THE 2007 HAWAI'I CONSERVATION CONFERENCE

Conservation Strategies: Matching Science and Management

July 25-27, 2007

Hawai'i Convention Center, Honolulu, Hawai'i

Sponsored by the Hawai'i Conservation Alliance (HCA)

Welcome to the 15th Annual Hawai'i Conservation Conference (HCC). This is the largest annual gathering of people actively involved in the protection and management of Hawai'i's natural environment. The purpose of your conference is to facilitate information transfer and interaction among natural resource managers and the scientific community. It is your opportunity to share experiences and ideas on a wide range of conservation issues within the 2007 theme of Conservation Strategies: Matching Science and Management. Mahalo nui loa for your continued participation and support of the activities of the HCA.

This year is a landmark year for the Hawai'i Conservation Alliance. It is the 15th anniversary of our conference and by far our largest one to date. As of July 1, twenty percent more registrations were received than at that date in 2006. There is a similar increase in presentations to be run in three and four concurrent sessions. This year the conference theme is **Matching Science and Management** – straight to the very core of our activities. Presenters have been asked always to have management in mind. If management is not presented, you know what the first question should be! The committee also asked for paired presentations – a paper dealing with an aspect of science followed by a paper dealing with its management. There are also eleven symposia topping last year's high of four.

On September 20, 2006 HCA formed a 501(c)(3) non-profit corporation, the Hawai'i Conservation Alliance Foundation (HCAF), IRS approved in May 2007. This year's conference is being run by the HCAF which has completely switched to online registration, payments, and uploading of abstracts. To provide better communication with the conservation community throughout the year conference attendees are provided with free membership in the "Friends of Hawai'i Conservation."

On May 13, 2007, the 24th Legislature of the State of Hawai'i passed House Concurrent Resolution 127 recommending the last week of July each year to be **Conservation Week**. This is a national first for any State. Over the past several years the HCC committee has developed activities that bring the public into closer proximity to conservation activities. Our first Conservation Week activities include My Hawai'i Nature Writers' Workshop, Conservation Film Festival, Conservation through Art Exhibition, and our public lecture, "50 ways to save the ocean" presented by David Helvarg.

CONFERENCE SETUP

Exhibits & Posters Move-in and Speaker Presentation Loading
Ala Halawai Concourse, 313 ABC, 316 ABC
Tuesday, July 24: 2:00 PM–7:00 PM

REGISTRATION

Ala Halawai Concourse
Tuesday, July 24: 2:00-7:00 PM
Wednesday, July 25: 7:00 AM–8:30 AM
Thursday, July 27: 7:00 AM–8:00 AM
Friday, July 28: 7:00 AM–8:00 AM

CONFERENCE ACKNOWLEDGMENTS

Mahalo to the following persons and organizations:

Conference Organizing Committee: *Christopher F. Puttock* (Chair), *Mariza Silva*, *Kendall McCreary* HCA; *Lee-Ann Choy* (Meeting Logistics Coordinator) Pacific Rim Concepts LLC; *Norma Bustos, Ron Cannarella, Jessica Hawkins* DLNR DOFAW; *Katie O'Neil* Waimea Valley Audubon Center; *Ron Walker* Retired Wildlife Biologist; *Phyllis Ha, Annie Marshall, Lorena Wada* USFWS Ecological Services. Special thanks to *Ken Kaneshiro* and *Jennifer Ho* at the Center for Conservation Research and Training, UH Mānoa for handling insurance and other financial matters.

Art Exhibition Subcomittee: *Norma Bustos* (Chair), *Jessica Hawkins*, *Jolie Wanger, Ron Walker, Phyllis Ha*.

Film Festival Subcommittee: *Jolie Wanger* (Chair) DLNR DOFAW; *Christopher Puttock*. Equipment provided by *Chuck Boller* Hawai'i International Film Festival

My Hawai'i Subcommittee: *Takiora Ingram* Pacific Writers' Connection (Chair); *J. Kendall McCreary, Christopher F. Puttock*; Special thanks to our Nature Writers *David Helvarg* BlueFrontier Campaign, *Jan TenBruggencate* Honolulu Advertiser; and *Kimo Armitage*.

Best Student Oral and Poster Award Subcommittee: *Lorena Wada* (Chair), and judges *Fred Amidon, Jeff Burgett, Adonia Henry, Annie Marshall, Steve Miller, Cheryl Phillipson, Jay Nelson, Mike Richardson, Christa Russell*, and *Katie Swift* USFWS; *Randy Kennedy* DLNR DOFAW; *Michelle Mansker* US DoD Army Garrison Hawai'i; *Greg Koob, Michelle Clark* USDA NRCS; *Marilyn Parris* National Park Service; *Kim Uyehara* USGS PIERC.

Volunteer Coordinator: *Katie O'Neil* Waimea Valley Audubon Center.

Oral Presentation AV Coordinator: *Aaron Lowe* DLNR DOFAW.

Video Production Coordinators: *Ron Cannarella* (Chair) *Jessica Hawkins* (Assistant chair). Equipment provided by 'Ōlelo Community Television.

Poster Session Coordinators: *Norma Bustos, Jessica Hawkins* and *Ron Walker.*

Conference Registration and Booklet Coordinator: *Mariza Silva*.

Conference Logos: *Ron Walker* (bags, mugs and T-shirts).

Cover Art: *Patrick Ching* Naturally Hawaiian Gallery, Waimānalo

Sponsorship and financial support for the HCC was provided by: Buddhawelt, DLNR DAR Coral Reef Outreach Network, Hawai'i Audubon Society, HCAF, Mālama Hawai'i, National Park Service, NOAA National Marine Sanctuaries Program, Patagonia, USFWS National Wildlife Refuge Complex, Wildlife Society Hawai'i Chapter, and private donations from individuals committed to our Conservation Conference.

Sponsorship and financial support for Conservation Week activities was provided by: CFP Landscapes, HCAF, Hawai'i International Film Festival, Kōkua Hawai'i Foundation, Rotary Club of West Honolulu, contributions from the HCA partners and private donations from individuals committed to Conservation Week activities.

Hawai'i Conservation Alliance Staff: *Christopher F. Puttock* Program Coordinator; *Mariza Silva* Program Assistant, *J. Kendall McCreary* Education Outreach Officer.

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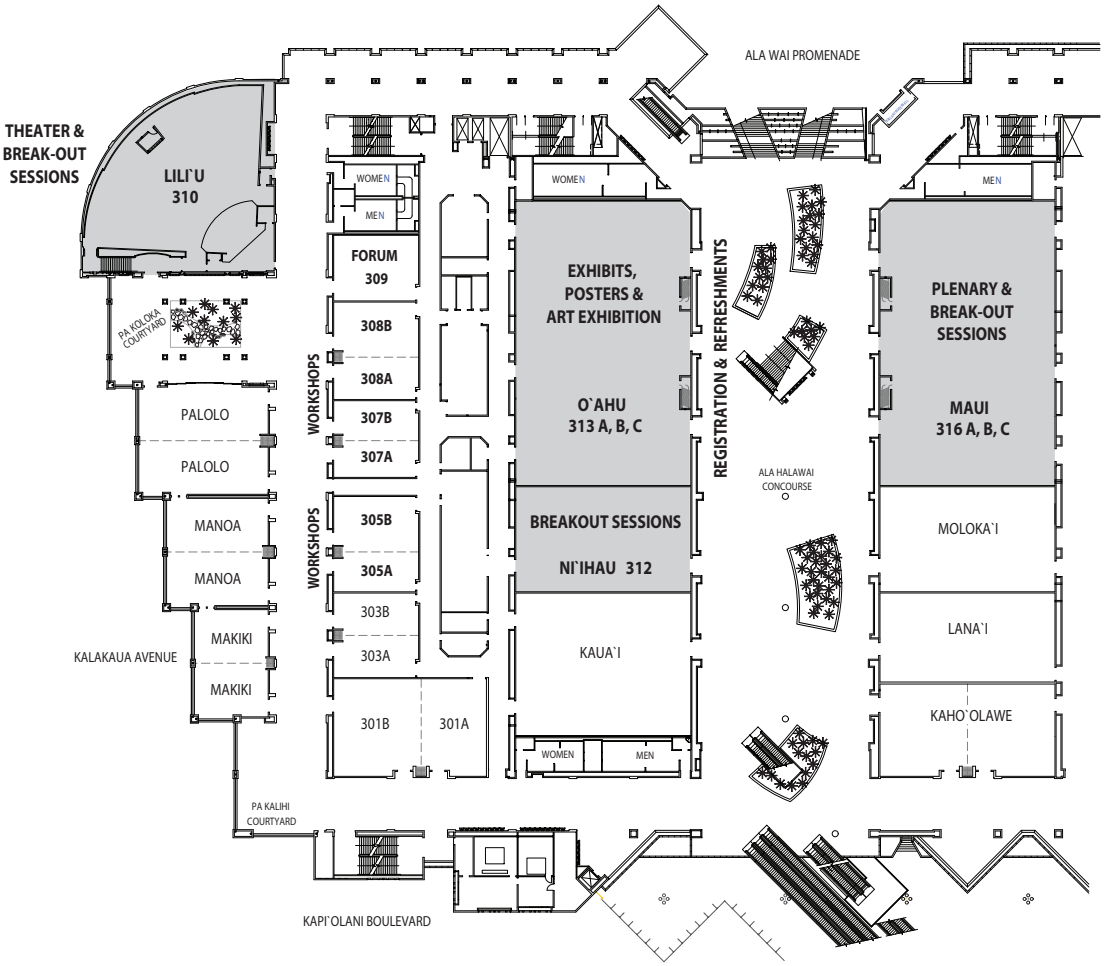
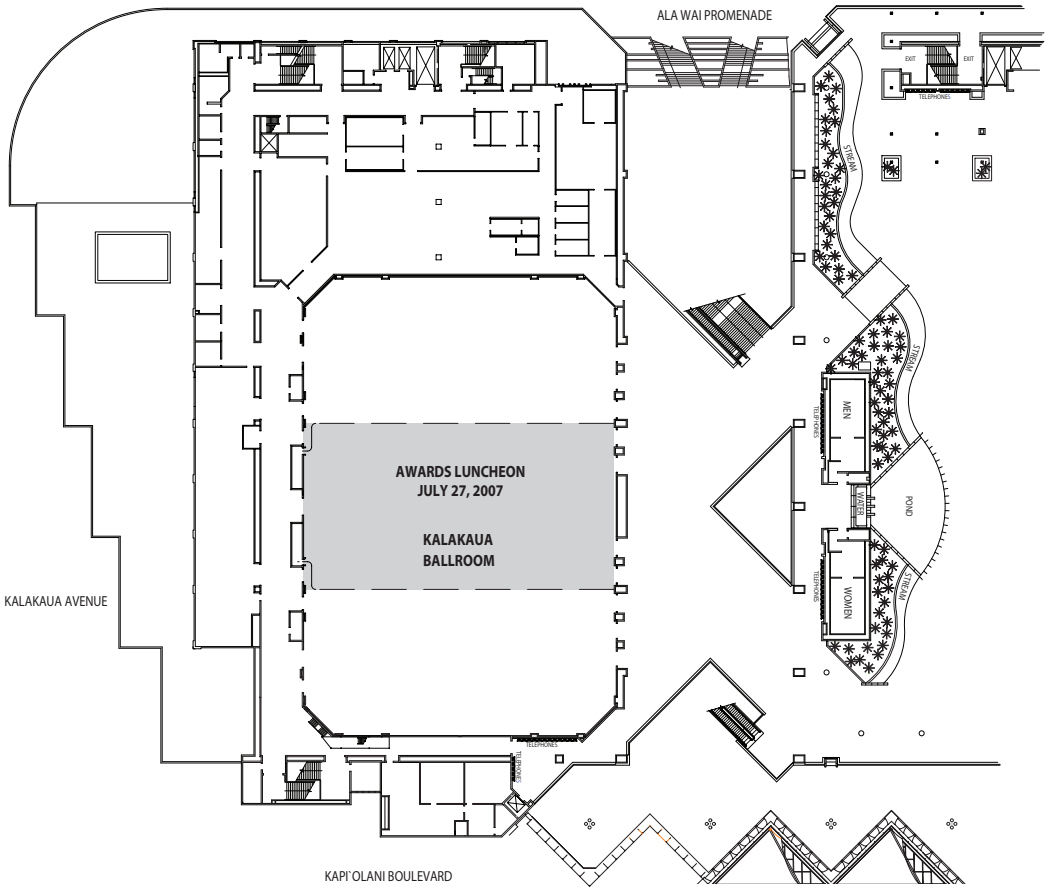


3RD LEVEL



4TH LEVEL

Wednesday, July 25, 2007

7:00 am	Registration			
8:30 am	Oli and HCA Introduction			
9:00 am	**Keynote Speaker:** Michael Soulé, Is Island Conservation Fundamentally Different from Continental Conservation?			
10:00 am	Break			
10:20 am	Governor Linda Lingle's Address			
10:45 am	Presentation of My Hawai'i Awards			
11:00 am	**Plenary Speaker I:** J. Michael Scott, Hawai'i: A Window to the Future of Conservation Biology?			
11:40 am	Gerald Marten, EcoTipping Points			
12:00 pm	Lunch Break			
1:00 pm	Near Shore/Marine Symposium	Insects Symposium I	Ecosystem Services Symposium	Alternative Energies Symposium
3:00 pm	Break			
3:20 pm	The Big Picture Session	Insects Symposium II	Native Biota Session	Invasives Session I
5:00 pm	Pau			
6-8:30 pm	Poster Session, Conservation Art and Exhibits Reception			

Thursday, July 26, 2007

7:00 am	Registration		
8:00 am	**Plenary Speaker:** David Helvarg, Saving the Ocean		
8:40 am	**Dieter Mueller-Dombois,** 2006 Distinguished Service Awardee		
9:00 am	**Holly Freifeld**, Hawai'i-New Zealand, Exchange Program		
9:20 am	**Carl McGuinness**, Hawai'i-New Zealand, Exchange Program		
9:40 am	Break		
10:00 am	Northwestern Hawaiian Islands Symposium	*Inter Situ* Restoration Symposium	Conservation Evaluation Symposium
12:00 pm	Lunch Break		
1:00 pm	Fisheries Session	Forest Health Symposium I	Landscape Management Session
3:00 pm	Break		
3:20 pm	Watershed Session	Forest Health Symposium II	Invasives Session II
5:00 pm	Pau		
7:30-9 pm	Free Public Event: **David Helvarg**, 50 ways to save the ocean		

Friday, July 28, 2007

7:00 am	Registration		
8:00 am	Monitoring Symposium I	Bridges to the Future Forum	Economics of Invasives Symposium
10:00 am	Break		
10:20 am	Monitoring Symposium II	Aquatic Biota Session	Invasives Session III
12:00 pm	Awards Luncheon		
1:40 pm	Ecosystem Management Session I	What's in the Water? Session	Winged Vertebrates Session I
3:00 pm	Break		
3:20 pm	Ecosystem Management Session II	Marine Vertebrates Session	Winged Vertebrates Session II
4:40 pm	Pau		
6-8:00 pm	An Evening at the Waikīkī Aquarium		

Wednesday, July 25, 2007

7:00 am	Registration			
8:30 am	**PLENARY SESSION ROOM 316ABC** Oli: Samuel ʻOhukaniʻāhiʻa Gon III HCA Introduction: Loyal Mehrhoff			
9:00 am	**Keynote Speaker:** Michael Soulé Is Island Conservation Fundamentally Different from Continental Conservation?			
10:00 am	Break			
10:20 am	**Governor Linda Lingle's Address**			
10:45 am	**Presentation of "My Hawaiʻi" Awards**: L. Lingle, T. Ingram, C.F. Puttock, J.K. McCreary			
11:00 am	**Plenary Speaker I:** J. Michael Scott Hawaiʻi: A Window to the Future of Conservation Biology?			
11:40 am	Gerald Marten EcoTipping Points			
12:00noon	Lunch Break: Concourse **"My Hawaiʻi" Story Reading Room 312**			
CONCURRENT SESSIONS I				
	Near Shore/Marine Symposium Room 310 Moderator: Athline Clark	**Insects Symposium I** Room 316A Moderator: Betsy Gagné	**Ecosystem Services Symposium** Room 316BC Moderator: Liba Pejchar	**Alternative Energies Symposium** Room 312 Moderator: William Steiner
1:00 pm	Introduction: Athline Clark	Introduction: Betsy Gagné	Introduction: Liba Pejchar	Introduction: William Steiner
1:05 pm	**Eric Brown**: Determining Fish Habitat Utilization Patterns and the Efficacy of Marine Protected Areas	**Darcy Oishi**: The Importance of Diagnostics for Conservation	**Gretchen Daily**: Ecosystem Services in Hawaiʻi	**Hans Krock**: Ocean Thermal Energy Conversion Systems
1:25 pm	**William Walsh**: Historical Overview of Resource Enforcement in Hawaiʻi	**Paul Krushelnycky**: The Effects of Invasive Ants on Hawaiian Arthropod Communities	**David Brand:** Valuing Carbon, Creating Markets	**Eric Miller**: Photovoltaics in Hawaiʻi
1:45 pm	**Debbie Gowensmith**: Looking Forward to the Past: Community-Based Marine Resources Management in Hawaiʻi	**Robert Peck**: Developing Management Tools for Invasive Ants in Hawaiʻi Volcanoes National Park	**Kate Brauman**: Ecosystem Service Based Watershed Management in Hawaiʻi	**David Waller**: Meeting Hawaiʻi Electricity Needs with Renewable Energy
2:05 pm	**Ivor Williams**: Effects of 25 Years of Rotational Management at the Waikīkī-Diamond Head Fishery Management Area	**Will Haines** *(Student)*: Rethinking Extinctions: Conservation Status of Hawaiian Leafroller Moths in the Genus *Omiodes* (Crambidae)	**Josh Goldstein**: Paying for Ecosystem Services in Hawaiʻi	**Gregory Spencer**: Renewable Energy and Resource Conservation in Motion: Implementing a Habitat Conservation Plan in West Maui, Hawaiʻi
2:25 pm	**Russell Sparks**: The Decline of Maui's Coral Reefs, the Rise of Invasive Algae, and the Need for Herbivore Management	**Jesse Eiben** *(Student)*: Status of the University of Hawaiʻi Conservation Efforts for the Wekiu Bug (*Nysius wekiuicola*) on Mauna Kea, Hawaiʻi	**Mark Fox**: Policy Dimensions of the Ecosystem Services Approach in Hawaiʻi	**William Steiner**: The State of the Biofuels Industry in Hawaiʻi
2:45 pm	**Q&A**: Athline Clark and panel	**David Foote**: Using Rare Hawaiian Picture-Wing *Drosophila* as Targets of Restoration	**Q&A**: Liba Pejchar and panel	**Q&A**: William Steiner and panel
3:00 pm	Break			

Wednesday, July 25, 2007 *continued*

CONCURRENT SESSIONS II				
	The Big Picture Session Room 310 Moderator: Sheri Mann	**Insects Symposium II** Room 316A Moderator: Betsy Gagné	**Native Biota Session** Room 316BC Moderator: Gregory Koob	**Invasives Session I** Room 312 Moderator: Mindy Wilkinson
3:20 pm	**Stephen Miller**: Climate Change and Endangered Species Conservation	**Francis Howarth**: Rats! They're Eating Native Insects!	**Kenneth Wood**: Marquesan Pteridophytes: Diversity on an Isolated Hot-spot Archipelago in the Pacific	**David Benitez** *(Student)*: Fountain Grass Removal in Hawaiian Ocean View Estates: A Cooperative Effort
3:40 pm	**Charles Fletcher**: Beaches, First Victims of Global Warming in Hawai'i	**Dan Polhemus**: What the Databases Don't Tell You: Hidden Biodiversity in Hawaiian Heteroptera	**Naomi Arcand** *(Student)*: Population Structure Of Hāpu'u Tree Fern (*Cibotium chamissoi*) Across Intact and Degraded Forests on O'ahu, Hawai'i	**James Stanford**: A Major Search Effort to Resolve Whether Brown Treesnakes are Present on Saipan
4:00 pm	**Zoe Norcross-Nu'u**: A Coming Calamity, Management Response to High Waters, Receding Coasts, and Low Lands	**Curtis Ewing**: Life History and Conservation Status of the Endemic Hawaiian Sap Beetles (Coleoptera: Nitidulidae)	**Dean Meason** *(Student)*: Potential Mechanisms That Limit Koa Growth and What It Could Mean for Koa Management–A Case Study	**James Stanford**: The Brown Treesnake Rapid Response Team
4:20 pm	**Paul Scowcroft**: Plantation Koa: Another Inconvenient Truth?	**Karl Magnacca**: Phylogenetics and Ecology in Conservation of *Hylaeus* and *Drosophila*	**Stephanie Dunbar** *(Student)*: The Role of Molecular Systematics in the Conservation of Rare Species: A Case Study of *Plantago princeps* var. *princeps* (Plantaginaceae) on O'ahu.	**Karen Johns**: Communities Applying Science
4:40 pm	**Howard Wiig**: A Portable Refinery for Wake Island and Remote Pacific Islands	**Q&A**: Betsy Gagné and Karl Magnacca	**Susan Ching**: Changes in Conservation Management Plans for *Plantago princeps* var. *princep*s Based on Genetic Data	**Aaron Shiels** *(Student)*: Rats, Humans, and Their Impacts on Islands: Integrating Historical and Contemporary Ecology
5:00 pm	Pause			
EVENING SESSION - Poster, Art and Exhibit Reception: Room 313ABC				
6-8:30pm	Poster Session with presenters in attendance (6:30-8:30pm) Conservation through Art Exhibition with artists Conservation Exhibitors and light pupu Reception General Public admitted at 6:30pm			

Thursday, July 26, 2007

7:00 am	Registration		
8:00 am	**PLENARY SESSION ROOM 316BC** **Plenary Speaker II:** David Helvarg Saving the Ocean		
8:40 am	**Dieter Mueller-Dombois**, 2006 Distinguished Service Awardee A Silvicultural Approach to Restoration of Native Hawaiian Rainforests		
9:00 am	**Holly Freifeld**, Hawai'i-New Zealand Exchange Program Seabird Translocation, New Zealand-style: Ideas and Applications for Restoration and Conservation in Hawai'i		
9:20 am	**Carl McGuinness**, Hawai'i-New Zealand Exchange Program Evolution of an Organisation: The New Zealand Department of Conservation		
9:40 am	Break		
CONCURRENT SESSIONS III			
	Northwestern Hawaiian Islands Symposium Room 310 Moderator: Malia Chow	***Inter Situ* Restoration Symposium** Room 316A Moderator: David Burney	**Conservation Evaluation Symposium** Room 316BC Moderator: Shawn Morford
10:00 am	Introduction: Malia Chow	Introduction: David Burney	Introduction: Shawn Morford
10:05 am	**Donald Kobayashi**: Larval Retention Versus Larval Reception: Marine Connectivity Patterns Within and Around the Hawaiian Archipelago	**David Burney**: *Inter Situ* Restoration: Thinking Bigger in Time and Space	**Shawn Morford**: The Emerging Field of Conservation Evaluation: An Overview
10:25 am	**Frank Parrish**: Foraging Competition Between Monk Seals and Other Apex Predators	**Lida Pigott Burney**: Makauwahi Cave Reserve: An Innovative Prototype for *Inter Situ* Restoration	**Terrell Erickson**: Evaluating Conservation
10:45 am	**Jean Kenyon**: Coral Community Structure at Pearl and Hermes Atoll in the Northwestern Hawaiian Islands: Unique Conservation Challenges in the Hawaiian Archipelago	**Margaret Clark**: Growing Hawaiian Natives for Large Scale Restoration	**Rusyan Jill Mamiit**: Lessons Learned: Coastal Zone Management Performance Measures in Hawai'i
11:05 am	**Daniel Merritt**: Monitoring Hawai'i's Bottomfish Complex Using Fishery-Independent Methods	**Mike DeMotta**: Lehua: A Priority Islet for Conservation	**Charles Giuli**: Evaluation Practice in 2007: Implications for Evaluation of Conservation Programs
11:25 am	**Amy Hall**: Biodiversity Census at French Frigate Shoals, A Baseline Diversity Study	**David Bender**: Case Studies and Perspectives on *Inter Situ* Plant Conservation in Hawai'i	**Samuel Gon**: Developing a State-wide Hawaiian Conservation Scorecard
11:45 am	**Q&A**: Malia Chow and panel	**Q&A**: David Burney and panel	**Q&A**: Shawn Morford and panel
12:00 noon	Lunch Break: Concourse **Hōkūle'a in Palau - Lessons in Marine Conservation -** Room 316A Presentation by Pauline Sato, Emily Fielding, and Eric Co The Nature Conservancy		

