waterbirds
Contact Information: Adam Asquith, Kaua‘i National Wildlife Refuge, PO Box 1128, Kīlauea, HI 96754; Adam_Asquith@mail.fws.gov and Christian Melgar, Kaua‘i National Wildlife Refuge, PO Box 1128, Kīlauea, HI 96754; Melgar@gte.net
Research Site: Hanalei National Wildlife Refuge, Kaua‘i
Timeframe: January 1999 to January 2001

Ecosystem Restoration: *Caves*

Title: Biological survey and conservation management of Hawaiian caves
Contact Information: Francis G. Howarth, Bishop Museum, Department of Natural Sciences, 1525 Bernice St., Honolulu, HI 96817; fhowarth@bishop.bishop.hawaii.org and Fred D. Stone, Hawai'i Community College, Department of Math and Natural Sciences, 200 W. Kawili St., Hilo, HI 96720; fred@hawaii.edu
Research sites: Hawaiian Islands
Timeframe: ongoing

Ecosystem Restoration: *Aeolian*

Title: Biological survey and conservation management of Hawaiian aeolian ecosystems
Contact Information: Francis G. Howarth, Bishop Museum, Department of Natural Sciences, 1525 Bernice St., Honolulu, HI 96817; fhowarth@bishop.bishop.hawaii.org and Fred D. Stone, Hawai'i Community College, Department of Math and Natural Sciences, 200 W. Kawili St., Hilo, HI 96720; fred@hawaii.edu
Research sites: Mauna Kea, Mauna Loa, Haleakalā, new lava flows on Maui and Hawai'i
Timeframe: ongoing

THREATS

Alien Species: *Feral Ungulates*

Title: Relative abundance and adverse impacts of introduced ungulates
Contact Information: Graham Nugent, Landcare Research New Zealand Ltd., P.O. Box 69, Lincoln 8152, New Zealand
Research Sites: Kamakou Nature Conservancy Preserve, Moloka'i; Pu'u Alii State Natural Area Reserve
Timeframe: 1999 to 2001

Deer

Title: Investigation of axis deer ecology and management options
Contact Information: Steve B. Anderson, Ph.D. Student, University of California at Davis, 749-B Pulehuiki Road, Kula, HI 96790; sbanderson@maui.net
Research Sites: Waikamoi Nature Conservancy Preserve, Maui and other sites on Maui
Timeframe: 1997 to 2000

Pigs

Title: Ecosystem response to feral pig removal in Hawai'i Volcanoes National Park
Contact Information: David Foote, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; david_foote@usgs.gov
Research Site: Hawai'i Volcanoes National Park, Big Island
Timeframe: 1994 to 1999

Title: Ecosystem consequences of low-density feral pig populations in Hawaiian montane rainforests.
Contact Information: Peter Vitousek, Stanford University, Department of Biological Sciences, Stanford, CA 94305; vitousek@leland.stanford.edu and David Foote, USGS Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; david_foote@usgs.gov
Research Sites: Kamakou Nature Conservancy reserve, Moloka'i (plus sites on Big Island)
Timeframe: 1994 to 2002

Alien Species: *Small Predators*

Title: Distribution and abundance of predators and their effect on native birds in wet forests of Hawai'i
Contact Information: Gerald Lindsey, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; Gerald_Lindsey@usgs.gov
Research Site: Hakalau Forest National Wildlife Refuge, Big Island
Timeframe: October 1993 to October 2000

Title: Test small mammal toxicants in mesic and wet forests
Contact Information: David Foote, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; david_foote@usgs.gov
Research Site: Hawai'i Volcanoes National Park, Big Island
Timeframe: ongoing

Mongoose

Title: Social ecology of the small Indian mongoose
Contact Information: Warren Hays, University of Hawai'i at Mānoa, Department of Zoology, 2538 The Mall, Honolulu, HI 96822; whays@hpu.edu
Research Sites: various dry, lowland sites, O'ahu
Timeframe: 1997 to 2000

Rats

Title: Effectiveness of predator control for increasing populations of endangered birds in wet forests of Hawai'i
Contact Information: Bethany Woodworth, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; Bethany_Woodworth@usgs.gov
Research Site: Hakalau Forest National Wildlife Refuge, Big Island
Timeframe: 1994 to 1999

Title: Effects of predator removal and disease on demography of O'ahu 'Elepaio
Contact Information: Eric VanderWerf, University of Hawai'i at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; vanderwerf@zoology.hawaii.edu and David Smith, State Department of Land and Natural Resources, Division of Forestry and Wildlife, 2135 Makiki Heights Drive, Honolulu, HI 96822; viking@hgea.org.
Research Sites: Honolulu State Forest Reserve, Schofield Barracks, Mākua Valley Military Reservation, Pāhole State Natural Area Reserve
Timeframe: January-July 1999