Thursday, July 26, 2007 *continued*

CONCURRENT SESSIONS IV			
	Fisheries Session Room 310 Moderator: Robert Nishimoto	**Forest Health Symposium I** Room 316A Moderator: Robert Hauff	**Landscape Management Session** Room 316BC Moderator: Greg Koob
1:00 pm	**Robert Nishimoto**: Waiākea Fish Pond/Wailoa River System in Hilo: A Significant Nursery Habitat for the Native Mullet (*Mugil cephalus*)	**Arthur Medeiros**: Biological Invasions Threaten Native Hawaiian Canopy Tree Species: The *Erythrina* Case Study	**Christine Mullen**: The Environment of Wine: A Global Concept
1:20 pm	**Thomas Iwai Jr.**: The Impact of Recreational Fishing in the Waikīkī-Diamond Head Shoreline Fisheries Management Area, O'ahu, Hawai'i	**Guy Hughes**: Response to Erythrina Gall Wasp, *Quadrastichus erythrinae* Kim in Kalaupapa National Historical Park (KALA), Moloka'i, Hawai'i	**Michelle Clark**: NRCS WHIP Assists Landowners to Restore Critical Habitats for Federally Listed T&E Species on Kaua'i
1:40 pm	**Thomas Iwai Jr.**: Moi (*Polydactylus sexfilis*) Stock Enhancement: Developing a Sustainable Moi Fisheries in Hawai'i	**Christopher Jacobsen**: Imidacloprid Concentrations Within *Erythrina* spp. Leaf Tissue That Control Erythrina Gall Wasp, *Quadrastichus erythrinae* Kim, Infestations	**Bill Standley**: Overview of Safe Harbor Agreements in Hawai'i
2:00 pm	**Ross Langston**: Coral Reef Fisheries I: Rapid, Low-Cost Analysis of Life History and Demographic Structure for Three Exploited Reef Fishes	**Daniel Rubinoff**: Geographic Origin and Identity of Hawai'i's Devastating Erythrina Gall Wasp (*Quadrastichus sp.*) Invader Based on DNA Analysis	**Vickie Caraway**: Habitat Conservation Plan for O'ahu's Red Ilima (*Abutilon menziesii*) at Kapolei
2:20 pm	**Ken Longenecker**: Coral Reef Fisheries II: Evaluating the Fishery Management Value of No-Take Marine Reserves	**Mohsen Ramadan**: Two Trips to Tanzania for Potential Biocontrol Agents of the Erythrina Gall Wasp, *Quadrastichus erythrinae*, a New Invasive Species in the Pacific Region	**Janna Shackeroff** *(Student)*: Human Dimensions and Historical Ecology of Kona Coast Coral Reefs: Applications to Ecosystem-Based Management of Social-Ecological Systems
2:40 pm	**Paul Bienfang**: The Sustainability Focus of Hawai'i's Aquaculture	**Mark Schmaedick**: Erythrina Gall Wasp Advent and Initial Impact in American Samoa	**Greg Bruland**: Comprehensive Inter-Island Assessment of Coastal Lowland Wetland Ecosystems of the Hawaiian Islands
3:00 pm	Break		
CONCURRENT SESSIONS V			
	Watershed Session Room 310 Moderator: Christine Ogura	**Forest Health Symposium II** Room 316A Moderator: Robert Hauff	**Invasives Session II** Room 316BC Moderator: William Pitt
3:20 pm	**Chelsie Settlemier**: An Evaluation of the Effectiveness of the Wai'ōpae Tide Pools' Marine Life Conservation District to Improve Management of the Natural Resources of the Tide Pools	**Alvin Yoshinaga**: Wiliwili (*Erythrina sandwicensis*) Germplasm Seed Bank	**Miyako Warrington** *(Student)*: Monitoring Coqui Frog (*Eleutherodactylus coqui*) Populations Using Sound Pressure Level
3:40 pm	**Mohammad Safeeq** *(Student)*: Modeling Surface Water Flow and Quality in Mānoa Watershed	**Lloyd Loope**: The Rust *Puccinia psidii* in Hawai'i: An Update	**Shenandoah Marr**: The Enemy Release Hypothesis and the Success of the Puerto Rican Tree Frog (*Eleutherodactylus coqui*) in Hawai'i
4:00 pm	**Alan Mair**: Spatial Distribution of Groundwater Recharge in the Upper Mākaha Valley, O'ahu	**Robert C. Anderson** *(Student)*: Establishing a Baseline: Assessment of Hosts, Effects, and Climatic Range of Hawai'i's Strain of *Puccinia psidii*	**William Mautz**: Sound Pressure Levels of Overnight Vocalization by Coqui Frogs (*Eleutherodactylus coqui*)
4:20 pm	**Katina Hanson**: What You Need to Know if You Want to Use the Results from a Watershed Model: Uncertainties in Erosion and Sediment Delivery Modeling in Pacific Island Watersheds	**Janice Uchida**: Pathogenicity and Biology of *Puccinia psidii*, the 'Ōhi'a Rust, in Hawai'i	**Raymond McGuire** *(Student)*: Does the Invasive Tree, *Falcataria moluccana*, Facilitate a Large Population Density of, *Eleutherodactylus coqui*?
4:40 pm		**Q&A**: Robert Hauff and panel	**Flint Hughes**: Fast, Cheap, and Out of Control; the Fate and Impact of Purposeful Exotic Tree Introductions in Hawai'i and Other Pacific Islands: *Falcataria moluccana* as a Case Study.
5:00 pm	Pause		
7:30-9 pm	Free Public Event, Room 310: **David Helvarg**, 50 ways to save the ocean		

Friday, July 27, 2007

7:00 am	Registration		
CONCURRENT SESSIONS VI			
	Effective Monitoring Symposium I Room 310 Moderator: James Jacobi	**Bridges to the Future Forum** Room 312 Moderator: Sharon Ziegler-Chong	**Economics of Invasives Symposium** Room 311 Moderator: Chris Buddenhagen
8:00 am	Introduction: James Jacobi	Introduction: Sharon Ziegler-Chong	Introduction: Chris Buddenhagen
8:05 pm	**Kevin Brinck**: A General Framework for Ecological Monitoring	**John Leong**: Interns: The Untapped Natural Resource	**Donna Lee**: Quantifying the Risk of Zebra Mussels to Florida Ecosystems: A Comparison of Prevention, Response, and Control Strategies
8:25 pm	**Alison Ainsworth**: Community and Species Level Vegetation Monitoring Examples from Hawai'i Volcanoes National Park	**Sharon Ziegler-Chong**: Back to the Future: Hawai'i's Future Conservation Community	**Oscar Cacho**: Applying Search Theory to Evaluate the Feasibility of Eradicating an Invasion
8:45 pm	**Steven Hess**: Effective Ecological Monitoring Symposium: Ungulate Monitoring	**Pauline Sato**: Bridging to the Future: Building our Environmental Workforce through Partnerships	**Kimberley Burnett**: Uncertain Populations and the Value of Information
9:05 pm	**Michelle Reynolds**: Pre- and Post-Translocation Monitoring of Endangered Laysan Teal on Midway Atoll and Laysan Island	**Loyal Mehrhoff**: The Value of Students and Interns to Research	**Oscar Cacho**: When is it Optimal to Eradicate a Weed Invasion?
9:25 am	**David Foote**: Using Monitoring Data to Manage Yellowjacket Wasps in Hawai'i	**Neil Hannahs**: Honoring Traditional Values and Becoming People of Place, Caring for Place	**Jim Roumasset**: How to Use Your Economist for Invasive Species Management
9:45 am	**Jonathan Price**: Beyond Traditional GAP Analysis: Identifying Gaps in Management of Hawaiian Plants and Birds	**Q&A** Sharon Ziegler-Chong and panel	**Chris Buddenhagen**: How Much is Spent Annually on Invasive Species Management in Hawai'i?
10:00 am	Break		
CONCURRENT SESSIONS VII			
	Effective Monitoring Symposium II Room 310 Moderator: James Jacobi	**Aquatic Biota Session** Room 312 Moderator: Lorena Wada	**Invasives Session III** Room 311 Moderator: Chris Buddenhagen
10:20 am	**Eric Brown**: Development and Implementation of a Marine Monitoring Program in The National Park Service Pacific Network (PACN)	**Gerald Marten**: Controlling Mosquito-Borne Diseases with Cyclopoid Copepods	**John Gutrich**: Potential Economic Impact of Introduction and Spread of the Red Imported Fire Ant, *Solenopsis invicta*, in Hawai'i
10:40 am	**Tahzay Jones**: Integration of Physical, Chemical, and Biological Monitoring of Water-Quality and Freshwater Animal Communities in Pacific Island National Parks	**Anthony Montgomery**: The Hawaiian Black Coral Fishery: Science and Management	**Chris Buddenhagen:** Economics of Invasive species synthesis, Q&A and panel
11:00 am	**Gregory Asner**: The Carnegie Airborne Observatory: 3-D Regional Mapping of Biodiversity, Structure, and Functioning of Hawaiian Ecosystems	**Alison Sherwood**: Utility of DNA Sequence Comparisons for Identification of Algae in the Hawaiian Islands	**Leyla Kaufman** *(Student)*: Effects of Alien Parasitoid Species on the Hawaiian Endemic moth *Udea stellata* (Lepidoptera: Crambidae)
11:20 am	**Stephen Ambagis**: Assessment of a Low-Cost High-Resolution Remote Sensing System for Monitoring Plant Species and Communities in Hawai'i	**Karla McDermid**: Making a Living on Limu: Nutritional Composition of Marine Plants in the Diet of the Green Sea Turtle (*Chelonia mydas*) in the Hawaiian Islands	**Luc Leblanc** *(Student)*: Assessment of Non-Target Insect Attraction to Fruit Fly (*Tephritidae*) Male Lures on Hawai'i and Maui Islands
11:40 am	**Q&A**: James Jacobi and panel	**I.A. Abbott and Celia Smith**: A Different Path to Conservation: Case Studies from Recent Research with Hawaiian Marine Algae	**Robert Hollingsworth**: Measures to Reduce the Risk of Yellowjacket Queens in Christmas Trees Imported into Hawai'i
12:00 noon	Awards Luncheon: Ballroom		

Friday, July 27, 2007 *continued*

CONCURRENT SESSIONS VIII			
	Ecosystem Management Session I Room 310 Moderator: Barry Steiglitz	**What's in the water? Session** Room 312 Moderator: Brian Hunter	**Winged Vertebrates Session I** Room 311 Moderator: Thane Pratt
1:40 pm	**Melora Purell**: GARP Habitat Models as Tools for Invasive Species Management	**Tracy Wiegner**: Concentrations and Bioavailability of Organic Matter and Nutrients During Base and Storm Flow Conditions in the Wailuku River, Hawai'i	**Frank Bonaccorso**: Roosting Ecology and Flight Emergence Times of the Hawaiian Hoary Bat on the Island of Hawai'i
2:00 pm	**Roberta Martin**: Leaf-level Biochemical and Optical Diversity Within and Across Native and Non-native Hawaiian Rainforest Species	**Richard MacKenzie**: Leaf Litter Breakdown of Native and Invasive Riparian Trees in Forested and Developed River Reaches on the Island of Hawai'i	**Dennis LaPointe**: Potential Impacts of West Nile Virus (WNV) on Endemic Hawaiian Avifauna: Experimental Infection of Hawai'i 'Amakihi (*Hemignathus virens*) with WNV
2:20 pm	**Samuel Gon:** A Conservation Analysis of the Ecological Systems of the Hawaiian Ecoregion	**Guy Ragosta**: Enterococci Surface Soil and Water Analysis of a Rural Tropical Island Stream and Tributaries	**Liba Pejchar**: Hawai'i's Last Abundant and Native Frugivorous Bird Provides Key Seed Dispersal Services
2:40 pm	**Steven Hess**: Ungulates in Hawai'i: A Literature Review	**Farhat Abbas**: Use of Riparian Buffers to Reduce Sediment and Nitrogen Transport in Hawaiian Watersheds	**Brenda Zaun**: The Albatross Egg Swap: Three Years Later
3:00 pm	Break		
CONCURRENT SESSIONS IX			
	Ecosystem Management Session II Room 310 Moderator: Barry Stieglitz	**Marine Vertebrates Session** Room 312 Moderator: Brenda Becker	**Winged Vertebrates Session II** Room 311 Moderator: Thane Pratt
3:20 pm	**Lauren Weisenberger**: Seed Conservation Research for Rare Plant Management	**Dave Johnston**: A Collaborative Hawaiian Spinner Dolphin Photo-Id Catalogue: Science for the Purpose of Better Management	**Kirsty Swinnerton**: Using Population Viability Analysis to Guide Management Strategies for the Recovery of the Maui Parrotbill
3:40 pm	**Jeff Hatfield**: Growth Rates of Trees and Shrubs in Three Forests on the Island of Hawai'i, 1996-2007	**Alecia Van Atta**: Rest for the Weary: Protecting Hawaiian Spinner Dolphin Resting Habitat Identified by Spatial Modeling	**Jay Penniman**: The Lāna'ihale 'Ua'u Colony Management Guided by Research Results
4:00 pm	**Paul Higashino**: Ten Years of Ecological Restoration on Kaho'olawe	**William Seitz**: Nesting Hawksbill Turtles (*Eretmochelys imbricata*) on the Island of Hawai'i	
4:40-6 pm	Pause		
6-8:00 pm	An Evening at the Waikīkī Aquarium Behind the scenes 'field-trip' of special exhibits Requires pre-enrolment		

Saturday July 28, 2007

FIELD TRIPS	
8:00 am-4:00 pm	Ka'ena Point with B. Gagné (DLNR DOFAW): requires pre-enrolment
8:30-11:30am	Kailua Waterways with Ron Walker (Audubon Society): requires pre-enrolment

HAWAIʻI CONSERVATION ALLIANCE MISSION STATEMENTS

Hawai'i Conservation Alliance (HCA)
Christopher F. Puttock Program Coordinator

The Hawai'i Conservation Alliance is a cooperative partnership of fifteen government, education and non-profit organizations that are strongly committed to environmental conservation in the Hawaiian Islands through land management, scholarly research and financial incentives. The mission of the Alliance is to promote effective, long-term management of Hawai'i's native ecosystems through collaborative research, training and outreach among land managers, scientists, educators and the general public.

The Conservation Mission Statements of the Alliance Partners are:

U.S. Geological Survey: Biological Resource Discipline (USGS/BRD)
Loyal Mehrhoff (2007 Chair), *Jim Jacobi*

The mission of USGS/BRD is to work with others to provide scientific understanding and technologies needed to support and implement sound management and conservation of our Nation's biological resources occurring in Hawai'i and other Pacific island locations.

National Park Service (NPS)
Marilyn Parris (2008 Chair), *Melia Lane-Kamahele*

The National Park Service preserves unimpaired the natural and cultural resources and values of the national park system for the enjoyment, education, and inspiration of this and future generations. The Park Service cooperates with partners to extend the benefits of natural and cultural resource conservation and outdoor recreation throughout this country and the world.

Department of Land & Natural Resources: Division of Forestry and Wildlife (DLNR/DOFAW)
Paul Conry, *Randall Kennedy* (2006 Past Chair)

The mission of DLNR-DOFAW is to responsibly manage and protect watersheds, native ecosystems, and cultural resources and provide outdoor recreation and sustainable forest products opportunities, while facilitating partnerships, community involvement and education. Malama ika ʻĀina.

University of Hawai'i at Mānoa: Center for Conservation Research & Training (UH Mānoa/ CCRT)
Kenneth Kaneshiro (Executive Director), *Rob Cowie*

The mission of UH Mānoa/CCRT is to create the premier multi-agency, trans-disciplinary research and education center in the Pacific Asia Region whose mission is to develop a new paradigm for addressing ecosystem and human health issues within a socio-ecological systems framework that includes the spiritual values of traditional cultures.

Department of Defense/U.S. Army Garrison Hawai'i: Natural Resource Program
Michelle Mansker

The goal of the US Army Garrison, Hawai'i's Natural Resource Program is to enable the installation to comply with the Endangered Species Act while maintaining military mission readiness. The Army in Hawai'i has over 100 listed species on their lands; which account for 1/3 of the nation's and the State's total listed species!

National Oceanic and Atmospheric Administration: National Marine Sanctuaries Program (NOAA/NMS)
Allen Tom, ʻAulani Wilhelm

The mission of NOAA's National Marine Sanctuaries is to serve as the trustee for the nation's system of marine protected areas, to conserve, protect, and enhance their biodiversity, ecological integrity and cultural legacy.

U.S. Department of Agriculture: Forest Service (USDA/FS)
Boone Kauffman, Julie Denslow

The mission of USDA/FS is through research, education, and demonstration, we provide scientific and technical information needed to restore, protect, and sustain forests of the Pacific for purposes of conservation and utilization.

U.S. Department of Agriculture: Natural Resource Conservation Service (USDA/NRCS)
Larry Yamamoto, Greg Koob

The Natural Resources Conservation Service works in partnership with private land owners and managers to protect, enhance, and preserve soil, water, air, plant and animals using sound science and expertise. Through our mission of "Helping People Help the Land," we provide technical and cost-share assistance for the implementation of conservation systems that help us to realize our vision of "Productive Lands, Healthy Environment."

U.S. Fish and Wildlife Service: Ecological Services (USFWS/ES)
Patrick Leonard, Steve Miller

The U.S. Fish and Wildlife Service's mission is: "working with others to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing benefit of the American people." The Service manages migratory birds and nationally significant fisheries; conserves and restores vital wildlife habitat through the National Wildlife Refuge System; protects and recovers endangered species; administers a Federal Assistance program; and helps other governments with conservation efforts.

U.S. Fish and Wildlife Service: National Wildlife Refuge Complex (USFWS/NWRC)
Barry Stieglitz

The mission of the USFWS/National Wildlife Refuge System is to administer a national network of lands and waters for the conservation, management and where appropriate, restoration of the fish, wildlife and plant resources and their habitats within the United States for the benefit of present and future generations of Americans.

Department of Land and Natural Resources/Division of Aquatic Resources (DLNR/DOFAW)
Dan Polhemus, Athline Clark

The State of Hawaiʻi Division of Aquatic Resources has primary stewardship for all fresh, estuarine and near-shore marine waters in the Hawaiian Archipelago. It promotes sustainable conservation and use of marine ecosystems and their associated biota.

University of Hawaiʻi at Hilo: College of Agriculture, Forestry & Natural Resource Management (CAFNRM)
William Steiner

The purpose of UH Hilo-CAFNRM is to provide quality education to assist individuals in acquiring the scientific knowledge, attitudes, and practical skills needed to practice environmentally sound, sustainable agriculture, forestry and natural resources and to be productive and responsible global citizens. The program blends comprehensive classroom instruction with practical, technology-based education through

the use of the University of Hawai‘i at Hilo Agricultural Farm Laboratory, on-campus laboratory facilities, and a developing forestry facility. CAFNRM graduates skilled professionals who can further develop and promote agriculture, forestry and natural resources in the State of Hawai‘i, the United States, the Pacific Basin, and other countries. The College is especially interested in moving agriculture in the tropical and semitropical areas of the Pacific Basin toward more economical and self-sustaining methods.

Kamehameha Schools (KS)
Ulalia Woodside, Nāmaka Whitehead

The mission of the Kamehameha Schools is to fulfill Ke Ali‘i Pauahi’s desire to create educational opportunities in perpetuity to improve the capability and well-being of people of Hawaiian ancestry. It is the policy of KS to manage their lands and resources to optimize the balance of educational, cultural, economic, environmental, and community returns and steward resources in an ethical, prudent and culturally appropriate manner.

The Nature Conservancy Hawai‘i (TNC Hawai‘i)
Karen Poiani, Sam Gon III

The mission of TNC Hawai‘i is to preserve the plants, animals, and natural communities that represent the diversity of life on Earth by protecting the lands and waters they need to survive. In the Hawaiian archipelago, our ecoregional goal is to bring active, protective management to representative, viable, native ecological systems and species of the Hawaiian Archipelago, and to thereby sustain the greatest possible complement of native Hawaiian biodiversity into the future. Working with partners, threats will be abated, health of terrestrial and freshwater ecological systems will be restored and maintained, and the unique biodiversity of the islands will be carried forward as an irreplaceable asset, meeting human needs and fulfilling ecosystem functions that serve all life in the islands. The Conservancy in Hawai‘i maintains a network of preserves, participates in watershed and other conservation partnerships, engages in active management of natural areas, and works to strengthen policies and capacity for conservation in Hawai‘i.

Office of Hawaiian Affairs (OHA)
Jonathan Scheuer

To mālama (protect) Hawai‘i’s people and environmental resources and OHA’s assets, toward ensuring the perpetuation of the culture, the enhancement of lifestyle and the protection of entitlements of Native Hawaiians, while enabling the building of a strong and healthy Hawaiian people and nation, recognized nationally and internationally.

Hawai‘i Conservation Alliance Foundation (HCAF)
Christopher Puttock Executive Director

The HCAF has the same mission as the HCA: “to promote effective, long-term management of Hawai‘i’s native ecosystems through collaborative research, training and outreach among land managers, scientists, educators and the general public.” The HCAF is the non-profit 501(c)(3) corporation of the HCA and it’s mission is to conduct many of the charitable, educational, literary, and scientific purposes for the HCA. The HCAF is a tax-exempt nonprofit organization that provides the benefit of federal income tax deductions for donations to our environmental conservation donors. The HCAF is also building a non-voting membership as the “Friends of Hawai‘i Conservation” through which we will be able to provide better communication with the conservation community. We also plan to build a carbon credit system amongst other member benefits built into the 2008 conference.

KEYNOTE SPEAKER BIOGRAPHY

Michael Soulé

Professor Emeritus of Environmental Studies
University of California, Santa Cruz
P.O. Box 1808
Paonia, CO 81428

Phone: (970) 527-4719
Email: rewild@tds.net

Michael Soulé is Professor Emeritus of Environmental Studies, University of California, Santa Cruz. He was born, raised, and educated in California. After spending much of his youth in the canyons, deserts, and intertidal of San Diego and Baja California, and after graduating from San Diego State, he went to Stanford to study population biology and evolution under Paul Ehrlich. Upon receiving his Ph.D. at Stanford, Michael went to Africa to help found the first university in Malawi. He has also taught in Samoa, the Universities of California at both San Diego and Santa Cruz, and the University of Michigan. He has done field work on insects, lizards, birds, and mammals in Africa, Mexico, the Adriatic, the West Indies, and in California and Colorado.

Michael was a founder of the Society for Conservation Biology and The Wildlands Project and has been the president of both. He has written and edited nine books on biology, conservation biology, and the social and policy context of conservation. He has published more than 170 articles on population and evolutionary biology, fluctuating asymmetry, population genetics, island biogeography, environmental studies, biodiversity policy, nature conservation, and ethics. He continues to do research on ecosystem regulation by highly interactive species. He is a Fellow of both the American Association for the Advancement of Science and the American Academy of Arts and Sciences, has received a Guggenheim Fellowship, is the sixth recipient of the Archie Carr Medal, was named by Audubon Magazine in 1998 as one of the 100 Champions of Conservation of the 20th Century, and is a recipient of the National Wildlife Federation's National Conservation Achievement Award for science.

Now living in Colorado, Michael serves on the boards of several conservation organizations, including the Wildlands Project, and consults and speaks internationally on nature protection. He is also co-chair of the Science Council for Australia's WildCountry Project and is completing a book about conservation and compassion and practical means of achieving harmony between the three life-affirming movements—conservation, animal protection, and humanitarianism.

PLENARY I SPEAKER BIOGRAPHY

J. Michael Scott

Senior Scientist
U.S. Geological Survey
University of Idaho
Moscow, ID 83844-1141

Phone: (208) 885-6960
Email: mscott@uidaho.edu

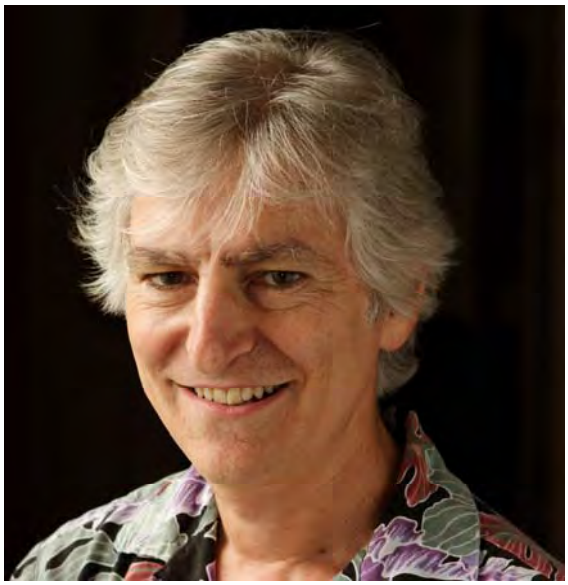
Dr. J. Michael Scott is a senior scientist with the U.S. Geological Survey, a professor in the Department of Fish and Wildlife Resources at the University of Idaho, and a leader with the Idaho Cooperative Fish and Wildlife Research Unit. Over his career, he has acted as Director for the National Gap Analysis Program, Director for the Condor Research Center in California, as a Research Biologist for the U.S. Fish and Wildlife Service, and as a Research Biologist for Oregon Department of Fish and Wildlife. His current research involves the examination of the distribution, abundance, and limiting factors on endangered species including multiple species of Hawaiian birds; reserve identification, selection, and design in North America; the use of translocation as a tool for establishing or augmenting animal populations; predicting wildlife species distribution; issues of scale and accuracy; and estimating bird abundance.

PLENARY II SPEAKER BIOGRAPHY

David Helvarg

Blue Frontier Campaign
P.O. Box 19367
Washington, D.C. 20036

Phone: (202) 387-8030
Email: helvarg@bluefront.org



David Helvarg is President of the Blue Frontier Campaign and the author of three books, *Blue Frontier-Dispatches from America's Ocean Wilderness*, *The War Against the Greens*, and *50 Ways to Save the Ocean*. He is editor of the Ocean and Coastal Conservation Guide, organizer of several "Blue Vision" conferences for ocean activists, and winner of Coastal Living Magazine's 2005 Leadership Award. Helvarg worked as a war correspondent in Northern Ireland and Central America, covered a range of issues from military science to the AIDS epidemic, and reported from every continent including Antarctica. An award-winning journalist, he produced more than 40 broadcast documentaries for PBS, The Discovery Channel, and others. His print work has appeared in publications including The New York Times, LA Times, Smithsonian, Popular Science, Sierra, The Nation, and the Honolulu Weekly. He's done radio work for Marketplace, AP radio, and Pacifica. He's led workshops for journalists in Poland, Turkey, Tunisia, Slovakia and Washington DC. He is a licensed Private Investigator, body-surfer and scuba diver.

LUNCHTIME PRESENTATIONS

Wednesday, July 25
12.15 - 12.45 pm Room 312

My Hawai‘i Story Reading

The My Hawai‘i student winners are provided with an opportunity to read their winning stories and poems to the conference participants.

Thursday, July 26
12.15 - 12.45 pm Room 316A

Hōkūle‘a in Palau - Lessons in Marine Conservation

Pauline Sato, Emily Fielding, Eric Co
The Nature Conservancy

In April 2007, the crews of Hōkūle‘a and Alingano Maisu completed their 500 mile round trip journey from Yap to Palau in Micronesia, bringing back images and reflections of a country rich in love with its culture and environment. The crew that voyaged to Palau was led by captain and navigator Nainoa Thompson and included several novice members brought on for their special contributions. Emily Fielding, Pauline Sato, and Eric Co of The Nature Conservancy joined the crew to focus on conservation lessons to be learned from Palau and shared back home in Hawai‘i. They will present lasting images and stories from Micronesia attained from the viewpoint of voyaging during this lunch-time presentation

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Friday, July 27
12 noon -1.30 pm Room 316A

Awards Luncheon

Science Fair Awards
HCC Oral PresentationAwards
HCC Poster Presentation Awards
Distinguished Service Award
Conservation Innovation Award
Outstanding Leardership Award

THURSDAY EVENING PUBLIC PRESENTATION

Thursday, July 26, 2007
Liliʻu Room 310
Hawaiʻi Convention Center
7:30-9:00 PM

50 ways to save the ocean

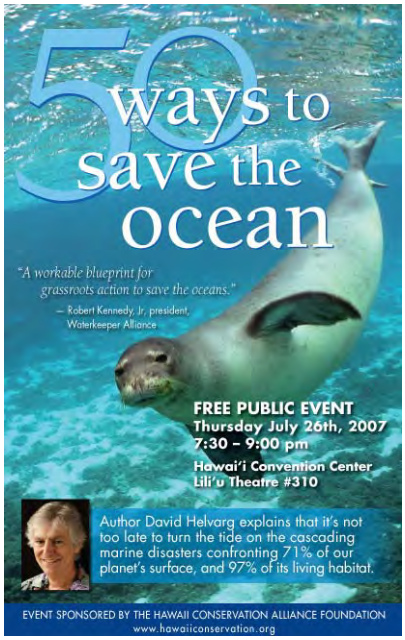
Presented by David Helvarg, President, Blue Frontier Campaign

David Helvarg explains that it's not too late to turn the tide on the cascading marine disasters confronting 71 percent of our planet's surface and 97 percent of its living habitat. Through individual and collective action as families, consumers and citizens we can still make a difference by working to protect, restore and explore our last great public commons. Not surprisingly in working to protect the oceans, through changing our daily consumption, energy use and transportation habits, we also find that we can save money, improve our health and reconnect with our communities.

"Blue is the new Green." Today in the United States there are some 2,000 groups working to protect our shores and waters. These include national and international organizations, professionalized marine groups, marine wildlife rescue and advocacy groups and, most numerous of the seaweed groups are local and regional organizations. What are they doing, how are they doing it, and is it enough?

Dedicated watermen and waterwomen, working together have begun the first ripples in a rising tide of citizen action for the recovery of our Blue Frontier and marine heritage. They know there are common sense solutions that can work. They know that protecting our nation's watersheds, shorelines, and seas, makes sense both morally and economically. Healthy, clean and bountiful oceans help assure vibrant coastal communities and economies.

In this presentation you will be hearing about a workable blueprint for grassroots action to save the ocean that surrounds Hawaiʻi.



TOURS AND FIELD TRIPS

Space is limited for these events. If you are not registered for a tour, go to registration desk and ask if space is still available. You must provide your own transportation to the meeting point. Car pooling is encouraged.

An Evening at the Waikīkī Aquarium Friday, July 27, 2007, 6-8 pm
Organizer: HCA and Waikīkī Aquarium Cost: $15.00 (includes heavy pupus)

Join us for an evening at the Waikīkī Aquarium, one of O'ahu's best attractions and one of Hawai'i's first marine field stations (1904). Mingle with other Hawai'i Conservation Conference participants under the stars and get a close-up look at Hawai'i's reef sharks, Hawaiian monk seals, reef fish, jellyfish, corals and other marine inhabitants. Throughout the evening, aquarium biologists will lead special "Back Scenes Tours" highlighting the aquarium's conservation projects. Get a peek at the "Coral Farm" from which coral is shipped to other aquariums and researchers around the world (over 2,500 pieces were shipped last year). Also behind the scenes, the aquarium houses two NMFS species of concern; a brachiopod, *Lingula reevi* and a coral *Montipora dilitata*. Don't miss this wonderful opportunity for a special tour of Waikīkī Aquarium and a chance to socialize with friends and colleagues. Heavy pupus will be served.

Kailua Waterways Tour Saturday, July 28, 2007, 8:30 to 11:30 am
Organizer: Ron Walker Cost: $10.00

Join renowned naturalist Ron Walker on a guided tour of one of Hawai'i's largest remaining wetlands. Visit sacred Hawaiian sites and learn more about Hawai'i's endangered waterbird species on this unique three hour tour. Ron will lead participants to Na Pōhaku o Hauwahine on the Kapa'a Quarry road (overlooking Kawai Nui Marsh). This rock formation of the Hawaiian Mo'o goddess and guardian of Kawai Nui Marsh offers a panoramic view into the "piko" of Kawai Nui where one can observe the wetland birds and marsh vegetation. Brush removal and trail construction at this site has revealed ancient Hawaiian terraces that align the massive rock outcrops.

Participants will next go to the Hāmākua Marsh State Wildlife Sanctuary in Kailua town where they will have ample opportunities to photograph and see firsthand some of the rarest waterbirds in the nation. Hawaiian Stilts, Hawaiian Coots, and even the "elusive" Hawaiian Moorhens can all be found at Hāmākua. The Kailua Waterways Tour will end with a visit to the Ka'elepulu Wetland Bird Preserve in Enchanted Lakes where numerous domestic ducks and waterbirds can be seen in this private preserve.

Participants should meet at 8:30 am at the Ulupō Heiau parking lot behind the Windward YMCA, 1200 Kailua Road. Come early and check out the Ulupō Heiau, one of the first sacred temples to have been built as a "māpele" (agriculture) heiau by the menehune and dedicated to Kaneulupo. Don't forget to bring plenty of water, sunscreen, insect repellant, a bird ID book, sturdy footwear, binoculars, raincoat and of course, your camera!

Ka'ena Point Hike/Service Trip Saturday, July 28, 2007, 8:00 am to 4:00 pm
Organizer: Betsy Gagné Cost: Service Trip – be prepared to work

Meet at 8 am in the parking lot on the Waialua side of Ka'ena Point, out past Dillingham Airstrip and Camp Erdman. We will hike out and in to the Reserve, view the large nesting colony of Wedge-Tailed Shearwaters, monk seals, maybe a few late albatross fledglings, 'ōhai and 'akoko plants, then pull a few select weeds and pick up trash on the way back. Bring your own lunch, at least two bottles of water, sunscreen, comfortable hiking shoes and clothes, rain gear, hat, binoculars, and camera. **Plan for a full day**. We should be back at our vehicles by 3-4 pm. It is a 45-60 minute drive from Honolulu out to the end of the pavement.

HAWAIʻI CONSERVATION ALLIANCE DISTINGUISHED SERVICE AWARD

Each year since 1997 the Hawaiʻi Conservation Alliance has recognized persons reaching the highest esteem within the conservation community. These persons are nominated by their peers. The award honors exceptional service, personal effort and unselfish interest, embodying long-term dedication and tenacity in environmental conservation for the Hawaiian Islands.

Recent Distinguished Service Award Winners

2007: _____

The 2007 recipient will be announced at the Awards Luncheon on Friday, July 27, 2007.

2006: **Dieter Mueller-Dombois, University of Hawaiʻi at Mānoa**

Dr. Dieter Mueller-Dombois has been a professor of plant ecology in the Department of Botany at the University of Hawaiʻi since 1963. He is well known as a teacher, researcher, and conservation advocate specializing in understanding the dynamics of plant communities in Hawaiʻi and the Pacific Islands. During his career he has served as an inspirational model for a whole new generation of people involved with conservation in Hawaiʻi, as well as throughout the entire Pacific. He has helped shape the character and direction of more than 30 graduate students through the University of Hawai`i, including many who are now important members of the conservation community, not only in Hawaiʻi, but worldwide. He has authored nearly 200 scientific publications including five books, several of which serve as standards in their field.

Although he officially retired from teaching at the University in 1990, he has continued to conduct field studies as well as organize research programs both in Hawaiʻi and across the Pacific. He has previously received the Gilford Pinchot Award of the US Forest Service for forest ecology research in Hawaiʻi, the Merit Award for Distinguished Service at the University of Hawaiʻi, the Hawaiʻi Governor's Award for service with the State Natural Area Reserves System, and the prestigious Rinhold Tüxen Prize in recognition of his outstanding international achievements in vegetation ecology.

Past Distinguished Service Award Winners

Descriptions are available online at: http://www.hawaiiconservation.org/awards.html

2005a: David Woodside, U.S. Fish and Wildlife Service
2005b: Tim Tunison, Hawaiʻi Volcanoes National Park
2004: Bryan Harry, Director of the National Park Service Pacific West Region
2003: Kenneth Kaneshiro, Director, Center for Conservation Research and Training, University of Hawaiʻi at Mānoa
2002: Sheila Conant, Professor of Zoology, University of Hawaiʻi at Mānoa
2001: Nancy Glover, Former Senior Program Officer, Secretariat for Conservation Biology
2000: Lloyd Loope, Research Scientist, USGS, Haleakalā Field Station, Haleakalā National Park
1999: Charles H. Lamoureux, Former Professor of Botany, University of Hawaiʻi at Mānoa, and Director of the Lyon Arboretum
1998: Don Reeser, Superintendent of Haleakalā National Park
1997: Clifford Smith, Director of the National Parks Service Study Unit, University of Hawaiʻi at Mānoa

HAWAIʻI CONSERVATION ALLIANCE
OUTSTANDING LEADERSHIP AND CONSERVATION INNOVATION AWARDS

HCA Outstanding Leadership Award: Mr. Peter Young

This award is given to a person who has demonstrated exceptional leadership in advancing environmental conservation in Hawaiʻi over the short to medium term (several years to a decade). Examples of such leadership may be seen in creating avenues for rapid advancement in conservation through influencing management or programs that lead to significant better protection of the Hawaiʻi's native ecosystems. The award is determined by nomination and seconded, with majority consensus by the HCA partnership.

Mr. Young has been an exceptionally strong leader in the conservation of Hawaiʻi's unique plants, animals, and the ecosystems that they inhabit. During his tenure as the Chair of the Board of Land and Natural Resources, the Department of Land and Natural Resources made significant strides in the sustainable use of natural and cultural resources. Key accomplishments include protection of the Northwestern Hawaiian Islands as the Papahānaumokuākea Marine National Monument, implementation of lay gill net regulations to provide long-term sustainability of Hawaiʻi's fisheries, overseeing a significant increase in the budget to protect Hawaiʻi's natural resources, strengthening forestry and wildlife watershed partnerships, overseeing significant improvements in water resource management, increased partnering with communities and agencies for conservation land acquisitions, and tackled other major issues in biodiversity conservation, land programs, and alien species management. Mr. Young's leadership has been instrumental in furthering the protection of Hawaiʻi's natural resources.

HCA Conservation Innovation Award: Conservation Partnerships Program

This award shall be given to the instigators or champions of a procedure that leads to significant advances to the structure or nature of environmental conservation in Hawaiʻi. Examples of such procedure may be the creating of legislation that changes the dynamics of management, or programs that lead to significant better protection of the Hawaiʻi's native ecosystems.

The mission statement of the Conservation Partnerships Program is *"to restore and protect native habitats by developing positive relationships with landowners, identifying biological resources and threats, implementing projects, monitoring results, and sharing information."*

The Conservation Partnerships Program is comprised of the following:

- Partners for Fish and Wildlife – Cost-sharing and technical assistance for long-term habitat restoration projects on private land;
- Pacific Islands Coastal Program – A new effort to identify important coastal resource problems and solutions, develop partnerships to carry out on-the-ground conservation projects, and encourage community action in high priority coastal areas;
- Private Stewardship Grants – A focused effort to address high-priority habitat restoration needs of species that are endangered, threatened, candidates or species of concern on private lands; and
- Other Funding - The Conservation Partnerships Program has been able to obtain funding from various other USFWS programs for a number of partnership programs.

This program has taken a unique and highly effective approach of combining resources in order to focus on collaborative efforts that conserve or restore large portions of ecosystems while still addressing species-specific conservation. The program completed over $6 million in restoration and conservation projects in the last two years alone, including The North Kona Dryland Forest Restoration Group, The Olaʻa-Kīlauea Partnership, Imi pono no ka ʻāina: A Partnership for Environmental Education, Maui Restoration Group (Auwahi) and Puʻuokali Wiliwili Forest Reserve Project, and Leeward Haleakalā Restoration Watershed Restoration Partnership.

SYMPOSIA AND FORUM SYNOPSES

Hawai'i's Marine Managed Areas: What Are We Doing and What Do We Know? Symposium
Athline M. Clark, Special Projects Program Manager, DLNR Division of Aquatic Resources
Wednesday 1.00 – 3.00 pm, Room 310

We often hear that there is not enough data to prove that spatial management of marine resources is working and that this type of management approach is effective. There are numerous issues that have been raised about how communities are left out of the process. When we are interested in establishing new sites for limiting certain types of extractive uses, what are some of the considerations that used to desginate a site? Is enforcement of these sites and other fisheries regulations effective? Do seasonal closures work better than permanent closures? Are you interested in obtaining the answers to these and many other questions? If so, this is the sympoisum to attend. The speakers will use examples from across the state to show data and trends in resource spatial marine resource management.

Insect Conservation Symposium
Karl Magnacca and Patrick O'Grady, University of California, Berkeley
Wednesday 1.00 - 5.00 pm, Room 316A

Hawai'i has nearly 6,000 species of endemic insects and other arthropods, many of which are restricted to narrow niches or dependent on particular hosts. Many of these species are members of a few extremely large radiations of hundreds of species. However, direct application of research and management toward conservation of insects has lagged far behind that of plants and birds in Hawai'i. Increasing knowledge of the systematics and ecology of Hawaiian insects is now allowing for greater understanding of the threats facing them. Techniques such as population genetics, molecular systematics, and long-term ecological monitoring, combined with traditional methods such as biotic surveys and ecological studies, are providing a more complete picture of the conservation needs of Hawaiian insects. The speakers in this symposium represent a wide range of views from management, policy, and applied and basic research perspectives, and we hope to present a broad picture of the what is being accomplished and what needs to be done for insect conservation in Hawai'i.

Ecosystem Services in Hawai'i: Supporting Conservation and Human Well-Being Symposium
Liba Pejchar and Gretchen Daily, Stanford-Hawai'i Working Group
Wednesday 1.00 – 3.00 pm, Room 316BC

This symposium will explore new avenues for conservation in Hawai'i that seek to make conservation commonplace and even profitable. Cost-benefit analyses rarely reflect natural capital, the living and non-living resources of nature upon which humans depend. These resources include the forests, grasslands, and coral reefs from which flow a steady stream of economically valuable "ecosystem services". In Hawai'i, examples of services include clean, abundant drinking water, carbon sequestration/climate mitigation, cultural sites, non-timber forest products, and the aesthetic and recreation values of open space.

Efforts are currently underway in Hawai'i through research projects, stakeholder working groups, and policy discussions to better understand the provision and value of ecosystem services and to incorporate this information into resource management decisions. Our goal with this symposium is to both introduce the concept of ecosystem services and to explore the opportunities and challenges of advancing an ecosystem services framework for conservation in Hawai'i. Each speaker will discuss ecosystem services that are currently undervalued in Hawai'i from both biophysical and economic perspectives. They will draw on successful global examples and local realities to discuss how each ecosystem service could be valued and coupled with conservation in Hawai'i – leading to "win-win-win" benefits for biodiversity, landowners, and communities. The last talk will take the form of a panel, offering the audience a chance to engage in the discussion.

Alternative Energies Symposium

Wiliam Steiner, Univeristy of Hawai‘i at Hilo

Wednesday 1.00 – 3.00 pm, Room 312

Hawai‘i faces a new transition away from imported energy and toward more energy self-reliance in the future. How we get there and what issues we face with respect to conservation of our natural ecosystem should be guiding factors. We have invited five presentations to address the following questions:

1. Summarize the most recent advances and contributions in their field to energy needs in Hawai‘i;
2. Include a summary of the pros and cons of the field’s specific approach (be it solar, wave, geothermal, traditional, wind or biofuel) with respect to global climate warming (GCW), ability to provide a sustainable energy source for the State, impact on Hawai‘i’s physical and biotic environment, how each speaker anticipates their field to interact with other fields, and viewpoint on integration and its need with the other energy fields above; and
3. Address Industry reactions on strengths and weaknesses of the recent Rocky Mountain Institute Energy Report commissioned for the State Legislature and submitted this past winter, especially as it pertains to the field of expertise or research being solicited.

The symposium speakers will present their positions and field questions from the participating audience. The goal is to seek common ground between the different fields that will benefit the State’s need to diversify its energy portfolio while protecting its biodiversity, a major concern of the HCA members.

The Northwestern Hawaiian Islands: Science in Support of Management

Randy Kosaki and Malia Chow, NOAA

Thursday 10.00 am – 12 noon, Room 310

The Northwestern Hawaiian Islands (NWHI) are home to one of the last intact predator-dominated marine ecosystems in the world. Designated as the Papahānaumokuākea Marine National Monument in 2006, the NWHI offer an unprecedented opportunity to move toward an ecosystem-based approach to management and research. Effective management decisions related to both ecosystem use and protection must be based on reliable information on the functional relationships between habitats, organisms, and the physical environment. Speakers will highlight specific areas of research that contribute to these understandings, and questions/discussion will explore their management applications.

Rewilding, Island Style: New Ideas In *Inter Situ* Conservation Symposium

David Burney, NTBG

Thursday 10.00 am – 12 noon, Room 316A

This symposium will examine examples and issues associated with *inter situ* conservation techniques. Although there has been some variation in its usage, the term *inter situ* is often applied to the suite of conservation and restoration techniques that are based on establishing new populations of native species in “the wild” but not on the present *in situ* locations where the species occurs. Usually the goal is to re-establish the species in places that were part of the range in late prehistoric or early historical times. Species reintroductions, rehabilitation of degraded biotic communities with appropriate species enrichment, and re-creation of lost communities using historical benchmarks are familiar examples of *inter situ* conservation. These and similar techniques should not be viewed as a substitute for classic *ex situ* and *in situ* conservation, but rather an important “third front” in the struggle to hedge against the current wave of extinctions. In the island context, this approach may help address some of the limitations of *ex situ* conservation, in which botanical gardens, zoos, and other cultural institutions have been swamped financially and logistically by the magnitude of the challenge where more than half the entire island biota may be at risk for extinction within the next few decades. Likewise, despite the paramount importance of *in situ* protection of the dwindling habitat of endangered island species, the sad truth is that most rare species are in remote locations where constant surveillance and frequent control of invasive species is not currently feasible.