Title: Epizootiology and control of avian diseases in endangered forest bird habitat in South Kona, Hawai'i
Contact Information: Carter Atkinson, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; Carter_Atkinson@usgs.gov
Research Sites: McCandless Ranch, Big Island; Hakalau Forest National Wildlife Refuge, Big Island
Timeframe: 1994 to 1999

Title: Seasonal prevalence and transmission of avian pox and malaria in Hawaiian forest birds
Contact Information: Carter Atkinson, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; Carter_Atkinson@usgs.gov
Research Sites: Hakalau National Wildlife Refuge, Big Island; Hawai'i Volcanoes National Park, Big Island; Alaka'i State Wilderness Preserve, Kaua'i; Hanawī State Natural Area Reserve, Maui; Waikamoi Nature Conservancy Preserve, Maui; Kūlani Correctional Facility, Big Island
Timeframe: 1990 to 2000

Title: Effect of malaria on experimentally-infected Hawaiian forest birds
Contact Information: Carter Atkinson, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; Carter_Atkinson@usgs.gov
Research Sites: Waiākea State Forest Reserve, Mauna Kea State Forest and Game Reserve and Hawai'i Volcanoes National Park, Big Island
Timeframe: October 1992 to October 1999

Title: Development of a serological test for avian malaria
Contact Information: Carter Atkinson, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; Carter_Atkinson@usgs.gov
Research Sites: Hawai'i Volcanoes National Park, Big Island; Kūlani Correctional Facility; Big Island; Hakalau Forest National Wildlife Refuge, Big Island; Waiākea State Forest Reserve, Big Island; Mauna Kea State Forest and Game Reserve, Big Island; Alaka'i State Wilderness Preserve, Kaua'i; Waikamoi Nature Conservancy Preserve, Maui; Hanawī State Natural Area Reserve, Maui
Timeframe: October 1991 to October 1999

Title: Distribution and disease vector potential of mosquitoes in Hawaiian forest bird habitat
Contact Information: Dennis LaPointe, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; Dennis_Lapointe@usgs.gov
Research Sites: Waiākea State Forest Reserve and Hakalau Forest Wildlife Refuge, Big Island
Timeframe: June 1991 to October 1999

Title: Breeding ecology, bionomics and control of *Culex* mosquitoes in Hawaiian forest bird habitat
Contact Information: Dennis LaPointe, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, PO Box 44, Hawai'i National Park, HI 96718; Dennis_Lapointe@usgs.gov
Research Sites: Hakalau Forest National Wildlife Refuge, Big Island; Waiākea State Forest Reserve, Big Island; Hawai'i Volcanoes National Park, Big Island; Alaka'i State Wilderness Area, Kaua'i; Waikamoi Nature Conservancy Preserve, Maui; Midway Atoll National Wildlife Refuge, Midway
Timeframe: October 1996 to October 1999

Alien Species: *Invertebrates*

Title: Investigation of population dynamics and impacts of the two-spotted leafhopper, *Sophonia rufofascia*
Contact Information: Linda Lenz, University of Hawai'i at Mānoa, Department of Botany, Ecology, Evolution and Conservation Biology Program, 3190 Maile Way, St., Honolulu, HI 96822; lenz@hawaii.edu
Research Site: Hawai'i Volcanoes National Park, Big Island
Timeframe: August 1998 - December 1999

Title: Ecological impacts and control of *Vespula pensylvanica* (Hymenoptera: Vespidae) in an 'ōhi'a-lehua (*Metrosideros polymorpha*: Myrtaceae) arthropod community
Contact Information: Dan Gruner, University of Hawai'i at Mānoa, Department of Zoology, Ecology, Evolution and Conservation Biology Program, 2538 The Mall, Honolulu, HI 96822; dgruner@hawaii.edu
Research Sites: Upper Waiākea State Forest Reserve and Hawai'i Volcanoes National Park, Big Island
Timeframe: October 1998 to October 2000

Title: Develop control for the Argentine ant within Haleakalā National Park
Contact Information: Lloyd L. Loope and Ellen Van Gelder, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, Haleakalā Field Station, P.O. Box 369, Makawao, HI 96768; Lloyd_Loope@usgs.gov, evangeld@hawaii.edu
Research Site: Haleakalā National Park, Maui
Timeframe: 1996 to 2002