Measuring Conservation Effectiveness Symposium

Shawn Morford, Benchmark Consulting

Thursday 10.00 am – 12 noon, Room 316BC

Measuring and documenting the effects of conservation efforts is an increasingly important part of conservation programs in Hawai‘i and nationally. Conservation practitioners are asked to document the "difference" their programs make by funders and government accountability requirements as well as motivated by a desire to increase their own effectiveness. Following an overview of the growing field of conservation evaluation, this symposium will include presentations by practitioners and academics involved in efforts in Hawai‘i and elsewhere to measure changes that occur as a result of conservation interventions. Topics will include "up and coming" approaches for species at risk evaluation; government requirements for accountability; purposes, types, and challenges of conservation evaluation; as well as practical how-to information on evaluation approaches

Forest Health Symposium

Anne Marie LaRosa, USDA Forest Service and Rob Hauff, DLNR Division of Forestry and Wildlife

Thursday 1.00 – 5.00 pm, Room 316A

In April 2005 two pests that threaten important native Hawaiian forest species first appeared in Hawai‘i. The Erythrina gall wasp (*Quadrastichus erythrinae*) was found infesting several *Erythrina* species including the native wiliwili (*E. sandwicensis*). Guava rust (*Puccinia psidii*) was found on ‘ōhi‘a lehua (*Metrosideros polymorpha*) seedlings in a nursery and has since been detected on 20 different native and non-native host species in the Myrtaceae. The precise pathway of introduction of each pest is unknown, and neither pest was recognized as a threat in the United States before being introduced. Both pests quickly spread throughout the State of Hawai‘i before eradication or quarantine could be attempted. Presenters will discuss the biology and management of both pests in Hawai‘i, including topics such as survey and monitoring, chemical and biological control, and genetics. A discussion on these two pests, as well as the larger issue of protecting Hawai‘i's forests from the ongoing invasion on alien forest pests, will follow.

Effective Ecological Monitoring Symposium

James Jacobi, USGS BRD

Friday 8.00 am – 12 noon, Room 310

Conservation of Hawai‘i's unique natural resources requires the design and implementation of effective research and management programs to reduce or eliminate the impacts of human-related factors that can lead to the decline or extinction on native species and communities. Equally important is the development of effective means of assessing the status of focal species and ecosystems, as well as their response to management actions. In this symposium we start off with an overview of the basic elements of an effective ecological monitoring program, followed by a series of presentations highlighting examples of successful programs that are being used to monitor both species and communities across a diversity of habitats. We close with a discussion session that is aimed at identifying ways we can increase our ability to collect and analyze monitoring data to help refine the cost and effectiveness of management.

Investing in Hawai‘i's Environmental Future Workforce and Community Forum

Sharon Ziegler-Chong, University of Hawa‘i at Hilo

Friday 8.00 – 10 am, Room 312

Our future success in conservation and management of our island resources depend on our efforts today to engage, train and mentor the next generation in this field. Many groups are interested in developing programs such as internships, volunteer programs, etc. that connect our youth to the land, issues and possible future careers. This session brings together five groups that have focused effort and resources on linking conservation with the community and its youth. Their presentations will provide an opportunity for audience members to learn about their programs and what lessons have been learned, and an open

discussion with the audience and panel will focus on strategies for working together to continue to maintain and build these important efforts.

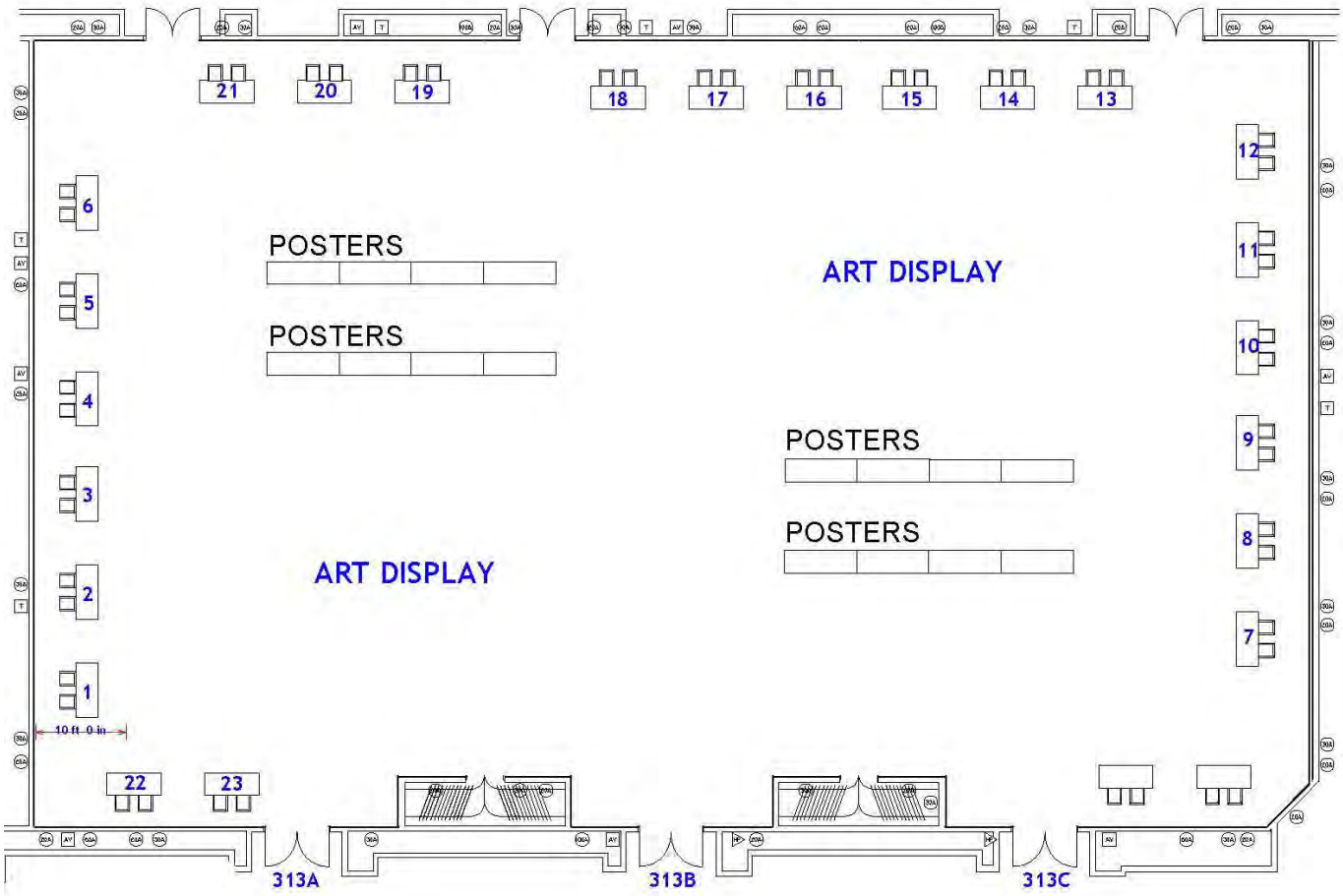
Invasive Species Economic Perspectives Symposium

Chris Buddenhagen, Hawai‘i Invasive Species Council Coordinator

Friday 8.00 am – 11 noon, Room 311

An economic perspective on invasive species management provides a straightforward means to connect science and management - in line with this year's theme. The impacts of invasive species on natural resources can be difficult to measure, especially in monetary terms though the agreement is that environmental cost to Hawai‘i because of invasive species has been high. Meanwhile managers are acutely aware of costs and funds are limited in comparison with the problems caused by invasive species. This symposium is an opportunity to talk about the economics of invasive species in terms of impacts and management, be that prevention, eradication, control, biocontrol or research and technology initiatives. Applied correctly economic analyses can help us to make good decisions with respect to invasive species management.

MAP OF O'AHU ROOM 313 ABC: POSTERS, ART AND EXHIBITORS



Ala Halawai Concourse

POSTER PRESENTERS, TITLES AND LOCATION NUMBER

1. **Lyman Abbott** *et al*. - A Three Year DOH Watershed Restoration Project on Kahoʻolawe.
2. **Amjad Ahmad** (*Student*) *et al*. - Soil Water Movement and Nutrient Dynamics under Different Land Cover Filters.
3. **Cathleen Bailey** *et al*. - Habitat Use by Maui Parrotbill in Haleakalā National Park: Implications for Reintroduction.
4. **Meris Bantilan-Smith** (*Student*) *et al*. - A Quantitative Investigation and Inventory of the Soils and Vegetation of Coastal Lowland Hawaiian Wetlands.
5. **Chazaray Baruela** (*Student*), Graham Schell (*Student*) - Comparison of Streams: Maili and Ainako.
6. **Allison Baum** *et al*. - Applying Biodiversity and Ecosystem Informatics to Enable Local Level Biodiversity and Sustainable Resource Management in the Pacific Region.
7. **Stephanie Bennett**, Scott Bloom - Partnerships Across the Pacific: Managing Fisheries for the Future.
8. **Joanne Birch** (*Student*) *et al*. - Lineage Diversification in the Hawaiian Flowering Plant Genus *Astelia* (Asteliaceae).
9. **Jeff Burgett** *et al*. - From Mice to Mouflon: Development and Test of a Complete Mammalian Pest Barrier for Hawaiʻi.
10. **Norma Bustos** *et al*. - Permits: What Every Researcher Should Know.
11. **Norma Bustos** - Hawaiʻi's Feral Cat Colonies: Examining the Effects of Feral and Free-ranging Cats on Hawaiʻi's Native Species.
12. **Frances Calvert**, M. Tracy Johnson - Quarantine Evaluation of Biocontrol Agents for *Miconia calvescens*: A Psyllid, *Diclidophlebia lucens*, and Stem Weevil, *Cryptorhynchus melastomae*.
13. **Colleen Cole** *et al*. - How do Hawaiian Native Forests Function over the Long-term?: The Hawaiʻi Permanent Plot Network (HIPPNET) for Monitoring, Research and Education.
14. **Colleen Cole** *et al*. - The Hawaiʻi Experimental Tropical Forest: New Opportunities for Research, Education, and Demonstration in the Pacific.
15. **Kris Coontz** (*Student*), Allison Sherwood - Algal Biodiversity and Distribution Before and After the Return of Previously Diverted Water to a Hawaiian Stream.
16. **Henrietta Croom** *et al*. - Patterns of Speciation Among Endemic Hawaiian Nemobiinae Crickets: A Molecular Approach for Conservation.
17. **Viet Doan** *et al*. - Landscape Change Monitoring in the Tropical Pacific.
18. **Chris Farmer** *et al*. - Invasion of Mauna Kea by Non-Native Weeds: Old Enemies and a New Threat.
19. **Chris Farmer** *et al*. - Demography of a Reintroduced Colony of Palila.
20. **Erin Foley** - The Role of Herbaria in Proficient Land Management: Developing a Small-Scale Herbarium at Pōhakuloa Training Area.
21. **Jean Franklin** *et al*. - Using Spatial Data to Inform Strategies for Invasive Species Control.
22. **Toni Makani Gregg** (*Student*) *et al*. - Coral Health in Protected and Unproteced Areas in the Waiʻōpae MLCD Tide Pools.
23. **Glenn Higashi** *et al*. - Atlas of Hawaiian Watersheds and Their Aquatic Resources.
24. **Nick Holmes**, Ken Wood. - Conservation Status of the Hawaiian Petrel *Pteradroma sandwichensis* on Kauaʻi, Hawaiʻi.
25. **Jefferson Jacobs** - Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) Survey and Monitoring at Pōhakuloa Training Area, Big Island of Hawaiʻi.

26. **Shelley James** *et al*. - Genetic Variation in the Endemic Hawaiian *Gardenia brighamii*: Conservation and Horticultural Implications.
27. **Stephanie Joe** - Safety and Efficacy of Molluscicide Deployment in Natural Areas to Control Invasive Slugs.
28. **M. Tracy Johnson** *et al*. - Biological Control of *Miconia calvescens*: Attacking Reproduction.
29. **Raina Kaholoa'a**, Paul Krushelnycky - Entomology and Management at Haleakalā National Park.
30. **Colby Kearns** *et al*. - PRISM: Partnerships for Reform through Investigative Science and Math.
31. **Matthew Keir** - Managing Mēhamehame: How Science is Saving Giants.
32. **Cheryl King** - By Air, by Land and by Sea: Assessing Kaho'olawe's Sea Turtle Population.
33. **Frances Kinslow** (*Student*) *et al*. - Fungal Colonization of Leaf Litter from Native and Invasive Riparian Trees in Forested and Developed River Reaches on the Island of Hawai'i.
34. **Sarah Knox** - Assessing 'Io and Nēnē Presence at Pōhakuloa Training Area.
35. **Bruce Koebele** *et al*. - Ten Years of Volunteer Conservation at Kalaeloa.
36. **Alex Lau** *et al*. - Implementing an Early Detection Program on O'ahu Island: Prioritizing for Weed Control.
37. **Johannes Le Roux** (*Student*), Ania Wieczorek - Global Monoclonality of Highly Invasive Fountain Grass Defies the Odds of Nature.
38. **David Leonard**, Jay Nelson - Using Models to Assist in Conservation Decision Making–An Example Using Hawaiian Passerines.
39. **Richard MacKenzie** *et al*. - Fish Community Structure in Hawaiian Coastal Wetlands.
40. **Ann Marshall** *et al*. - Hawai'i Island Nēnē (*Branta sandvicensis*) Restoration Planning.
41. **Danielle McKay** *et al*. - Utilization of Inventory and Monitoring Program Data in Evaluating Environmental Impacts for National Parks.
42. **Wallace Meyer** (*Student*), Robert Cowie - Recognition of Succineid Land Snail Diversity in Hawai'i: The Beginnings of a New Conservation Challenge.
43. **Michelle Montgomery** *et al*. - Use of Springtails as Indicators of Feral Pig Disturbance in Hawaiian Montane Forests.
44. **Nikhil Narahari** *et al*. - The Importance of Collaborative Research in Developing Effective Management Strategies for a Subalpine Tropical Dryland Ecosystem at Pōhakuloa Training Area, Hawai'i.
45. **Corbett Nash** - Sharing Mana'o in Pacific Island Network: Arrows of Information in the Sea of Natural Resources.
46. **Michelle Norman** (*Student*), Rebecca Ostertag - Effects of a Multiple Species Invasion on Decomposition and Decomposer Communities.
47. **Linda Pratt** *et al*. - Limiting Factors of *Portulaca sclerocarpa* A.Gray in Hawai'i Volcanoes National Park.
48. **Erin Raboin**, David Foote - The Status of Yellowjacket Wasps in Mixed Koa Forests of Hawai'i.
49. **Sharon Reilly**, Joanne Woltmon - Recent Advances in the Rehabilitiation, Sexing and Identification of Kaua'i's Seabirds.
50. **Matt Rosener** - Erosion Control on a Forest Trail Using Bioengineering Methods in Hanalei, Kaua'i.
51. **Kayla Saenz** (*Student*) - Decomposition of Leaf Litter: Ainako Stream, Wailuku Tributary.
52. **Heather Sahli** *et al*. - Characterizing Plant-Pollinator Interaction Webs in the Hawaiian Islands.
53. **Pamela Scheffler**, Orlo Steele - Designing College Education to Address Both Science and Management.
54. **Jerrod Schreck** *et al*. - Feral Ungulate Control and Monitoring in Hawai'i Using Contract Specialists.

55. **Lisa Shizuma** (*Student*) *et al*. - Impacts of *Falcataria moluccana* on the Water Quality of Hawaiian Streams.
56. **Steven Souder** (*Student*), M. Tracy Johnson - Host Specificity of *Syphraea uberabensis* for Biocontrol of *Tibouchina herbacea*.
57. **Evann Souza** (*Student*), Peter Follett - Field Control of the Invasive Little Fire Ant, *Wasmannia auropunctata* (Roger) (Hymenoptera: Formicidae) in Tropical Fruit Orchards.
58. **Fred Stone** *et al*. - Conservation of Hawaiian Nemobiinae Crickets.
59. **Tiana Sudduth** - Māla Hōʻikeʻike O Pōhakuloa (The Pōhakuloa Interpretive Garden): Exhibiting Hawaiʻi's Unique Natural and Cultural Resources
60. **Lori Tango** *et al*. - Size-Specific Predation Rates of fhe Beautiful Hawaiian Damselfly on the Southern House Mosquito under Three Different Temperatures.
61. **Jarrod Thaxton** *et al*. - Fuel Loading and Potential Fire Behavior in Sub-alpine Forests on Mauna Kea.
62. **Christopher Todd** *et al*. - Assessing Bat Detectibility and Occupancy with Multiple Automated Echolocation Detectors.
63. **Kimberly Uyehara** *et al*. - Conservation of Hawaiian Duck: Research and Management Needs.
64. **Erica vonAllmen** *et al*. - Spontaneous, Unassisted Reproduction of Native Dryland Species Following Restoration, Auwahi Forest, Maui, Hawaiʻi.
65. **Mashuri Waite** - Trying to Put the ʻŌhiʻa Back into Puʻu ʻŌhiʻa.
66. **Kemble White**, Steven Carothers - Field Methods for the Identification and Characterization of Potential Habitat for Rare and Endangered Hawaiian Cave Fauna.
67. **Kristin White** - Comparison of the Results of a Ground Penetrating Radar and Very Low Frequency Study Used to Detect Cold Lava Tubes (potential habitat for cave-adapted species), Hualālai Volcano, North Kona, Hawaiʻi.
68. **Corie Yanger** *et al*. - Fire Effects in Coastal Grasslands of Kealakomo Waena, Hawaiʻi Volcanoes National Park.

2007 Hawaiʻi Conservation Alliance Science Fair Award Recipients

At the Annual State Science and Engineering Fair held in April 2007 the HCA provided $1000 in awards to two Senior and two Junior Research Projects. The two Senior awardees are invited to attend the HCC with their winning posters:

Jacob Garner (*Student*) - Species Distribution Relative to Soil Characterization in Kalaeloa.

Riles Martinez (*Student*), **Guy Miller** (*Student*) - Comparison of Hydrated Lime and Citric Acid and Return to Soil Neutrality.

EXHIBITORS

Registered Exhibitors as of July 6, 2007

ʻAhahui Mālama I Ka Lokahi

Buddhawelt

Conservation Council for Hawaiʻi

Environment Hawaiʻi

ESRI

Hawaiʻi Audubon Society

Hawaiian Electric Company, Inc. (HECO)

Hawaiʻi Watchable Wildlife Guides

Mālama Hawaiʻi

National Tropical Botanical Garden

NOAA Fisheries, Pacific Islands Region

NOAA Pacific Services Center

NOAA Papahānaumokuākea Marine National Monument

Pacific GPS

reThink Solar

The Trust for Public Land

The Wildlife Society Hawaiʻi Chapter

CONSERVATION THROUGH ART EXHIBITION

One of the most effective ways of helping people of all ages to connect to conservation is through art[1]. The Hawai‘i Conservation Conference is proud to present “*Conservation through Art*” a multi-artist exhibition focused on the theme of conservation in the Hawaiian Islands. Our hope in this exhibit is to provide conference participants – a select audience of conservation practitioners – the opportunity to share the artists’ awareness of, appreciation for, and views on Hawai‘i’s natural environment.

Exhibit artists were selected based upon their ability to use two-dimensional art as a medium of expression around the theme of environmental conservation in Hawai‘i. Several exhibitors are professional wildlife biologists, scientists, and conservationists.

We are very pleased to be able to showcase the work of these outstanding artists. The variety and quality of the pieces are remarkable. Please visit the exhibition and enjoy the unique art of these conservation-minded individuals. It is our hope that their art will inspire you as you continue your conservation work and help to stimulate new dialogues and action.

- HCC 2007 *Conservation through Art* Exhibition Subcommittee

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Please join the artists on the evening of Wednesday, July 25, 2007, 6:00-8.30 p.m. for the opening reception. The art exhibition is located in Room 313ABC of the Convention Center and will be on display from Wednesday through noon Friday. Artists’ biographies and contact information can be found in the binders located at the art exhibition.

Artists’ Statements

Louise Barr Honolulu, O‘ahu
c/o laura@honoluluprintmakers.com

Hā hā. Lithograph – multicolored, on paper / 16” x 17”

This multicolored lithograph was printed by the artist for the portfolio “Terra Botanica: 18 Perspectives.” The Terra Botanica Perspective show is a HonoluluPrintmakers - Dutch - Canadian art exchange and features an exchange portfolio of prints among three countries: Hawai‘i (USA), the Netherlands and Canada. Eighteen artists (printmakers) participated with each making a print based on the title. The focus of all the prints is the flora of the respective countries of the artists.

“*Hāhā* [*Cyanea* spp.] hides in the Hawaiian rainforest and is endemic to these islands. This flower ranges from purple to almost black and, unfortunately, most people will never see this native plant.” – *Louise Barr*

Jan Becket Honolulu, O‘ahu
janbeck@earthlink.net

Punawai, kalo, Mākua. Black & white photograph / 16” x 20”
Ki‘i pōhaku at Kumuaku‘opio Heiau, Mākua. Black & white photograph / 16” x 20”
Mākua, Ko‘iahi. Black & white photograph / 16” x 20”
Ka‘ena. Black & white photograph / 16” x 20”

“Those of us who call Hawai‘i home but who are not Hawaiian must eventually come to terms with the ambiguities and tensions inherent in our relationship with this place and with the prior culture that arose here over two millennia. I was born here. My images are of the land of my birth but also of the stone structures on this same land, built by Hawaiians centuries before my grandfather emigrated from Holland in 1908.

[1] Jacobson, S.K, M.D. Mcduff, and M.C. Monroe. 2007. Promoting conservation through the arts: outreach for hearts and minds. *Conservation Biology*, 21(1):7-10.

Most of my images pose questions rather than make statements. The questions have to do with the nature of the non-Hawaiian stewardship of this place and of the non-Hawaiian relationship with the culture of its indigenous people. I am interested in the historical and cultural footprint left by the West on Hawai‘i, which for me is often best explored through the metaphor of Hawaiian ceremonial places, especially those places that are damaged or have fallen into disuse. When I photograph them, the camera is pointing in two directions, not one. Of course, other images are simple records of my seduction by light falling on stone and foliage, perhaps similar to the seduction experienced by the very first voyagers to haul canoes up onto a hospitable beach so many centuries ago." – *Jan Becket*

Melissa Chimera Makawao, Maui
melissachimera@gmail.com

Mind of a Conservationist. Oil on canvas /23.5" x 49.5" (framed)
‘Āhinahina o Haleakalā No. 2. Gicleé (print from original) / 25" x 39.5" (limited edition)
Ma‘o Hau Hele. Gicleé (print from original) / 17.5" x 19.5" (limited edition)

Melissa's inspiration is rare plants that she and her husband, a botanist, encounter in remote places. "Those who love Hawai‘i mistakenly identify it with the Costa Rican plumeria flower. Most people don't know what flowers I'm painting – or that they were the first kama‘āina (islanders) before the Hawaiians got here. And it's almost an unknown fact that these islands are the world's epicenter for plant and animal extinction."

Being from a Lebanese family that fled civil war brings a unique insight into life and death. "The suffering of my grandfather's people continues in many parts of the mid-east right now." In her work, Melissa explores the similar fate of Arabian people, Hawaiians, and their flora, all of which are at once endangered yet resilient in the face of change.

"The real Hawai‘i – a place of forgotten flowers and people, of devastation and recovery – is truly veiled." – *Melissa Chimera*

Patrick Ching Waimānalo, O‘ahu
www.patrickching.com

Cloud Forest. Gicleé print of oil painting
Seaflight. Gicleé print of oil painting
Lord of the Evening Sky. Giclee

"I was sixteen when I decided I was going to make a living as an artist 'or die trying.' I paint the places and things that I love with the colors that have surrounded my life. My objective is to bring the beauty that I've experienced into people's homes and lives so that they may appreciate the things that are Naturally Hawaiian." – *Patrick Ching*

Craig Clouet Honolulu, O‘ahu
1416 Koko Head Ave, Honolulu, HI 96816

Kāne‘ohe Topographical Features Map. Laser print on paper, 24" x 36".

"The abstraction of reality should not be difficult for a geographer. Thinking about composition, color, and the message of a map is the art of cartography. Sometimes the science of the data collection or software routines can become important, but in the end, it is the communication of ideas and the response of the viewer that transcend the work itself." – *Craig Clouet*

Francisca Carolina do Val São Paulo, Brasil
fracdval@usp.br

Echings + watercolor prints:
Pritchardia sp. Acqua-fort, acqua-tint print, 14cm x 20cm
Pā‘u-o-Hi‘iaka Jacquemontia. Acqua-fort, acqua-tint w/ watercolor, 6.8cm x 9.4cm
Ma‘o. Acqua-fort, acqua-tint w/ watercolor / 7cm x 10cm

Ka‘ena Point. Acqua-fort, acqua-tint/watercolor, 14cm x 20cm
Hibiscus koki‘o. Acqua-fort, acqua-tint/watercolor, 7cm x 10cm
Dianella sandwicensis. Acqua-fort, acqua-tint w/ watercolor / 7cm x 10cm
Naupaka. Acqua-fort, acqua-tint w/ watercolor / 7cm x 10cm
Hibiscus kokio saintjohnianus. Acqua-fort, acqua-tint w/ watercolor, 7cm x 10cm
Sesbania tomentosa. Acqua-fort, acqua-tint w/ watercolor, 7cm x 10cm
Wickstroemia uva-ursi ‘Ākia, Acqua-fort, acqua-tint/watercolor, 10cm x 12cm
Abutilon menziesii. Acqua-fort, acqua-tint/watercolor, 6.7cm x 9.3cm
Pittosporum sp. Acqua-fort, acqua-tint w/ watercolor, 9cm x 6.5cm
Brighamia sp. Acqua-fort, acqua-tint w/ watercolor / 10cm x 10cm
Growing Natives. Dry-point w/ watercolor / 19cm x 20cm
Mokulei‘a’s Crab. Acqua-fort, acqua-tint w/ watercolor / 9.7cm x 13.5cm
Kanaloa. Acqua-fort, acqua-tint w/ watercolor, 25cm x 28cm

“My interest in learning about Hawai‘i’s native flora and fauna began during my first years in Hawai‘i (1973-1975), while I was working on the famous picture-winged *Drosophila* flies under Dr. Hampton L. Carson. I’ve been out on many field trips and have had several chances to sketch plants in the forest. However, it was only in 1999, when I bought a vase of *ma‘o* and a vase of *pili* grass from Dennis Kim at a sale at the Center for Hawaiian Studies, that I started to take a closer look at some native species. Years later, I again met Dennis at a conference, and he invited me to sketch in his pioneer nursery of native plants. Most prints in this exhibit result from my observations at his nursery.

People cannot talk about things that have no names. I’ve learned that people don’t think about things that they don’t talk about. Therefore, people cannot care about plants, animals and ecosystems that they don’t recognize. To me, it’s common sense that it’s necessary ‘to know in order to conserve’ and also that ‘an image is worth a thousand words.’

I’m very thankful to Dennis Kim and I believe I’ve joined his cause of an ‘unconventional way to conservation’ by spreading the word (and the images) through my art work. I also acknowledge my friend Bill Steiner for the poem *Kanaloa*, on the restoration of Kaho‘olawe, that inspired the last print I prepared for this show.”– *Francisca do Val*

Jodi Endicott Kailua, O‘ahu
endicottj001@hawaii.rr.com

Boar. Oil/acrylic (mixed media) / 3’ x 6’

“The boar…the wild boar… tearing up the native plants…eroding the hillsides…a disrespectful and destructive visitor who never left…

This mixed media painting is a containment of the power of the boar… even though the physical body only fills part of the canvas, its breath invades the untouched space. In a similar way, these invasive beasts have a hold on our environment. They may not always be seen, but we know they’ve been there.” *– Jodi Endicott*

Michael Furuya Honolulu, O‘ahu
www.michaelfuruya.com/index.htm

‘Akialoa. Painting
‘Ō‘ū. Oil Painting.
Nēnē. Scratchboard

“My goal in these paintings is to show people the natural treasures that we have here in Hawai‘i. Most people will never have the opportunity to venture into the native Hawaiian forest to experience these special places. Many of our native species have already become extinct.

I enjoy creating paintings that stir emotions and tell a story. Being in the wild brings me peace, tranquility, and a rejuvenated spirit. These paintings are my way of bringing the wonder of the natural world into people's everyday lives." – *Michael Furuya*

Gail Gauldie Auckland, NZ
c/o laura@honoluluprintmakers.com

Bracken. Linocut print, mixed media on printer/ 14" x 14"

Bracken was printed by the artist for the portfolio "Terra Botanica: 18 Perspectives." The Terra Botanica Perspective show is a HonoluluPrintmakers - Dutch - Canadian art exchange and features an exchange portfolio of prints among three countries: Hawai'i (USA), the Netherlands and Canada. Eighteen artists (printmakers) participated with each making a print based on the title. The focus of all the prints is the flora of the respective countries of the artists.

"Bracken is often called the 'mother of the forest.' It provides cover and protection for young plants and small animals. After a forest fire, bracken is amongst the first re-growth to 'mend' the destroyed land. Bracken is poisonous to eat and is also a pest in domestic farming situations. The white cross symbolizes 'mother' and the red cross is a dual international symbol of nurture and aid and also of poison and danger." – *Gail Gauldie*

David K. Hayes Kailua, O'ahu
glassdeco@hawaiiantel.net

Pūlama i nā waiwai 'ōiwi o ka ma'ukele (Cherish the Treasures of the Forest). Acrylic / 18" x 36"
Pelekunu. Acrylic / 18" x 24"
'Alae 'Ula- Hawaiian Moore Hen (Gallinula chloropus sandvicensis). Acrylic / 12" x 16"
'Alae Ke'oke'o - Hawaiian Coot (Fulica alai). Acrylic / 12" x 16"
Koloa Maoli / Hawaiian Duck (Anas wyvilliana). Acrylic /12" x 16"
Ae'o-Hawaiian Black-necked Stilt (Himantopus mexicanus knudseni). Acrylic /12" x 16"

"I try to capture within an image an accurate portrayal of a particular species interaction within its established environment. Both introduced as well as indigenous flora and fauna are noted in an effort to make a more honest assessment of a particular ecosystem's state of existence. Although Hawai'i supports a vast variety of plants and animals within its limited area, the introduction of exotic species has made an unforeseen impact on the endemic populations, which has significantly altered the ecology of these islands over the last 16 centuries.

One must cast aside the intuitive sense of primordial romanticism, because for better or worse, these introduced species will have a continuing influence over the evolution of these islands' unique ecosystems for the rest of their biological history. Their existence cannot be ignored. This is why my principal study is wildlife art. I wish to celebrate the beauty of this heritage.

Unfortunately, many are largely unaware of Hawai'i's ecological uniqueness and diversity. When I conceive an image, I try to incorporate this uniqueness in an effort to educate residents and visitors alike about the beauty of Hawai'i's ecosystems. I try to capture these islands' rugged beautify in the incredible landscapes this State is noted for. Weather extremes are noted, as well as the interaction of the established life forms. Finally, after the stage is set, I present my primary subject interacting within its surroundings. The result is an intricate depiction drawn from my memory and imagination which I couple with studies of reference sources for anatomical accuracy." – *David Hayes*

Vincent A. Hazen Honolulu, O'ahu
www.vincehazen.com

Day and *Night*. Diptych. Screen print on paper / 11" x 15" each
Sugar Coated Biohazard. Silkscreen on paper with sugar / 36" x 27"

"*Day* and *Night* are screen prints about a failed plot to control nocturnal rats with a diurnal mongoose. Many Hawaiian birds (and other plats and animals) continue to disappear as a result of introduced species and loss of habitat. Extinction is forever.

Sugar Coated Biohazard is a screen print flocked with white sugar. I was inspired by stories of urban wildlife, King Rats, and an interest in combining the spectacle of sparkle with the repulsiveness of pestilence." – *Vincent A. Hazen*

Matthew Holton Kula, Maui
holtongallery@yahoo.com

Haleakalā Reflection. Acrylic on Canvas, 30" x 24"
Twin Falls. Acrylic on Canvas, 24" x 30"
Taken By Nature. Acrylic on Canvas, 18" x 24"

Raised and schooled in Maui, Matt's eyes were fed with the beautiful surroundings we all enjoy. Matt's earliest formal art influences were art classes through the *Hui Noeau* while still in grade school. Matt is an active young man dividing his time between creating new art, hiking, reading, and constantly finding new ways to express himself. He has the soul of an artist, which is solitary in nature. He now spends thirty or more hours a week on his painting development.

Matt is largely a self-taught acrylics painter. While being surrounded by the amazing flora and fauna his senses are continuously awakened. Having completed a series of flowers, he has moved on to portraits. Light is one of the themes found throughout Matt's work. The light that reflects off of his canvases is a unique style that Matt can call his own.

Kathleen Kam Kea'au, Hawai'i
k1111kam@earthlink.net

Hawai`i's International Biosphere. Acrylics and Oils / 24" x 36"
'Ō'ū with 'Ie 'ie Bloom. Watercolor / 18" x 24"
'Amakihi's Song. Watercolor / 18" x 24"
'I'iwi with Lehua. Watercolor / 18" x 24"

"The Hawai'i Volcanoes National Park, an incredible natural land mass, is home to one of the world's most biologically diverse ecosystems and many of the world's endangered species. It is a unique Ahupua'a and Wao o Akua of our Hawaiian heritage, and an area to be treasured. From the icy cold summit of Mauna Loa, and throughout the sub-alpine, mixed mesic and rain forests, rare flowers, insects, and native birds struggle to survive and thrive.

Incredibly unique flora and fauna, from the dry forests on the slopes of Mauna Loa, and along the lava fields of Ka'u, have revealed themselves to adaptations in harsh conditions and are likewise considered endangered. This naturally rich and rare area in our Volcanoes National Park is now recognized as one of the International Biospheres!

My intent is not only to illustrate this particular area of the Big Island, it is also to address our awareness of species protection. Our stewardship and knowledge of what it is to have a sense of place needs to rise above the plagues of a modern world. It is mind, heart, and spirit in positive action that will keep us in continuing to mālama 'āina. With knowledge, we go forward, "Ho'omau – continue on, perpetuate and persevere. It is our responsibility, it is e mālama i na kuleana." – *Kathleen Kam*

Jim Maragos Kāne'ohe, O'ahu
jim_maragos@fws.gov

Rare Corals and a Sea Urchin in the Northwestern Hawaiian Islands
Unidentified relict coral. Photograph / 32" x 20"
Laysan coral & red fish (Pocillopora laysanensis *and* Cirrhites arcatus). Photograph/ 12" x 9"

Mushroom coral (Fungia scutaria). Photograph / 14" x 10"
Radiant urchin (Astropyga radiata). Photograph / 14" x 9.14"
Small mushroom coral (Diaseris distorta). Photograph / 14" x 11"
Peach-colored rose coral (Leptoseris *cf.* scabra). Photograph / 12" x 12"
Unidentified rice coral (Montipora *cf.* turgescens). Photograph 14" x 11"
Maldive coral (Pavona maldivensis). Photograph / 14" x 10.5"
Unidentified finger coral (Porites sp. 12 c, annae). Photograph / 14" x 10.5"
Moose-horn coral & one-spot damselfish (Pocillopora eydouxi *and* Dascyllus albisella). Photograph / 33" x 22"

"I realized early that words alone could not adequately convey the beauty and grandeur of coral reefs, and purchased my first camera, a new *Nikonos* model in 1968. However, I was frustrated by its limitations, the difficulty of underwater photography, constant malfunctions, and the many lost "photo-ops". My most vivid visual underwater memory was about a photo I never took, at a depth of 100 ft on the flight deck of the sunken aircraft carrier *USS Satatoga* in the lagoon of Bikini Atoll. Before the dive I asked the rest of the team to pose as airplanes with their arms outstretched and to land in formation on the flight deck. When I reached the bottom, I realized my camera had flooded, and only then did I look up to see four beautiful eagle rays in a perfect diamond-shaped formation swim past me, seemingly mocking me. Now I laugh every time I think about it. In 1994 I graduated to using three *Nikon RS* cameras, an SLR model designed for underwater use, but costing considerably more than the car I was driving. These took many beautiful photos but still not without some malfunctions and missed opportunities.

Now I really appreciate the advent of digital cameras and ability of computer software to correct and crop images. I relish the opportunity to confirm when a photo is taken successfully and the capacity to take hundreds of photos during a single dive. I still use the same inexpensive model I first acquired in 2003, the Olympus 5050 zoom. I prefer it because the optics are incredibly sharp, and the lens is still the fastest on the market (f = 1.8), important in the dim light of underwater seascapes. It is also very small with a wrist strap that allows me to accomplish underwater counts and measurements of corals without added inconvenience. All the photos in the exhibit except that of the sea urchin *Astropyga radiata* were taken with the *Olympus.*

Photographs, films, and videos are powerful tools for conservation. Some of my photos of the famous "Coral Gardens" at Palmyra contributed to its eventual designation as a National Wildlife Refuge and were also used as a poster to promote support for National Wildlife Refuges. The 2002 illustrated booklet that I co-edited with David Gulko on the NWHI captured the interest of Jean-Michel Cousteau who asked me to serve as his underwater guide during the filming of *Voyage to Kure* in 2003. This film released in 2005 together with the David Liittschwager and Susan Middleton 2005 photographic essay *Archipelago: Portraits of Life on the World's Most Remote Islands* were the primary reasons for the decision by President George Bush to afford lasting protection for the NWHI in June 2006." - *Jim Maragos*

Liz Nakoa Honolulu, Oʻahu
c/o laura@honoluluprintmakers.com

Kaunaʻoa. Reductive woodcut / Paper size is 22" x 22"

This woodcut was printed by the artist for the portfolio "Terra Botanica: 18 Perspectives." The Terra Botanica Perspective show is a HonoluluPrintmakers - Dutch - Canadian art exchange and features an exchange portfolio of prints among three countries: Hawaiʻi (USA), the Netherlands and Canada. Eighteen artists (printmakers) participated with each making a print based on the title. The focus of all the prints is the flora of the respective countries of the artists.

Richard Palmer Honolulu, Oʻahu
rick@hawaii.edu

Lichen on Acacia koa. Photography, Digital composite / 25" x 30"
Acacia koa *trunk.* Photography, digital composite / 15" x 48"

Hedyotis parvula. 4-color photo-etching / 8” x 8”

“My approach to my artwork is a direct outgrowth of my education as a Botanist and my profession as an environmental scientist. I strive to capture the educational potential of a subject as well as its intrinsic beauty. While using photography extensively in my environmental work and teaching, I also incorporate the process of photo-etching in new compositions. In this way, I have been able to combine the use of photography, digital editing, and traditional printmaking in the creation of a final image. Also, I continue to concentrate on photographing subjects related to the unique natural and cultural history of Hawai‘i nei. The main impetus behind these images is the desire to convey the message: ‘Ho‘okahi nō ka ‘aina a me nā kānaka’ (The land and the people are one). Without nature, we lose our humanity.” – *Rick Palmer*

Marcia Pasqua Honolulu, O‘ahu
mpasqua@aloha.com

Pua ‘Uala O Hina (Hina's Sweet Potato Flower). Monoprint / 22” x 22” (Edition of 30)

The flower image is the blossom of the Hawaiian sweet potato. This monoprint, Pua ‘Uala O Hina (Hina’s sweet potato flower) makes reference the myth of the Hawaiian Goddess Hina who escaped her abusive husband by transporting to the moon. On the moon she found the sweet potato and brought it back to her people. The sweet potato became a staple food of the ancient Hawaiians.

“My creative process involves a great deal of time and observation. I often make numerous studies of my subject during which time I begin to see the results in abstract terms. I find myself enamored by certain elements and begin to concentrate on these and de-emphasize others. Sometimes I might be drawn to shapes and how they fit together. Other times, my emphasis might be on the quality of color. The resulting art is a culmination of this visual evolutionary process.” – *Marcia Pasqua*

Anna Peach Honoka‘a, Hawai‘i
studio@annapeach.com

"Fertility Suits" Photograph of 3-D fabrications using invasive plant material / 30” x 40”

Anna Peach is a studio artist who develops ideas based on the experiences of a community. She then collects materials that contain memories of these histories. Collecting is part of the physicality of the work, from diving to retrieve thousands of golf balls from the ocean, to hand picking the seeds of invasive plants – these symbolic solutions illuminate humankind’s increasingly complex relationship to the environment and technology.

Using human curiosity to bring attention to environmental topics, Peach established a storefront studio in Hawai‘i that allowed the public to interact with her sculptures over the course of five years. Part performance, part science lab visitors were lured in by window displays that used elements of taxidermy to create newly “cloned” or “discovered” species kept in water filled aquariums. Golf balls recovered from a dying reef “grew” urchin spines, and “mongoose fur” (from a reclaimed mink collar) became the foot of invasive African land snails.

Peach also explored the introduction of plant species to the Hawaiian Islands. She created a couture line of “fertility suits” that linked the introduction of invasive plant species to the humans that brought them to this remote island chain. These sculptural garments become the physical evidence of one woman’s effort to undo the environmental destruction that came from introduced species. This symbolic, though inadequate attempt to right past wrongs lends a spirit like quality to the work. Suspended in space like ghosts from the past, the invasive plants are temporarily kept from dominating the fragile native environments.

Laura Smith Honolulu, O‘ahu
laura@honoluluprintmakers.com

Ties that Bind. Reduction woodcut / 22” x 22”

"My work is the combination of visually expressive subject matter and the process of printing itself. My objective is to make a print that both tells a story and makes use of the repetition, graphic pattern, flat, layered colors inherent in printmaking.

In this particular print, *Ties that Bind*, I used cherry plywood cut into various shapes for the printing plates. It is a color reduction relief print meaning that I reduced or cut away the plate as I printed it. In the end there was hardly any wood left for the last printed color.

In *Ties that Bind* the cut out dress shape refers to the missionary ladies who came to Hawai'i in the 19th century. Although from New England, they came to be bound to the islands through culture and nature. The twisting 'ie'ie vines represent the elements that bound them to Hawai'i." – *Laura Smith*

Dan Van Zyle Honolulu, O'ahu
2063 Roundtop Dr., Honolulu HI 96822

Kōloa…Once upon a time. Hawai'i Duck Stamp Print / 6½" x 9"
Hawaiian Heritage. Nēnē. Handcolored etching / 5½" x 8¾"
Canefield cover. Hawaiian owl. Handcolored stone lithograph / 10" x 14¼"

"All my life I've had a great interest in making art, in things nature, and in conserving and maintaining for the future... *mālama*.

I've combined all three and it satisfies all the interests at once. The end result is what you see here.

My works have been called documentary and that may be true. But I have only two goals with each work... Be accurate, that is the look of 'having been there. And to tell a hell of a good story.

If I've accomplished the goals, I'm confident the art will pique someone's interest, therefore creating more awareness, more involvement more conservation. I truly believe this. I've seen it happened many times." - *Daniel Van Zyle*

PRESENTER'S ABSTRACTS
PLENARY SESSIONS, SYMPOSIA, CONCURRENT SESSIONS AND POSTERS

Session VIII
Water Session

Ali Fares, **Farhat Abbas**
University of Hawai'i at Mānoa, Honolulu, HI

Use of Riparian Buffers to Reduce Sediment and Nitrogen Transport in Hawaiian Watersheds. Non-point source (NPS) pollution is the greatest threat to water quality. Sediments and nitrogen are the major NPS pollutants which could pose human and ecosystem health risks. Agricultural practices produce excess sediments and nutrients including nitrogen to runoff into fresh water bodies i.e. streams, lakes, and wetlands. Riparian buffers, areas of permanent vegetation adjacent to fresh water bodies, can reduce the impacts of agricultural pollutants on water quality by filtering polluted overland and subsurface flow from adjacent lands. In numerous studies, the effectiveness of buffers has been shown to be a function of landscape topography, soil properties, hydrological characteristics, and vegetation types. Most studies on riparian buffers have been conducted in relatively large watersheds with gentle slopes in temperate zones. There is a lack of information on the performance of riparian buffers in small mountainous watersheds with steep slops in tropical environments i.e. watersheds in Hawai'i. Variable estimation methods and models have been used to predict the effects of riparian buffers on NPS pollutant reduction. This review presents our current knowledge of pollutant reduction function of riparian buffers. The optimal designs and installation strategies of buffer are discussed. Environmentally effective and economically viable construction techniques of riparian buffers are needed for improving water quality. Because of high values and small holdings, the farmers in Hawai'i are reluctant to spare their lands for buffer allocation. If the economic benefits and national incentives are explained, more farmers will be willing to establish riparian buffers to protect fresh water bodies from NPS pollution.

Session VII
Aquatic Biota
Session

I.A. Abbott and C.M. Smith
University of Hawai'i at Mānoa

A Different Path to Conservation: Case Studies from Recent Research with Hawaiian Marine Algae. With recent research, the level of endemism among Hawaiian marine algae is on the rise, above the 25% typical for many marine animals in Hawai'i. What is not well appreciated by this trend is the exceptional nature of discovery, describing new, rare species on the basis of single collections or from single expeditionary-style collections around O'ahu and other main Hawaiian Islands. Several of these exceptional case studies will be presented. In marked contrast is the threat posed by multiple non-indigenous species to hard-bottom and soft-bottom marine environments on O'ahu. Recent approaches to mitigate harmful impacts of alien algae will be discussed.

Poster 1

Lyman Abbott, Jamie Bruch, Paul Higashino
Kaho'olawe Island Reserve Commission, Wailuku, HI

A Three Year DOH Watershed Restoration Project on Kaho'olawe. A three-year DOH project for watershed restoration on Kaho'olawe in the headwaters of Kaulana and Hakioawa watersheds is half complete. The USGS has installed 75 soil erosion pins and 2 stream gages in the watersheds, and 2 ocean turbidity monitors in the near shore ocean waters off of the two bays. The soil erosion pins are being re-measured every 6 months to determine accurate soil erosion rates. The stream gages measure stage height and are collecting water samples for suspended sediment (mg/l). This data will be correlated to precipitation from the remote access weather station at Hakioawa. To date, over 1000 volunteers have contributed 35,000 hours to the efforts of the project, planting more than 25,000 native grasses, shrubs and trees. Scheduled to finish in November 2008, the project will have planted 100ha of the summit area of Kaho'olawe, installing soil erosion control measures such as check dams, wattles and swales.

Poster 2
Student

Samira Fares, Ali Fares, **Amjad Ahmad**, Farhat Abbas
University of Hawai‘i at Mānoa, Honolulu, HI

Soil Water Movement and Nutrient Dynamics Under Different Land Cover Filters. A study was conducted to determine the effects of three land covers (Sunn Hemp, Sudex, and Oats) planted as vegetative filter strips on the reduction of sediment, nutrient loadings and water and solute movement in the subsurface within the Kaika-Waialua watershed on the island of O‘ahu, Hawai‘i. The current presentation is focusing on the soil water and nutrient dynamics as influence by these different land covers. A Six-probe multisensor capacitance system (EasyAg, Sentek Ltd, South Australia) was used to monitor the soil water content at 10, 20, 30 and 50 cm below the soil surface, every 15 minutes at each of these locations. Suction cups were installed in each of the 12 plots at 31 cm below the soil surface. Soil solutions were collected following several rainfall events. Results showed that land cover reduced the concentration of nitrogen in the soil solution compared with the fallow treatment. Nitrate was the dominate form of nitrogen collected. The phosphorus did not show any substantial subsurface movement as compared to nitrogen. Spatial variability was detected between plots of individual cover crops located at the top, middle, and bottom of the slope. Sunn hemp, a nitrogen fixer, showed the second highest nitrogen concentration after the fallow treatment. Thus, this crop is better suited for cover crop to enhance N levels in cropped areas but should be avoided in vegetative buffer areas, and in areas with high water tables.