Title: Systematics and evolution of Hawaiian planthoppers (native and non-native)
Contact Information: Manfred Asche and Dr. Hannelore Hoch, Department of Entomology, Institute of Systematic Zoology, Museum of Natural History, Berlin, Invalidenstrasse 43, D-10115 Berlin, Germany; manfred.asche@rz.hu-berlin.de, hannelore.hoch@rz.hu-berlin.de
Research Sites: Kamakou Nature Conservancy Preserve, Moloka'i (plus sites on other islands)
Timeframe: 1997 to at least 2000

Alien Species: *Snails*

Title: Monitoring the introduction and spread of alien snails in the Hawaiian Islands
Contact Information: Robert H. Cowie, Bishop Museum, 1525 Bernice Street, Honolulu, HI 96817; rhcowie@bishop.bishop.hawaii.org
Research Sites: Many sites on all islands
Timeframe: 1990 - ongoing

Title: Distribution and ecology of introduced apple snails in the Hawaiian Islands
Contact Information: Robert H. Cowie, Bishop Museum, 1525 Bernice Street, Honolulu, HI 96817; rhcowie@bishop.bishop.hawaii.org, Lori Lach, Ecology and Evolutionary Biology, Cornell University, Comstock Hall, Ithaca, NY 14853; LJL13@cornell.edu; David K. Britton, University of Hawai'i at Mānoa, Department of Zoology, Honolulu, HI 96822; britton@hawaii.edu and Rebecca J. Rundell, University of Hawai'i at Mānoa, Department of Zoology, 2538 The Mall, Honolulu, HI 96822; rundell@hawaii.edu
Research Sites: Kaua'i, O'ahu, Maui, Moloka'i, Lāna'i, Big Island
Timeframe: 1990 - ongoing

Alien Species: *Plants*

Title: Mechanisms of invasion of intact Hawaiian rain forest by non-native plant species
Contact Information: Arthur C. Medeiros and Lloyd L. Loope, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, Haleakalā Field Station, PO Box 369, Makawao, HI 96768; artmedeiros@juno.com, Lloyd_Loope@usgs.gov
Research site: Kipahulu Valley, Haleakalā National Park, Maui
Timeframe: June 1995 to September 2000

Title: Distribution, biology, and control strategies for alien plant species of Maui which threaten native ecosystems to assist interagency management
Contact Information: Arthur C. Medeiros and Lloyd L. Loope, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, Haleakalā Field Station, PO Box 369, Makawao, HI 96768; artmedeiros@juno.com, Lloyd_Loope@usgs.gov
Research site: Island of Maui
Timeframe: March 1998 to September 2002

Title: Factors influencing inflorescence fasciation and invasion by mullien (*Verbascum thapsus*)
Contact Information: Shahin Ansari and Curtis C. Daehler, University of Hawai‘i at Mānoa, Department of Botany, Ecology, Evolution and Conservation Biology Program, 3190 Maile Way, Honolulu, HI 96822; shahin@hawaii.edu, daehler@hawaii.edu
Research sites: Hawai‘i Volcanoes National Park and US Army Pōhakuloa Training Area, Big Island
Timeframe: ongoing

Biocontrol

Title: Biocontrol of yellow Himalayan raspberry (*Rubus ellipticus*)
Contact Information: Don Gardner, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, 3190 Maile Way, Honolulu, HI 96822; dgardner@hawaii.edu
Research Site: Hawai‘i Volcanoes National Park, Big Island
Timeframe: May 1997 to January 2003

Title: Biocontrol of *Myrica faya*
Contact Information: Don Gardner, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, 3190 Maile Way, Honolulu, HI 96822; dgardner@hawaii.edu
Research Site: Hawai‘i Volcanoes National Park, Big Island
Timeframe: January 1996 to January 2000

Title: Biocontrol of kahili ginger
Contact Information: Don Gardner, US Geological Survey, Biological Resources Division, Pacific Island Ecosystems Research Center, 3190 Maile Way, Honolulu, HI 96822; dgardner@hawaii.edu
Research Site: Hawai‘i Volcanoes National Park, Big Island
Timeframe: January 1995 to January 2002

Title: Using a food web to quantify nontarget biological control effects on native Hawaiian Lepidoptera
Contact Information: Jane Memmott, University of Bristol, School of Biological Sciences, Woodland Road, Bristol BS81UG, United Kingdom, Jane.Memmott@bristol.ac.uk and M. Laurie Henneman, (University of Bristol and) University of Hawai‘i Kaua‘i Research Station, 7370 Kuamo‘o Road, Kapa‘a, HI 96746, margery@hawaii.edu
Research site: Alaka‘i State Wilderness Area, Kaua‘i
General Timeframe: September 1998 to September 2001