Session VI
Monitoring
Symposium I

Alison Ainsworth[1], Rhonda Loh[1], Boone Kauffman[2]
[1]Hawai‘i Volcanoes National Park, Hawai‘i National Park, HI, [2]Institute of Pacific Islands Forestry USDA, Hilo, HI

Community and Species Level Vegetation Monitoring Examples from Hawai‘i Volcanoes National Park. Vegetation monitoring can indicate management needs and management effectiveness. Many vegetation monitoring programs have been conducted in the Hawaiian Islands with mixed levels of success. The purpose of this presentation is to examine three vegetation monitoring projects conducted in Hawai‘i Volcanoes National Park that range in scope from individual species to community level. These examples include: 1) distribution of select invasive species in ‘Ōla‘a wet forest, 2) abundance and population demographics of invasive mullein (*Verbascum thapsus*) on Mauna Loa, and 3) community vegetation recovery following wildfires in the East Rift. Specific objectives, study designs, results and interpretation of results for management differ among these studies. Valuable vegetation data were collected during these studies and the results directly influence the Park’s adaptive management strategy. However, in each study improvements to the study design would have increased field efficiency and/or data analysis and interpretation. For the invasive species studies few inferences could be made beyond the actual sample plot or transect because of the limited design. In the fire effects study, field efficiency would have been improved with smaller subplots for some variables such as tree ferns and greater replication for *Metrosideros* seedlings. These examples demonstrate how clearly defined management and monitoring objectives and an appropriate sampling design increase the success of a monitoring program. The results of these and other similar vegetation studies are being used in the development of plant species and community monitoring protocols under the National Park Service’s Inventory and Monitoring Program, Pacific Island Network.

Session VII
Monitoring
Symposium II

Stephen Ambagis[1], Dana Slaymaker[2], James D. Jacobi[3]
[1]U.S. Geological Survey, Hawai‘i Cooperative Studies Unit, Pacific Aquaculture and Coastal Resources Center, University of Hawai‘i at Hilo, Hawai‘i National Park, HI, [2]GeoProcessing Laboratory, Mt. Holyoke College, Hadley, MA, [3]U.S. Geological Survey, Pacific Island Ecosystems Research Center, Kīlauea Field Station, Hawai‘i National Park, HI

Assessment of a Low-Cost High-Resolution Remote Sensing System for Monitoring Plant Species and Communities in Hawai‘i. Collection of data on the distribution and cover of plant species and communities of an area is an important component of resource management and monitoring programs. For the past two years we have been testing the applicability and cost effectiveness of supplementing ground-based vegetation sampling with analysis of images collected using a very high resolution multi-spectral digital camera mounted on a helicopter. This system

consists of a Duncantech MS4100 camera (3-band 10 bit or 4-band 8 bit) coupled with a pulse laser, an attitude/heading reference system, and real-time differential GPS system which allows for high-resolution georectification of each image. For this presentation we summarize data collected in March 2007 from study sites on the islands of Kauaʻi, Oʻahu, and Hawaiʻi. Results of this test indicate that digital images with pixel size/resolution ranging from 10 to 30 cm can accurately georeferenced and used to accurately identify individual plants by species, and that structural and cover parameters can also be measured and used for site comparison or change detection at repeat-sampling plots.

Session V
Forest Health
Symposium II
Student

Robert C. Anderson[1], Janice Y. Uchida[2], Lloyd L. Loope[1]
[1]USGS-BRD-PIERC, Honolulu, HI, [2]University of Hawaiʻi PEPS, Honolulu, HI

Establishing a Baseline: Assessment of Hosts, Effects, and Climatic Range of Hawaiʻi's Current Strain of *Puccinia psidii.* *Puccinia psidii* was first described on guava (*Psidium guajava*) in Brazil, and until its introduction to Hawaiʻi, was restricted to the Neotropics and the state of Florida in the United States. Worldwide, 22 Neotropical species in 11 genera and 58 Australasian and Pacific species in 12 genera have been recorded as hosts of *Puccinia psidii*. New records from Hawaiʻi include the endemic ʻōhiʻa lehua (*Metrisideros polymorpha*) and nīoi (*Eugenia koolauensis*), the indigenous nīoi (*E. reinwardtiana*), two cultivated species of Pacific *Metrosideros* (*M. collinum* and *M. kermadecensis*), the introduced downy rose myrtle (*Rhodomyrtus tomentosa*) and three *Eucalyptus* species (*E. dunnii, E. smithii,* and *E. torelliana*). To date, three native and 15 non-native species have been observed as hosts of *Puccinia psidii* in Hawaiʻi, with the introduced rose apple (*Syzygium jambos*), being the most severely affected. The rust has been found statewide attacking local Myrtaceae from sea level to about 1200 m elevation in areas with rainfall ranging from 750–3000 mm. Hosts recorded elsewhere that appear unaffected by the rust strain in Hawaiʻi include: *Acmena smithii, Angophora costata, Eucalyptus camaldulensis, E. cloeziana, E. globulus, E. nitens, E. paniculata, E. pellita, E. punctata, E. saligna, E. tereticornis, E. urophylla, E. viminalis, Eugenia brasiliensis, E. pyriformis, E. uniflora, Pimenta dioica, P. racemosa, Psidium cattleianum, P. guajava, P. guineense* and *Syncarpia glomulifera*. The host distribution and DNA profile of *Puccinia psidii* in Hawaiʻi suggests that only one genotype has been established.

Session II
Native Biota
Session
Student

Naomi Arcand
University of Colorado-Boulder, Boulder, CO

Population Structure of Hāpuʻu Tree Fern (*Cibotium chamissoi*) Across Intact and Degraded Forests on Oʻahu, Hawaiʻi. The endemic species of Hawaiian tree fern, known locally as hāpuʻu, is considered a key species in Hawaiian forest communities. Yet this charismatic component of the understory may be in decline on Oʻahu. Hypothesized causes for the restricted range include predation by feral pigs, encroachment of invasive vegetation, historical over-harvesting, and an episodic two-spotted leafhopper infestation in the early 1990's. I examined the distribution, population structure, and restoration importance of *C. chamissoi* in forest communities within a range of native to degraded forest ecosystems on the island of Oʻahu. Hāpuʻu is commonly found at the transitional elevation range where degraded forests of lower elevation overlap with areas of intact native forest in both the Waiʻanae and Koʻolau mountain ranges. In addition to assessing individual *C. chamissoi* morphological attributes in sampling plots, I also measured plant community diversity, percent native cover, canopy density, slope, elevation, and soil nutrients at each research site. To gauge the effects of ungulate predation, plots were paired inside and outside of fenced ungulate exclosures in the Waiʻanae Mountains. Plots were also located singly in unfenced locations across the Koʻolau Mountains. Multiple components analysis and ANOVA results indicate feral ungulates are responsible for severely limiting *C. chamissoi* recruitment in the Waiʻanae Mountains, but hāpuʻu populations seem able to maintain themselves in other areas. Other factors that may be influencing population structure across all unfenced plots will be discussed. Implications for tropical forest understory restoration include fencing and weed control in some areas.

Session VII
Monitoring
Symposium II

Gregory Asner[1], Flint Hughes[2], David Knapp[1], Matthew Jones[1], Ty Kennedy-Bowdoin[1], Roberta Martin[1], Peter Vitousek[3], Gretchen Daily[3], Boone Kauffman[2]
[1]Carnegie Institution, Stanford, CA, [2]U.S. Forest Service, Hilo, HI, [3]Stanford University, Stanford, CA

The Carnegie Airborne Observatory: 3-D Regional Mapping of Biodiversity, Structure, and Functioning of Hawaiian Ecosystems. Hawaiian ecosystems are undergoing rapid changes by invasive species, climate variation, and land-use activities. Efficient regional observations and mapping are central to any conservation, management or resource policy development activities, but regional assessments of ecosystem diversity, structure and function have been lacking in Hawai‘i. The Carnegie Airborne Observatory (CAO) was conceived and built for regional mapping studies of ecosystems, and it is based at the Carnegie Labs of the Institute of Pacific Islands Forestry, U.S. Forest Service in Hilo, Hawai‘i. The CAO brings high-fidelity hyperspectral imaging together with a new type of waveform Light Detection and Ranging (LiDAR) system to map the three-dimensional structure, biomass, plant species richness and dominance, and canopy growth rates in Hawaiian ecosystems. The images are acquired at 0.3-1.5 meter spatial resolution, at a rate of up to 25,000 acres per day. Early results, acquired in collaboration with the U.S. Forest Service and DOFAW-State of Hawai‘i, show the location and spatial patterning of forest biomass, species richness, invasive overstory and understory species, and microtopography of the Laupāhoehoe unit of the Hawai‘i Experiment Tropical Forest and Natural Area Reserve, the Wao Kele ‘O Puna Natural Area Reserve, and a range of other ecosystems on Hawai‘i Island. This presentation will present these early results, which highlight ways that regional-scale, high-tech mapping studies can benefit conservation planning and management activities in Hawai‘i.

Poster 3

Valerie Stein[1,3], **Cathleen Bailey[2]**, Laura Arnold[1], Emily Severson[1], David Duffy[1,3]
[1]Pacific Cooperative Studies Unit (PCSU), University of Hawai‘i at Mānoa, 3190 Maile Way, St. John 410, Honolulu, HI 96822, [2]Haleakalā National Park, Resources Management Division, PO Box 369, Makawao, HI 96768, [3]Department of Botany University of Hawai‘i at Mānoa, 3190 Maile Way, Honolulu, HI 96822

Habitat Use By Maui Parrotbill in Haleakalā National Park: Implications for Reintroduction. Accurate and timely assessments of habitat are essential for sound management of animal populations. Understanding how habitat affects endangered species can provide critical information to scientists and managers faced with restoring recovery habitat. Assessing habitat at multiple spatial scales can be an effective method for identifying varying avian habitat needs. We used this approach to measure Maui Parrotbill habitat use across an area of montane rainforest under consideration for release of captive-reared parrotbill in Haleakalā National Park on Maui. Our objectives were to quantify the effects of forest stand structure and plant species composition on parrotbill habitat selection at the macrohabitat (home range) and microhabitat (foraging site) scales. We utilized a combination of bird and vegetation surveys to compare vegetation parameters between used and unused areas. We found parrotbill in 49% of the 210 hectares of habitat surveyed. Parrotbill exhibited preferential habitat use at multiple spatial scales. At the macrohabitat scale, vegetation structure and plant composition differed significantly between used and unused sites. Parrotbill were associated with areas with larger trees and dense understory. Significant indicator species of parrotbill habitat use were *Cheirodendron*, *Ilex* and *Melicope*. At the microhabitat scales, only plant species composition differed significantly between used and random sites, however parrotbill foraged selectively on specific plant species, tree size class, and vertical height tier. Our data suggest parrotbill prefer well developed, diverse forest. This work provides information on the suitability of Manawainui as a release site and gives insight into the habitat requirements of Maui Parrotbill.

Poster 4
Student

Meris Bantilan-Smith[1], Greg Bruland[1], Rich MacKenzie[2], Christina McGuire[3], Adonia Henry[4], Connie Ramsey[5]
[1]University of Hawai'i at Mānoa, Honolulu, HI, [2]Institute of Pacific Island Forestry, U.S. Forest Service, Hilo, HI, [3]Pacific Coast Joint Venture, Honolulu, HI, [4]U.S. Fish and Wildlife Service, Honolulu, HI, [5]U.S. Army Corps of Engineers, Honolulu, HI

A Quantitative Investigation and Inventory of the Soils and Vegetation of Coastal Lowland Hawaiian Wetlands. Coastal lowland wetlands are important features in the landscape that provide numerous functions for people and wildlife, including water quality improvement, flood attenuation, wildlife habitat, and biological productivity. Due to the loss and degradation of wetlands throughout the Hawaiian Islands, created (CWs) and restored (RWs) wetland projects are becoming more common. A comprehensive, quantitative assessment of the conditions of these wetlands has yet to occur and it has not been resolved whether CWs and RWs provide the same environmental and ecological benefits as NWs. In light of this deficiency this project seeks to assess the current water quality and habitat functions of CWs, RWs, and semi-natural wetlands in Hawai'i. Approximately 40 coastal wetlands sites on each of the five major Hawaiian Islands (Kaua'i, O'ahu, Moloka'i, Maui, and Hawai'i) were intensively sampled. The sampling consisted of collecting soil samples and assessing percent cover of vegetation across two transects that spanned the major hydrologic gradients at each site. Preliminary results revealed that vegetation communities were dominated by exotic, invasive species and that there were significant differences in soil across the hydrologic gradients and among the different types of sites. Soil samples and vegetation data will be further analyzed to evaluate whether the water quality and habitat functions performed by the different wetland types significantly differ between wetland types and among different islands.

Poster 5
Student

Chazaray Baruela, Graham Schell
Connections New Century Public Charter School, Hilo, HI

Comparison of Streams: Mā'ili and Ainako. In this project, we were trying to discover the similarities and differences between two streams, Mā'ili and Ainako. Data was collected over a time period of several months from two locations along each stream – one upstream and one downstream. The upstream site on Ainako stream was located in an established residential zone while the downstream site was located in an area of new residential development. The Mā'ili stream sites are at higher elevation and located in a non-residential area. We discovered that both streams were similar in pH levels, turbidity, phosphate levels, average relative humidity, stream species, and surprisingly both streams tested positive for coliform bacteria. The differences were in the water velocity, average wind speed, and water temperature. Our hypothesis was both proven and disproved in part. Since Mā'ili stream sites were located at a higher elevation and in a non-residential area, we thought the water quality would be a lot different than that of the Ainako stream. We also hypothesized that the stream organisms and plant life would be different due to a difference in elevation. In actuality, the stream organisms were similar, while the plant species differed.

Poster 6

Allison Baum, Rhyn Davies, Mark Fornwall
Pacific Biodiversity Information Forum, Kahului, HI

Applying Biodiversity and Ecosystem Informatics to Enable Local Level Biodiversity and Sustainable Resource Management in the Pacific Region. Island nations face both the greatest opportunities and greatest challenges for the conservation and sustainable use of biodiversity in the world. Improved access to baseline biodiversity information provides a basis for informed decision making and enables the efficient management of delicate island ecosystems. The Pacific Biodiversity Information Forum, convened under the auspices of the Pacific Science Association in 2004, is an international effort to link all available Pacific-based biological and taxonomic data into an electronically accessible information system. The Forum seeks to provide a multilateral venue for knowledge transfer and information access thereby increasing scientific understanding of regional biological resources and supporting the management and conservation of biological diversity. Among the PBIF priorities is the creation of linkages to existing information, digitization of relevant data, and

repatriation of specimen data from overseas institutions. Success in biodiversity conservation rests at the hands of governments, science-based organizations, non-governmental organizations, scientists, and local communities. PBIF will provide the vehicle for each of these groups to access the necessary information for biodiversity conservation pursuits and foster ongoing partnerships.

Session III
Inter Situ
Symposium

David Bender
National Tropical Botanical Garden, Kalāheo, HI

Case Studies and Perspectives on *Inter Situ* Plant Conservation in Hawai'i. There are many compelling factors that support the strategy of *inter situ* conservation of endangered plant species. In Hawai'i, few intact areas exist for reintroduction of lowland plant species, in both dry and wet habitats. In-situ efforts are complicated by concerns of pest introduction, genetic makeup of populations, permitting, access, and the need for interagency collaboration. Many of the areas where endangered species exist are not managed for the threats that have caused their decline. Botanic gardens have limited space and staffing, and their *ex situ* collections are subject to aesthetic and landscape maintenance constraints. Inter situ plant conservation strategies offer solutions to many of these problems, but also raise concerns of their own. Ten years of experience in dry and wet habitats, covering a range of projects aimed at augmenting or reintroducing native plant populations have provided valuable insights. The value and potential of these projects is considerable, and concerns regarding *inter situ* strategies pose only minor challenges. Case studies include Limahuli Preserve and Lāwa'i Valley (Kaua'i), and Ka'ūpūlehu Preserve (Hawai'i).

Session II
Invasives
Session I
Student

David M. Benitez, Rhonda Loh
[1]Pacific Cooperative Studies Unit, University of Hawai'i, Hawai'i Volcanoes National Park, [2]National Park Service, Division of Resources Management, Hawai'i Volcanoes National Park

Fountain Grass Removal in Hawaiian Ocean View Estates: A Cooperative Effort. Fountain grass (*Pennisetum setaceum*) is a serious weed of Hawaiian ecosystems; it aggressively invades dry areas and alters fire regimes. Although widespread in leeward districts on the Big Island, fountain grass is infrequent throughout the Ka'ū district. In Ka'ū, management of infestations has been limited to populations in Hawai'i Volcanoes National Park (HAVO) and Manuka Natural Area Reserve. Infestations in private subdivisions in Ka'ū were previously unmanaged. These infestations have the potential to increase the communities' fire potential and spread into natural areas. In 2004, HAVO began working with the Ocean View Community Association (OVCA) to map infestations along 251 km. of roadsides in Hawaiian Ocean View Estates (HOVE). Surveys found 69 fountain grass populations, each of less than 207 individuals. Fifteen populations were observed within residential lots. The localized nature of the infestations encouraged the Park and community to develop a strategy to control fountain grass in the subdivision. Since 2005, systematic treatment of all roadside populations has been conducted, resulting in the removal of 8,084 plants. Populations in 2 residential lots have also been controlled. NPS crews were assisted by staff from BIISC, DOFAW, TNCH, and volunteers from HCC and Ka'ū residents. Public service announcements and presentations within HOVE were instrumental in building support for the operation. Continued support by agencies and residents may lead to expanded control efforts in other subdivisions, private lands and public roadways, creating a network of fountain grass free areas in Ka'ū.

Poster 7

Stephanie Bennett, Scott Bloom
NOAA Fisheries Service-Pacific Islands Regional Office, Honolulu, HI

Partnerships Across the Pacific: Managing Fisheries for the Future. The NOAA Fisheries Service Pacific Islands Regional Office (PIRO) Grants Program administers a broad range of financial assistance and program partnership activities throughout the Pacific in Hawai'i, American Samoa, Guam and the Commonwealth of the Northern Mariana Islands (CNMI). Specific programs that support the NOAA Fisheries Service mission include: Hawai'i Seafood Program, Western Pacific Fisheries Information Network, Interjurisdictional Fisheries Act, Western Pacific Fishery Management Council, Saltonstall-Kennedy Grant Program, Native Fishery Observer Program, coral

reef conservation, and sea turtle management. For the past few years, the PIRO Grants Program has grown with innovative grants that revitalize community support in fisheries management issues. Projects such as the Olosega Small Scale Longline Fishery Education, He‘eia Fishpond Revitalization, and Rota Traditional Fishing Education exemplify the grassroots approach to support fishery management needs for the future of Pacific communities. Olosega Village in American Samoa has begun steps to provide economic stability to one of its underserved communities in the Manua Islands. On Rota in the CNMI, the Northern Marianas College has begun educating their local youth on unique Carolinian and Chamorro fishing methods and stewardship of marine resources. O‘ahu’s He‘eia Fishpond has been a catalyst to encourage the preservation and practice of traditional fishing and resource management techniques observed by communities of Hawaiians for decades. These and other PIRO projects have proven to be integral facets to successful management of fishery resources by creating partnerships with local communities, governments and individuals across the Pacific.

Session IV
Fisheries
Session

Paul Bienfang
University of Hawai‘i at Mānoa, Honolulu, HI

The Sustainability Focus of Hawai‘i’s Aquaculture. In the face of the fully-exploited status of most capture fisheries, and the growing demand for seafood, most countries are increasing looking for aquaculture to supply more seafood. This has resulted in steady growth in global aquaculture, together with concerns for the potential environmental impacts from this growth. Hawai‘i has a long history in the practice of coastal aquaculture. For decades Hawai‘i has shown global leadership in both technology development and the environmental planning related to aquaculture. This presentation gives an overview of several past and present features of Hawai‘i’s government policies, research, and commercial practices in pursuit of environmentally sustainable aquaculture. The relevance of land use planning, water quality protection, biological conservation, disease prevention, offshore production, and specific pathogen free stocks are addressed, together with illustrations of their implementation within the commercial sector.

Poster 8
Student

Joanne L. Birch[1], Clifford W. Morden[1], Clifford W. Morden[2], Sterling C. Keeley[1]
[1]Botany Department, University of Hawai‘i at Mānoa, Honolulu, HI, [2]Center for Conservation Research and Training, University of Hawai‘i at Mānoa, Honolulu, HI

Lineage Diversification in the Hawaiian Flowering Plant Genus *Astelia* (Asteliaceae). This research uses the plant genus *Astelia* (Asteliaceae) as a model to investigate the evolution of adaptive radiations at two levels, one intraspecific population divergence among islands in the Hawaiian archipelago and the other divergence and radiation of species across the Pacific. The widespread distribution of *Astelia* and the presence of species radiations in Australia, Hawai‘i, and New Zealand make this genus ideally suited to investigate mechanisms driving the generation of biodiversity in insular floras. A preliminary phylogenetic reconstruction of *Astelia* is presented that identifies possible origins of the Hawaiian *Astelia*. Ongoing biogeographic analyses will test the hypothesis, based on morphological data, that the Hawaiian species are most closely related to *A. tovii* from the Marquesan Islands. The genetic diversity of the widespread Hawaiian species, *A. menziesiana*, is quantified using inter-simple sequence repeat data to determine the degree of genetic differentiation in this species. The genetic diversity of *A. menziesiana* populations is compared to investigate whether O‘ahu populations, which have undergone sustained restrictions in population size, contain lower than expected genetic diversity. This research provides a protocol, including the identification of markers that are polymorphic in the genus *Astelia*, for quantification of the genetic diversity for endangered *Astelia* taxa in Hawai‘i, New Zealand, and Australia, which will be available for application to the management plans for these taxa.

Session VIII
Winged
Vertebrates
Session I

Frank Bonaccorso[1], Adam Miles[2], Christopher Todd[2], Marcos Gorresen[1]
[1]U.S. Geological Survey, Hawai'i National Park, HI, [2]Hawai'i Cooperative Studies Unit, University of Hawai'i, Hilo, HI

Roosting Ecology and Flight Emergence Times of the Hawaiian Hoary Bat on the Island of Hawai'i. We present a description of roosts used by the Hawaiian hoary bat (*Lasuirus cinereus semotis*) that allows land managers to make informed decisions when considering manipulation of subcanopy and canopy vegetation within the range of this endangered bat. We captured bats along roads and flyways of exotic, urban, and native landscapes using elevated mist nets. We followed bats (N = 18) to tree roosts using radio-telemetry and attempted to visually confirm the location of roosting bats. Bats captured in urban and exotic plant dominated landscapes commonly selected roosts in *Eucalyptus* spp., *Mangifera* sp., *Litchi* sp., *Persea* sp., and *Albizzia* sp. The native 'ōhi'a lehua (*Metrosideros polymorpha*) was used by four bats captured in native forest, and one bat captured in an urban landscape. Roosts were located within dense vegetation, but had open access to facilitate launching into flight. Bats selected roosts in sub-canopy if canopy trees had sparse foliage or in canopy trees where dense foliage was present. During the period of lactation, we observed bats roosting in groups ≤3, likely representing mother-offspring groups. We monitored the evening emergence of bats from roosts visually and by telemetry. Emergence time of females was 9.3 ± 8.4 (mean ± se) min before sunset; male emergence was 10.3 ± 2.7 min after sunset. Night roosts included day-roost trees and trees near foraging locations including the genera *Eucalyptus*, *Macadamia*, and *Araucaria*. Roosting positions at night were often <5 m above the ground in *Macadamia* or *Araucaria*, but >5 m when in *Eucalyptus*.

Session I
Ecosystem
Services
Symposium

David Brand
New Forests, West Chatswood, NSW, Australia

Valuing Carbon, Creating Markets. Forests provide a tremendous range of values to society, in biophysical, economic and cultural terms. This presentation will describe new incentives for recognizing these values in decision-making, drawing on experience from around the world, and tailoring that to Hawai'i. Specifically, we'll consider the potential scope for a carbon market to enhance conservation of native forest in Hawai'i.

Session I
Ecosystem
Services
Symposium

Kate Brauman[1], Kaeo Duarte[2]
[1]Stanford University, Stanford, CA, [2]University of Hawai'i at Mānoa, Honolulu, HI

Ecosystem Service Based Watershed Management in Hawai'i. Better understanding the role of Hawaiian watersheds in water provision is key to not only providing people with much needed fresh water supplies and mitigating water hazards, but also to protecting these fragile ecosystems. Effectively protecting watersheds—maximizing provision of hydrologic services and ensuring the health of watershed ecosystems—requires information about ecosystem effects on water quantity, quality, timing, and location, and information about the value of land in relation to its effects on water supply or water hazard mitigation. Valuing these ecosystems for their hydrologic service provision opens new avenues for designing and funding watershed management. We consider the biophysical and institutional dimensions of an ecosystem service approach to drinking water and flood control in Hawai'i, focusing on one case study in Kona and on more general science and policy needs for ecosystem-service based watershed management.

Session VI
Monitoring
Symposium I

Kevin Brinck, Rick Camp
USGS Hawai'i Cooperative Studies Unit, Pacific Aquaculture and Coastal Resources Center, University of Hawai'i at Hilo, Hilo, HI

A General Framework for Ecological Monitoring. Hawai'i has many unique ecological systems, but unfortunately many are threatened by a variety of influences. Effective actions to manage and protect these systems depend on accurate knowledge of their natural biological processes, their current status, and any current trends, either positive or negative. Monitoring data will help generate this scientific knowledge. A successful ecological monitoring program requires that specific objectives be identified. These objectives should be realistic, measurable, and meaningful to the biological system

being monitored and the managing agencies responsible for them. Well-chosen objectives will help determine the best sampling protocols, specify the limits of inference, and provide useful measures of progress. There are a wide variety of sampling designs suited to different monitoring goals, from traditional plot-level sampling to simple multi-metric indexes to sophisticated remote sensing methods. Beyond sampling, an effective monitoring program should also incorporate data quality and storage standards for long-term studies, and be flexible enough to adapt to changing field conditions and technologies. Periodic evaluation of the monitoring program allows researchers and managers to track progress toward attaining performance goals, refine monitoring objectives, improve or relax sampling protocols, and assess the feasibility of the program as a whole. We discuss the components of an effective monitoring program and highlight how they are used in the symposium case studies. Finally we will identify some of the resources available to the Hawai‘i conservation community.

Session I
Near Shore/
Marine
Symposium

Alan Friedlander[1], **Eric Brown[2]**, Mark Monaco[1], Athline Clark[3]
[1]NOAA, Silver Spring, MD, [2]National Park Service, Kalaupapa, HI, [3]DLNR, Division of Aquatic Resources, Honolulu, HI

Determining Fish Habitat Utilization Patterns and the Efficacy of Marine Protected Areas in Hawai‘i via Integrated Coral Reef Ecosystem Mapping and Monitoring. Over the past four decades, Hawai‘i has developed a system of 11 Marine Life Conservation Districts (MLCDs) to conserve and replenish marine resources around the state. These MLCDs vary in size, habitat quality, and management regimes, presenting a unique opportunity to test hypotheses concerning marine protected area (MPA) design and function. A robust stratified sampling design based on digital benthic habitat maps was employed to evaluate the efficacy of these protected areas. MLCDs contained higher fish biomass, larger overall fish size, more apex predators, and higher diversity than adjacent areas of similar habitat quality. Most MLCDs in Hawai‘i are currently too small and encompass too few habitat types to provide substantial benefits to coastal reef fisheries. In addition, MLCDs currently encompass less than 1% of the total reef area of the main Hawaiian Islands. Future protected area design in the main Hawaiian Islands needs to incorporate a mosaic of habitats at larger spatial scales to support viable reef fish populations.

Session VII
Monitoring
Symposium II

Eric Brown[1], Dwayne Minton[2], Raychelle Daniel[3], Fritz Klasner[3], Larry Basch[3], Allison Synder[3], Peter Craig[4], Gordon Dicus[3], Kimber DeVerse[3], Tahzay Jones[3], Jim Beets[5], Alan Friedlander[6]
[1]National Park Service, Kalaupapa, HI, [2]National Park Service, Piti, Guam, [3]National Park Service, Volcano, HI, [4]National Park Service, Pago Pago, Tutuila, American Samoa, [5]University of Hawai‘i at Hilo, Hilo, HI, [6]NOAA/National Ocean Service, Waimānalo, HI

Development and Implementation of a Marine Monitoring Program in the National Park Service Pacific Network (PACN). The National Park Service in cooperation with the University of Hawai‘i at Hilo, NOAA Center for Coastal Monitoring and Assessment, and the Oceanic Institute initiated a marine monitoring program in four national parks around the Pacific. Three Vital Sign protocols, benthic community, fish, and water quality were co-located and co-visited. The benthic community protocol addresses changes in the composition and physical structure of the coral reef benthos, patterns in coral recruitment, and the frequency of disease/bleaching in corals. The fish protocol examines trends in the abundance and biomass of coral reef fishes of ecological, cultural or harvest significance. The water quality protocol investigates spatial and temporal patterns in temperature, oxygen, pH, and turbidity in various water bodies within the parks. A split panel sampling design was implemented with thirty randomly selected sites sampled annually between 10 and 20 meters depth. Fifteen of the sites were permanent with the remaining sites randomly selected each year. The water quality protocol doubled the number of sites to increase statistical power. This sampling regime represents the maximum sustainable effort given logistical and fiscal constraints. Based on previous data, the sampling design should have statistical power ranging from 0.34 (fish) to 0.80 (benthic) to 0.99 (water quality) to detect relative change in various parameters after 10 years. A principal investigator for each protocol oversees data analysis and reporting, park staff facilitate data collection, and a park lead ensures Vital Signs address park management needs. A PACN Aquatic Ecologist provides status and trend analyses at the national level.

Session IV Landscape Management Session

Greg Bruland[1], Rich MacKenzie[2], Christina McGuire[3], Adonia Henry[4], Connie Ramsey[5], Meris Bantilan-Smith[1]

[1]University of Hawai'i at Mānoa, Honolulu, HI, [2]Institute of Pacific Islands Forestry, U.S. Forest Service, Hilo, HI, [3]Pacific Coast Joint Venture, Honolulu, HI, [4]U.S. Fish and Wildlife Service, Honolulu, HI, [5]U.S. Army Corps of Engineers, Honolulu, HI

Comprehensive Inter-Island Assessment of Coastal Lowland Wetland Ecosystems of the Hawaiian Islands. The goal of this project is to document the ecological attributes of coastal lowland wetlands in the main Hawai'i Islands. During phase one in 2007 we sampled over 35 wetland sites across Hawai'i, Kaua'i, Maui, Moloka'i, and O'ahu. Sites included restored, created, and semi-natural wetlands within both estuarine and freshwater systems. At each site we oriented random transects across the major hydrologic gradients, sampling dry, intermediate, and wet zones. Along each transect we sampled water quality, soils, vegetation, and fish communities. Surface water samples were analyzed for total phosphorus (TP), total dissolved nitrogen (TDN), nitrate (NO_3-N) and ammonium (NH_4-N). Soil samples were analyzed for bulk density, soil organic matter, TP, total nitrogen, and soluble reactive P. Vegetation and fish species composition were quantitatively assessed. Additionally, plant tissue samples were collected from the dominant plant species for analysis of $\delta^{15}N$ signatures to determine nitrogen sources (i.e., cesspools, invasive N-fixing plants). Preliminary results indicated that the majority of coastal lowland wetland sites, including those within the most remote, undeveloped watersheds were dominated by invasive vegetation and fish species. This is the first comprehensive quantitative ecological inventory of coastal lowland wetlands in Hawai'i. Results will lay a foundation for the additional research needed to develop biocriteria for Hawai'i that will guide wetland creation and restoration. Phase two of the project will utilize a statewide volunteer network to sample water quality, vegetation, and fish communities on quarterly basis.

Session VI Economics of Invasives Symposium

Chris Buddenhagen

Hawai'i Invasive Species Council, Honolulu, HI

How Much is Spent Annually on Invasive Species Management in Hawai'i? I estimate recent annual spending to manage invasive plants, animals, invertebrates and diseases in Hawai'i. Information was obtained from private, federal and local government sources. I asked for, or found documentation of, the most recent complete year's financial breakdown related to invasive species management. Since fiscal years differ between agencies, the data I was able to obtain was for a one year period ending in 2006 or 2007. I obtained information from funders and from fund recipients so I had to be careful not to duplicate amounts. I tried to be as thorough as possible but data is incomplete, especially in the area of private spending. Estimates are therefore conservative. Spending to manage invasive species threatening natural resources was more than $35 million—principally control efforts of various kinds and prevention. State and Federal spending are closely matched for combined total of about $30 million. Spending on management activities included prevention 22%, eradication 7%, control 61%, research 8% and information systems 1%. I estimate around $15 million private spending by the agriculture sector and if you included household pests such as termites total spending exceeds $100 million. In 1999 invasive species spending was estimated at less than $10 million and a suggested total of $50 million was needed for the State to adequately address principal threats from invasive. Current efforts fall short of addressing key threats in the most cost effective manner, e.g. preventing the entry of new unwanted organisms and predator and ungulate management to protect threatened endemic species.

Poster 9

Jeff Burgett[1], Timothy Day[2], William Pitt[3], Kylie Day[4]

[1]U.S. Fish and Wildlife Service, Honolulu, HI, [2]Xcluder Pest Proof Fencing, Ltd, Cambridge, New Zealand, [3]USDA APHIS-Wildlife Services, Hilo, HI, [4]Kiwi Encounter, Rotorua, New Zealand

From Mice to Mouflon: Development and Test of a Complete Mammalian Pest Barrier for Hawai'i. Establishment of areas with few or no mammalian pests is critical for restoration of many sensitive Hawaiian species and ecosystems. Such "islands" can be established by installing fences that exclude all non-native mammals, and completely removing those mammals from within the fenced area. This strategy is being widely adopted in New Zealand but has not yet been used in Hawai'i.

Existing fence technology (Xcluder™) was trialed in 2002 against multiple feral mammal species at a bare ʻaʻā lava site on the island of Hawaiʻi, and defeated all species except mice (*Mus musculus*). A follow-up trial, described here, was conducted to find a low-cost modification of the Xcluder™ fence that would prevent passage of mice beneath the fence and yield a complete barrier for use in Hawaiʻi. Mouse behavior in relation to the fence and surrounding lava rubble was studied in transparent tubs as they interacted with the fence mesh both above and below ground. A mixture of cement and lava fragments (<6 mm diameter), applied as powder and wetted, was found to effectively seal the buried mesh edge and prevent mouse passage under the mesh. This edge seal was tested in a small field pen and a larger (8 m diameter) trial pen used in the 2002 tests, and appeared to be entirely successful at preventing mouse passage. This modification can be applied inexpensively during fence installation. Pest-proof fencing on soil and crushed ʻaʻā substrates is now feasible in Hawaiʻi; fencing on pāhoehoe lava requires further development and tests.

Session VI
Economics of
Invasives
Symposium

Nori Tarui, Sean D'Evelyn, **Kimberly Burnett**, James Roumasset
University of Hawaiʻi, Honolulu, HI

Uncertain Populations and the Value of Information. Virtually all management models of invasive species assume that the initial species population is known with certainty, and have based management recommendations on projected growth and species capture from the assumed initial number. Because the actual population size of invasive species is almost always unknown, the policy implications of such models are limited. This paper proposes a methodology for management decisions in the presence of uncertainty about species population size. Given uncertainty, a resource manager's efforts for invasive species control provide two benefits: (1) a direct benefit of reducing the population of invasive species, and (2) an indirect benefit of information acquisition (due to learning about the population size, which reduces uncertainty). We develop a methodology which takes into account both of these benefits, and show how optimal management decisions are altered in the presence of the indirect benefit of learning. We then apply this methodology to the case of the imminent arrival of the brown treesnake (*Boiga irregularis*) from Guam to the State of Hawaiʻi. We find that the indirect benefit—the value of information to reduce uncertainty—is likely to be quite large.

Session III
Inter Situ
Symposium

David Burney
National Tropical Botanical Garden, Kalāheo, HI

***Inter Situ* Restoration: Thinking Bigger in Time and Space.** Human colonization of tropical islands throughout the world has transformed these remote biotic communities. Island histories reveal that human predation and landscape change have each played a key role, but many extinctions following human arrival, and most of those occurring today, are strongly associated with the effects of alien species—introduced predators, herbivores, weeds, and diseases. In the Hawaiian Islands, a human-caused extinction catastrophe is currently taking place in a microcosm of island endemics. Recent studies reveal that conventional *in situ* and *ex situ* conservation strategies have been inadequate to the huge challenge of protecting a flora in which nearly half the species are at risk. Paleoecological findings, including fossil pollen and seed records, early historical occurrences, and ethnographic accounts, fully support the idea that creating new populations in formerly much larger late prehistoric and early historical ranges of declining species may provide a reliable and cost-effective hedge against extinction. Advantages of the *inter situ* approach include improved husbandry through better access than many *in situ* populations, increased opportunity for study and monitoring, potential for accelerated production of large numbers of propagules, educational and ecotourism opportunities, and increased security against disturbance. Challenges and limitations are fairly minor. *Inter situ* populations can be designed to maximize genetic diversity. Regulatory obstacles are only temporary: if the law interferes, the law can be changed. Esthetic and philosophical obstacles are ephemeral at best. Successes, from New Zealand and Mauritius to Kauaʻi, show that *inter situ* projects can save

species that previously seemed quite hopeless.

Session III
Inter Situ
Symposium

Lida Pigott Burney[1], David Burney[2]
[1]Makauwahi Cave Reserve, Kalāheo, HI, [2]National Tropical Botanical Garden, Kalāheo, HI

Makauwahi Cave Reserve: An Innovative Prototype for *Inter Situ* Restoration. Since paleoecological research began in 1992 at Makauwahi Cave in Māhāʻulepū, Kauaʻi, scientists have revealed new and surprising facts about late prehistoric Hawaiʻi. Studies have shown the depth of the biotic losses that have occurred since human arrival, continuing and accelerating up to the present. Other findings have provided rays of hope for saving the native species remaining. A trend in the data that provokes optimistic thinking is the realization that many locally extinct species have survived elsewhere on Kauaʻi or other islands. This supports the growing notion worldwide that conservation can increase its effectiveness with proactive strategies aimed at creating larger populations of rare species in places where they do not occur today, but did in late prehistoric or early historical times—strategies generally referred to as *inter situ* conservation. In recent years, the site has been transformed into the Makauwahi Cave Reserve, a 17 acre restoration project designed to test and demonstrate techniques for ecological restoration with an emphasis on reintroduction of species eliminated from the area by human activities and alien species. The Reserve features six management units each with unique challenges and goals for restoration. Controlled experiments and monitoring protocols provide insights concerning the most efficient restoration methods. Innovative education programs in collaboration with the National Tropical Botanical Garden provide opportunities to involve the community in these efforts. A new project with Grove Farm Company has extended these successful techniques to a spectacular site on their property on the flank of Kilohana Crater in eastern Kauaʻi.

Poster 10

Norma Bustos, Betsy Gagné, Vickie Caraway
Hawaiʻi Division of Forestry and Wildlife, Honolulu, HI

Permits: What Every Researcher Should Know. This poster will go into the different permits issued by the Division of Forestry and Wildlife and will provide general information as to what research activities require permits, who to contact, and what time-frame is needed for the processing of those permits. Examples of permits to be covered include: Protected Wildlife Permits for Scientific Collection, Natural Area Reserves System Permits and Permits for Collection For Threatened and Endangered Plant Species.

Poster 11

Norma Bustos
Division of Forestry and Wildlife, Honolulu, HI

Hawaiʻi's Feral Cat Colonies: Examining the Effects of Feral and Free-ranging Cats on Hawaiʻi's Native Species. As the extinction capitol of the nation Hawaiʻi's native species face enormous pressure in the simple effort of survival. This poster will examine the impacts that feral and free-ranging cats have on Hawaiʻi's native species and will provide information on what individuals can do to help get our County Council and legislators back on track.

Session VI
Economics of
Invasives
Symposium

Oscar Cacho
University of New England, Armidale, NSW, Australia

When is it Optimal to Eradicate a Weed Invasion? When a weed invasion is discovered a decision has to be made as to whether to attempt to eradicate it, contain it or do nothing. Ideally, these decisions should be based on a complete benefit-cost analysis, but this is often not possible. Partial analysis, combining knowledge of the demographics of the weed and economic techniques, can assist in making the best decision. This paper presents a general conceptual model to decide when eradication of a weed should be attempted. Decision rules are derived based on a few parameters that represent the rate of spread, the cost of controlling the invasion, and the cost of damage caused by the invasion. These decision rules are then used to identify the 'switching point'; the invasion size at which it is no longer optimal to attempt eradication. The decision rules are used to estimate the

optimal duration of the eradication effort depending on the current size of the invasion. Sensitivity analysis is undertaken and the possibility of characterizing an invasion based on five parameters is discussed.

Session VI Economics of Invasives Symposium

Oscar Cacho
University of New England, Armidale, NSW, Australia

Applying Search Theory to Evaluate the Feasibility of Eradicating an Invasion. The detectability of invasive organisms influences the costs and benefits of alternative control strategies, and the feasibility of eradicating an infestation. Search theory offers a mathematically rigorous framework for defining and measuring detectability, taking account of searcher ability, biological factors and the search environment. In this paper, search theory concepts are incorporated into a population model and the costs of search and control are calculated as functions of the amount of search effort (the decision variable). Simulations are performed on a set of weed scenarios in a natural environment, involving different combinations of plant longevity, seed longevity and plant fecundity. Results provide preliminary estimates of the cost and duration of eradication programs to assist in prioritizing weeds for control. The analysis shows the importance of collecting information on the labor and chemical inputs required to control invasions (as functions of plant density and size), in order to improve the efficiency of invasive control programs.

Poster 12

Frances Calvert, M. Tracy Johnson
USDA Forest Service, Institute of Pacific Island Forestry, Hilo, HI

Quarantine Evaluation of Biocontrol Agents for *Miconia calvescens*: A Psyllid, *Diclidophlebia lucens*, and Stem Weevil, *Cryptorhynchus melastomae*. Two insect species from Costa Rica are currently under evaluation in Hawai‘i as potential agents for biological control of *Miconia calvescens*. The phloem-feeder *Diclidophlebia lucens* (Hemiptera: Psyllidae) has small, bright orange-red adults and nymphs that excrete abundant white threads of wax. *Cryptorhynchus melastomae* (Coleoptera: Curculionidae) is a relatively large weevil that bores stems as a larva and feeds on leaves and stems as an adult. Host specificity of adult and immature *Diclidophlebia lucens* was tested on 28 test plant species, including a variety of Melastomataceae, other non-native and native Myrtales, and five unrelated endemics. Psyllids were able to survive, reproduce and develop on a broad range of melastomes, but *Miconia calvescens, Tetrazygia bicolor, Heterocentron subtriplinervium, Arthrostema ciliatum* and *Pterolepis glomerata* appeared to be the most suitable hosts. Psyllids did not survive or reproduce on any non-melastomes. Preliminary host specificity testing of the weevil *Cryptorhynchus melastomae* indicates that this species is also probably restricted to melastomes. Because its larvae must feed within stems to complete their life cycle, *C. melastomae* is likely to be limited to melastomes with relatively large stems. Our hope is that these species represent the first of a suite of miconia insects that will prove suitable for release in Hawai‘i.

Session IV Landscape Management Session

Vickie Caraway[1], Greg Mansker[2], Bill Standley[1]
[1]Department of Land and Natural Resources, Division of Forestry and Wildlife, Honolulu, HI, [2]Pacific Cooperative Studies Unit, Honolulu, HI

Habitat Conservation Plan (HCP) for O‘ahu *Abutilon menziesii* at Kapolei. In 1998, during the planning for housing development and construction of the North-South Road at Kapolei, O‘ahu, a population of *Abutilon menziesii* was discovered on former sugarcane lands. The development of these lands was expected to result in the “take” of the entire Kapolei population. Discovery of this federally and state listed endangered species triggered the development of Hawai‘i’s first Habitat Conservation Plan (HCP) for plants. The goal of this planning document was to initiate and sustain a program that results in an overall gain in the number of *A. menziesii* plants on the island of O‘ahu. In return, an incidental take permit was issued to allow for the “take” of this population by the State of Hawai‘i’s Department of Transportation. The strategy of the HCP is to mitigate the highway and development impacts to the species by the creation of three protected off-site wild populations using the Kapolei site as the founder source. Five years into this 20 year process, outplanting sites have been

developed at Koko Crater Botanical Gardens, Kaʻena Point State Park, Diamond Head State Park, Honouliuli Wildlife Refuge, ʻEwa Villages Golf Course, and Ka Iwi State Park. The Koko Crater population functions as a genetic repository for the Kapolei population. The Kaʻena Point site has inherent issues (alien weeds, vandalism, off-road vehicles, fire) and the long-term success of this site is in question.

Session II
Native Biota
Session

Susan Ching, Kapua Kawelo, Joby Rohrer, Matthew Keir, Jane Beachy, Matthew Burt, Stephen Mosher, Dan Sailer
Oʻahu Army Natural Resources, Schofield Barracks, HI

Changes in Conservation Management Plans for *Plantago princeps* var. *princeps* Based on Genetic Data. The Oʻahu Army Natural Resources (OANR) is involved in the conservation of 50 plant species, seven snail species, and one avian species as part of the Army's ESA section 7 consultations with the USFWS regarding military training on Oʻahu. For the last several years OANR has been managing populations of the plant taxon *Plantago princeps* var. *princeps* occurring in both the Mākua and Schofield training areas. Based on genetic data produced by Stephanie Dunbar (UH Botany, Ph.D. candidate), OANR has modified the original management plans for the stabilization of this species to reflect new information. Original plans included the management of populations in both the Waiʻanae and Koʻolau ranges in order to protect a genetically and geographically diverse representation of this taxon. On learning that the three known Koʻolau populations of *P. princeps* are more closely related to *P. princeps* var. *laxiflora* on Maui, the OANR decided to focus management on the genetically distinct *P. princeps* var. *princeps* populations in the Waiʻanae Mountains. Genetic analyses by Ms. Dunbar along with geographical, landowner, and military impact considerations have allowed OANR to make more knowledgeable decisions on how to best manage a portion of the approximately seven small remaining populations of this taxon.

Session III
Inter Situ
Symposium

Margaret Clark, Robert Nishek
National Tropical Botanical Garden, Kalāheo, HI

Growing Hawaiian Natives for Large Scale Restoration. The National Tropical Botanical Garden has been developing its capacity to propagate native Hawaiian plants in large quantities for many restoration projects which it has undertaken. The challenges of propagation on this scale are discussed. These include managing the demands of multiple projects, the flow of materials through the nursery, and the control of plant pests and disease, conditioning plants for outplanting, labelling and tracking of origin of parent material.

Session IV
Landscape
Management
Session

Michelle Clark, Gregory Koob
USDA Natural Resources Conservation Service, Līhuʻe, HI

NRCS Assists Landowners to Restore Critical Habitats for Federally Listed Threatened and Endangered Species on Kauaʻi through the Wildlife Habitat Incentives Program. The Wildlife Habitat Incentives Program (WHIP) is a voluntary, Farm Bill program administered by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS), for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP, NRCS provides both technical assistance and up to 75 percent cost-share assistance to establish and improve upland, wetland, riparian, and aquatic habitats. The 2002 Farm Bill expanded funding available to WHIP and placed a greater emphasis on establishing conservation practices that benefit habitat of threatened and endangered species. About 57,300 acres have been designated as critical habitat by the U.S. Fish and Wildlife Service on Kauaʻi for federally listed endangered species including the Kauaʻi cave wolf spider and amphipod (272 acres), Newcomb's snail (4,479 acres), and for 83 plant species (52,549 acres). NRCS has entered into partnerships with the National Tropical Botanical Garden; Garden Island RC&D Inc., Kōkeʻe Resource Conservation Program; Makauwahi Cave Reserve, and Kiahuna Players LLC., to aid in the recovery of endangered species occurring on lands designated as critical

habitat. This presentation will highlight these projects and the conservation practices implemented.

Poster 13

Lawren Sack[1], Susan Cordell[2], Rebecca Ostertag[3], Christian Giardina[2], **Colleen Cole[2]**
[1]University of Hawai‘i at Mānoa, Honolulu, HI, [2]USDA Forest Service, Hilo, HI, [3]University of Hawai‘i at Hilo, Honolulu, HI

How do Hawaiian Native Forests Function over the Long-term?: The Hawai‘i Permanent Plot Network (HIPPNET) for Monitoring, Research and Education. The spectacular climate, elevation, and substrate age gradients of Hawai‘i present a natural opportunity for the Hawai‘i Permanent Plot Network (HIPPNET), a set of permanent research sites to be located throughout the state. Initially, we plan to develop ten permanent plots of native dominated forest on Hawai‘i, O‘ahu, and Kaua‘i. Permanent plots will be established and censused following widely used protocols developed for tropical and temperate forests. Additionally, we propose to designate and monitor adjacent land areas of invasive dominated forest to understand how invasive species alter these dynamics. The data generated through coordinated projects carried out at HIPPNET sites will enable the University of Hawai‘i and collaborators to become leaders in numerous important areas of ecology including global change, ecohydrology, ecosystem services, and restoration. HIPPNET sites will have a strong beneficial effect on Hawaiian ecological research in perpetuity and will be fully integrated into the network of scientific forest plots around the world. HIPPNET sites will provide safe, secure sites for expensive equipment, and will be the premier locations for innovative and cutting-edge research, and will provide essential data on natural forest dynamics for natural resource managers. This project will lead directly to improved research infrastructure and productivity, creating shared resource facilities and equipment for ecology research. The development of HIPPNET will increase the numbers of cross-cutting collaborations, partnerships, and alliances that increase research capacity and support, leading to increased proposal submissions, award success rates, high impact publications, and students of all ages involved in research.

Poster 14

Boone Kauffman, Susan Cordell, **Colleen Cole**
USDA Forest Service, Institute of Pacific Islands Forestry, Hilo, HI

The Hawai‘i Experimental Tropical Forest: New opportunities for research, education, and demonstration in the Pacific. The primary value of experimental forests is the provision of lands dedicated to scientific research with applicable findings to land and water managers. Until the establishment of the Hawai‘i Experimental Tropical Forest (HETF), there were no lands dedicated to forest ecosystems research in the Pacific. This shortcoming excluded researchers of many opportunities that would arise from the presence of an experimental forest and deprived land managers and the public of information that arises from experimental forests. The experimental forest, established in 2007, consists of two sites on the Big Island of Hawai‘i. These are the Laupāhoehoe rain forest in North Hilo, and the Pu‘u Wa‘awa‘a dry forest in North Kona. These sites encompass broad gradients of climate, forests, soils, and land use history. The HETF, managed cooperatively with the Hawai‘i Division of Forestry and Wildlife and the Institute of Pacific Islands Forestry - Forest Service, will be open to all those interested in conducting relevant research on the tropical forests and natural environments of Hawai‘i. The objectives of the HETF will be to: (1) provide lands for conducting research that benefits the preservation and sustainability of tropical forests; (2) improve our abilities to restore and sustainably manage tropical forests, their ecosystem components and services; (3) provide lands for long term studies to understand the linkages of forests to climate change and water resources; (4) improve our ability to control invasive and exotic species that diminish forest productivity, biodiversity, and values, and; (5) provide learning opportunities for school children of all ages.

Poster 15
Student

Kris M. Coontz, Alison R. Sherwood
University of Hawai‘i at Mānoa, Honolulu, HI

Algal Biodiversity and Distribution Before and After the Return of Previously Diverted Water to a Hawaiian Stream. Algal biodiversity and average percent quadrat coverage, were monitored as a component of an interdisciplinary stream restoration study before and after the return of previously diverted water to a stream system on the island of Hawai‘i. Monitoring was carried out in Lālākea and Hi‘ilawe Streams (above and flowing through Waipi‘o Valley) for a 10-month period prior to the return of water in June 2004, and for 20 months post-return to study the effects of water restoration. A combination of field observations, morphological characterization and molecular comparisons were employed to identify the macroalgal community composition and to characterize the habitat within the streams. Habitat characterization trends revealed an increase in the proportion of sites classified as runs and a decrease in the proportion of sites classified as “no water” with the return of water. Average percent cover of the survey quadrats by macroalgae ranged from 14% for Lālākea Stream on the first sampling trip to 63% for Hi‘ilawe Stream on the sixth sampling trip, but was not consistently increased or decreased with the return of water to the stream. A total of 66 macroalgal taxa were identified over the course of the study, including 25 cyanobacteria, 30 green algae, five red algae, one yellow-green alga and five diatom taxa identified. Increases in diversity at the species and broader taxonomic levels were found in both Hi‘ilawe and Lālākea Stream with the return of water to the system. Compared with stream surveys conducted in other regions of the world, the Lālākea-Hi‘ilawe watershed contains outstanding macroalgal biodiversity. This study represents one of the first to examine temporal changes in diversity and abundance in Hawaiian streams.

Poster 16

Henrietta Croom[1], Fred Stone[2], Shelley James[3], Francis Howarth[3]
[1]The University of the South-Sewanee, Sewanee, TN, [2]Hawai‘i Community College, Hilo, HI, [3]Bishop Museum, Honolulu, HI

Patterns of Speciation Among Endemic Hawaiian Nemobiinae Crickets: A Molecular Approach For Conservation. We have conducted phylogenetic analysis of sequences of two mitochondrial DNA genes from all known nemobiinae crickets of the Hawaiian Islands, comprising nine described and more undescribed species of the endemic genus *Caconemobius* and one indigenous species *Thetella tarnis*. The two marine littoral species—*Caconemobius sandwichensis* from four high islands and *C. nihoensis* from Nīhoa atoll—and the two lava flow species from Hawai‘i Island—*C. anahulu* and *C. fori*—constitute a single clade. All troglobitic (cave-adapted) populations from lava tubes on Hawai‘i Island form a second clade. Our results show that: 1) *Thetella* populations from four islands are essentially identical, 2) *Caconemobius sandwichensis* populations are similar but show a pattern of divergence from older to newer islands; 2) *C. nihoensis* is most closely related to the *C. sandwichensis* populations of Kaua‘i and O‘ahu; 3) both *C. fori* and *C. anahulu* represent recent adaptive shifts from two nearby *C. sandwichensis* populations on Hawai‘i Island; 4) the lava tube clade either diverged from the seacoast clade before Hawai‘i Island formed and thus represents a separate colonization, or the species have undergone unusually rapid sequence divergence; and 5) a single lava tube may harbour as many as three different troglobitic species. This work promises to yield data important for developing appropriate conservation strategies to protect these remarkable animals, as well as improving our understanding of how island invertebrates adapt to novel habitats.

Session I
Ecosystem
Services
Symposium

Gretchen Daily
Stanford University, Stanford, CA

Ecosystem Services in Hawai‘i. Ecosystems services are the life-supporting and fulfilling benefits that ecosystems confer on people and society. These include the production of goods (e.g., seafood, fine koa), life support processes (groundwater recharge, flood control), and life fulfilling conditions (beauty, inspiration, other cultural values), as well as the conservation of options (genetic diversity for future use). Unfortunately ecosystem services are poorly understood, scarcely monitored, and—in many important cases—undergoing rapid degradation and depletion. This is beginning to change. In hundreds of cases around the world, people have found ways of making conservation attractive, in

important economic and cultural terms. This presentation will provide an overview of these cases, their rationale, their scope and limitations, and the ways in which Hawai‘i is pioneering in this global transformation.

Session III
Inter Situ
Symposium

Mike DeMotta[1], Chris Swenson[2], Thomas Ka‘iakapu[3], K. R. Wood[1]
[1]National Tropical Botanical Garden, Kalāheo, HI, [2]U.S. Fish and Wildlife Service, Honolulu, HI, [3]DLNR/DOFAW, Līhu‘e, HI

Lehua: A Priority Islet for Conservation. Lehua Islet represents a secondary tuff crater and lies 1.2 kilometers off the northern point of Ni‘ihau, Hawai‘i. Publications over the last two years on Lehua’s flora and avifauna have helped to elucidate the biological importance of this 1.1 sq kilometer islet. Conservation efforts for Lehua include recent rabbit removal, vegetation monitoring, and strategic planning for rodent eradication in 2008. A native plant restoration project for Lehua is also being organized by members of the Offshore Islet Restoration Committee, in partnership with the Hawai‘i State Division of Forestry & Wildlife and the National Tropical Botanical Garden. A discussion on selected taxa and the criteria for their selection are presented, including the use of paleoenvironmental data derived from fossil pollen and radiocarbon screening of charcoal–to name a few. The restoration of Lehua offers opportunities for re-establishing endangered Hawaiian coastal species on small, manageable islets and for furthering scientific methodologies in conservation.

Poster 17

Viet Doan[3], Page Else[3], Allison Snyder[1], Sandy Margriter[1], Fritz Klasner[1], Barbara Gibson[2], Miguel Castrence[2]
[1]National Park Service, Hawai‘i National Park, HI, [2]University of Hawai‘i at Mānoa, Honolulu, HI, [3]Research Corporation of the University of Hawai‘i, Honolulu, HI

Landscape Change Monitoring in the Tropical Pacific. The National Park Service Inventory & Monitoring Program is developing a protocol that will utilize a variety of methods to monitor land use and land cover changes for the National Parks within the Pacific Islands. The approach will be to develop Remote Sensing and GIS methods to monitor changes in physiognomic classes such as vegetation formations (e.g., forest, woodland, grassland, shrubland, and sparse vegetation), wetlands, developed areas (e.g. agriculture, residential, industrial, and commercial), and water. Landsat satellite imagery from two time periods (1991 and 2001) will be used in a pilot study to detect the direction (type) and magnitude of land cover changes. Areas identified as having ‘changed’ will then be examined more closely using aerial photos, satellite imagery, and field data in order to develop new land cover maps that show the types of changes that have occurred within a 5 or 10 year time frame. Using the new land cover maps, along with other GIS data such as transportation (roads, harbors), land ownership, land stewardship, land use zoning, and demographics (population and park visitation summaries), Park Managers will be able to analyze status and trends in landscape change that have an impact on Park resources.

Session II
Native Biota
Session
Student

Stephanie F. Dunbar[1], Ania M. Wieczorek[2], Clifford W. Morden[1]
[1]University of Hawai‘i, Department of Botany, Honolulu, HI, [2]University of Hawai‘i, Department of Tropical Plant and Soil Sciences, Honolulu, HI

The Role of Molecular Systematics in the Conservation of Rare Species: A Case Study of *Plantago princeps* var. *princeps* (Plantaginaceae) on O‘ahu. Nowhere in the world should conservation be more of a priority than in the Hawaiian Islands, where degradation of native habitat and competition with alien species has so damaged the original environment that 317 species are now threatened or endangered, representing one-quarter of all federally listed species. Despite this, many of Hawai‘i’s native plant species remain unstudied. The endemic Hawaiian members of the plant genus *Plantago* are an interesting example of adaptive radiation. Five of the seven taxa within Hawaiian *Plantago* are currently endangered. Nevertheless, the group is understudied and relatively poorly known. In this study, we chose to focus our attention on the endangered, O‘ahu endemic, *P. princeps* var. *princeps*. We used DNA sequence data to examine the relationship between populations from the Wai‘anae and Ko‘olau ranges in hopes of prioritizing conservation efforts for this taxon. Phylogenetic analysis shows that populations of *P. princeps* var. *princeps* in the Ko‘olaus are

genetically distinct from those in the Wai‘anaes, but are genetically identical to populations of *P. princeps* var. *laxiflora* on Maui. This relationship is supported by ecological and morphological information. These results are being incorporated in the management decisions of the O‘ahu Army Natural Resources (OANR) and have led to the prioritization of conservation efforts for the Wai‘anae populations of *P. princeps* var. *princeps*. Taxonomic revision that groups the Ko‘olau populations with *P. princeps* on Maui seems warranted.

Session I
Insects
Symposium I
Student

Jesse Eiben, Dan Rubinoff
University of Hawai‘i at Mānoa, Honolulu HI

Status of the University of Hawai‘i Conservation Efforts for the Wekiu Bug (*Nysius wekiuicola*) on Mauna Kea, Hawai‘i. The Hawaiian *Nysius* contain about a quarter of the world’s species in the genus, with the wekiu bug (and its sister species the Mauna Loa bug, *N. aa*) showing the most derived ecology and morphology. Hawaiian *Nysius* seed bugs are widely distributed in drier environments on all of the Hawaiian Islands. While all other *Nysius* are seed-feeders, *N. wekiuicola* and *N. aa* are both flightless, micropterous, cold tolerant, scavenger-predators of moribund insects on the 13,790 ft volcanoes of Mauna Kea and Mauna Loa on the island of Hawai‘i. The wekiu bug is a candidate for listing under the Endangered Species Act, due to its decreasing numbers, limited range, specialized habitat requirements, isolated populations, and habitat destruction. Wekiu bug populations may be isolated on disparate cinder cones on Mauna Kea. For conservation of the species these populations may require different management, so the population level genetics of the wekiu bug have been studied with mtDNA data, and a nuclear DNA microsatellite study is in progress. The data from the COI gene showed no variation between different cinder cones. Continued monitoring of wekiu bug populations was conducted during the spring of 2007, and wekiu bug presence has been confirmed again in a wide range of habitat from the summit area to the SE fringe populations at 12,300 ft. Wekiu bugs collected during the spring are being studied to shed light on their still largely anecdotal life history and unknown reproductive capacity. The ongoing lab study of longevity and reproduction will be presented.

Session III
Conservation
Evaluation
Symposium

Terrell Erickson
USDA/NRCS, College Park, MD

Evaluating Conservation. Measuring conservation effectiveness is a new and expanding field, with its own parameters and language. The Office of Management and Budget’s Program Assessment Ranking Tool (PART) elucidates what the government wants federal agencies to do to be accountable. It may seem like “bean counting” to many, yet its bottom line is to show effectiveness and efficiency in our programs and actions. How effective are we as natural resource managers? Programs and actions are evaluated on numerous levels, top-down, i.e., Congress (General Accounting Office) or agencies (i.e. Office of the Inspector General), or internally, such as my work with the Natural Resources Conservation Service (NRCS). My presentation will focus on the framework of these types of evaluations, and how and why they got started. I’ll also discuss challenges the “audit” structure brings to the ecological arena, with examples from NRCS.

Session II
Insects
Symposium II

Curtis Ewing
University of California, Berkeley, CA

Life History and Conservation Status of the Endemic Hawaiian Sap Beetles (Coleoptera: Nitidulidae). The endemic Hawaiian sap beetles are a morphologically and ecologically diverse group. There are 140 described and over 50 undescribed species that are the result of a single colonization event. Monophyly of the endemic species is supported by morphological and molecular data and colonization is estimated to be pre Kaua‘i. All species are associated with native plants, with a wide variety of ferns (9 genera in 5 families) and flowering plants (86 genera in 53 families) exploited. The associations are primarily saprophylic in nature with adult beetles consuming primarily micro-fungi and pollen. Habitat loss and loss of specific host plants are obvious threats. One group of

6 closely related species has not been collected since the 1930s. All were associated with the subcortical microhabitat of *Acacia koa*. Concurrent with the disappearance of these species this microhabitat was invaded by non-native isopods. Alteration of host microhabitat leading to extirpation of host fungi in the absence of large scale disturbance is a less obvious threat to the survival of endemic Hawaiian sap beetles.

Poster 18

Chris Farmer[1], Kevin Brinck[1], Kalei Rapozo[1], Paul Banko[2], James D. Jacobi[2], Frederick R. Warshauer[1]

[1]USGS Hawai‘i Cooperative Studies Unit, Pacific Aquaculture and Coastal Resources Center, University of Hawai‘i at Hilo, Hawai‘i National Park, Hawai‘i, [2]U.S. Geological Survey, Pacific Island Ecosystems Research Center, Kīlauea Field Station, Hawai‘i National Park, HI

Invasion of Mauna Kea by Non-Native Weeds: Old Enemies and a New Threat. To assess potential threats to the subalpine woodland of Mauna Kea Forest Reserve, Hawai‘i Island, we surveyed the distribution of non-native weed species. In 1981, the presence or absence of invasive plants was surveyed at 383 stations, and in 1999-2001 we used point-intercept methods to characterize the vegetation at 504 stations around Mauna Kea. Recently we re-surveyed the forest reserve, taking point-intercept samples at 40 stations, including 23 on the western slope. Four weeds merit special attention because of their potential to suppress native vegetation, alter fire regimes, or spread rapidly. Fireweed (*Senecio madagascariensis*) increased dramatically: it was not detected in 1981, only scattered individuals were found at low elevation in 1999-2001, but >80% of stations were occupied in 2006, including sites above 3000 m elevation. Cape ivy (*Delairea odorata*) increased from trace detections in 1981 (<1% stations) to presence at ~10% of stations in 1999-2001 and 2006. Cape ivy has not expanded noticeably since 2001 and seems limited to areas of denser tree cover on Mauna Kea. The distribution of fountain grass (*Pennisetum setaceum*) has changed imperceptibly in the 25 years between surveys. Kikuyu grass (*P. clandestinum*) was not targeted in the surveys of 1981, but it was detected at ~2% of stations during 1999-2001 and 2006. No high-profile, non-native woody species (e.g., gorse [*Ulex europaeus*]) were detected in any of our three surveys. However, we demonstrated that some weed species, such as fireweed, can rapidly spread and their effects on fire and nutrient cycles warrant further investigation.

Poster 19

Chris Farmer[1], Paul Banko[2], Kevin Brinck[1], Jeremy Morris[1], Carter Snow[1]

[1]USGS Hawai‘i Cooperative Studies Unit, Pacific Aquaculture and Coastal Resources Center, University of Hawai‘i at Hilo, HI, [2]U.S. Geological Survey, Pacific Island Ecosystems Research Center, Kīlauea Field Station, Hawai‘i National Park, HI

Demography of a Reintroduced Colony of Palila. There are approximately 2500 Palila (*Loxioides bailleui*) remaining, concentrated on the western slope of Mauna Kea. We reintroduced birds within the species' former range by translocating 188 palila to the northern slope during 1997-2006. Additionally, the Zoological Society of San Diego released 21 captive-reared Palila on the northern slope in 2003-2005. The result is a colony of approximately 20 adult Palila: 15 (6 females) from the 2004-2006 translocations and five (2 females) from captive-rearing. No reproduction was detected during 1997-2003, but a translocated and a captive-reared pair nested unsuccessfully in 2004. Successful breeding was not evenly distributed among individuals. During 2005-2006, five females and six males (including a captive-reared male) produced ten fledglings (from 16 nests), six of which survived to March 2007. Hatch success for translocated palila (70%; n=17 eggs) was at the high-end compared to western slope Palila (47-71%; n=909 eggs; 1988-2001), but none of 3 eggs from captive-reared females hatched. Because we monitored the colony throughout multiple years, we were able to detect an increase in fecundity each year after 2004, and by 2006 it was similar to the fecundity of the western population. Our results suggest two important considerations for future conservation programs: 1) many birds should be translocated or released to ensure the inclusion of individuals most likely to breed; and 2) several years of monitoring are necessary to assess the success of restoration efforts because the productivity of recently reintroduced birds seems to increase over time.

Session II
Big Picture
Session

Charles Fletcher, Zoe Norcross-Nu‘u, Matthew Barbee, Ayesha Genz, Brad Romine, Chris Bochicchio, Matthew Dyer
University of Hawai‘i, Honolulu, HI

Beaches, First Victims of Global Warming in Hawai‘i. This talk will highlight rates of shoreline change on O‘ahu, Maui and Kaua‘i and analyse the convergence of eroding coasts, sea-level rise, and shoreline development. Rising sea level leads to accelerated coastal erosion which increases the vulnerability of coastal communities. Under IPCC-IV scenarios of rising sea level in the next 5 decades, the existing 1:60 ratio of sea-level rise to erosion measured in Waimānalo, for example, suggests coastal erosion will potentially threaten homes and roadways presently over 100 ft away from the shoreline. The present Hawai‘i setback is only 40 ft. Hence, coastal homes will require seawalls in a few decades. This armoring will lead to beach loss and decreased public access where there is chronic shoreline recession. Beaches will be the first victims of global change in Hawai‘i, and probably around the world. This talk will also explore the threat of coastal plain flooding as sea level rises. The water table will rise on low-lying coastal plains, and after heavy rainfall areas that today are poorly drained will cease to drain altogether. This process is already taking place in several areas including the Honolulu airport. Eroding coasts, beach loss, decreased drainage following rains, lost public access, and increased inundation due to high waves and high tides are the combined effects of global change along our shorelines. The expense will be significant and there exists no state or county program in recognition of this coming calamity. The following talk will examine the management implications of these trends.

Poster 20

Erin Foley
Pōhakuloa Training Area, HI

The Role of Herbaria in Proficient Land Management: Developing a Small-Scale Herbarium at Pōhakuloa Training Area. Plant reference collections, or herbaria, facilitate proficient land management. Herbarium specimens provide documentation of plant occurrences at specific locations and are useful as references for plant identifications. Data linked to collections including habitat type, associated species, elevation, phenology, etc., provide valuable information for related research topics. Herbaria with ongoing specimen collection document changes in species occurrences on managed lands over time, yielding data useful in studies concerning biodiversity, invasive weeds, and rare plant ecology. Small-scale herbaria, such as the herbarium at Pōhakuloa Training Area (PTA) can be developed with minimal resources, while supplying valuable information necessary for successful land management. At PTA new collections are being added, processed, and stored according to standard herbarium procedures. Collections are being utilized as vouchers in our Incipient Weed Program, which aims to document new occurrences and the spread of weedy plant species. Collections are also being made to assess plant species composition of outplanting sites. Additionally, the herbarium provides an excellent resource when unknown plants are encountered. Currently, the herbarium at PTA includes 441 accessions of 195 unique taxa, with herbarium data being managed in Access and ArcGIS. Supplies and storage materials for an additional 200 accessions have been acquired for less than five hundred dollars, and duplicate specimens are being sent to the Bishop Museum’s Herbarium Pacificum. A small-scale herbarium, such as the one at PTA, can be developed with minimal resources, providing an important scientific reference useful to land managers.

Session VI
Monitoring
Symposium I

David Foote
U.S. Geological Survey, Pacific Island Ecosystems Research Center, Hawai‘i National Park, HI

Using Monitoring Data to Manage Yellowjacket Wasps in Hawai‘i. Introduced western yellowjacket wasps, *Vespula pensylvanica*, are a threat to arthropod biodiversity in native ecosystems including National Parks and Refuges of Hawai‘i. Wasp populations are presently monitored using non-toxic plastic traps baited with heptyl butyrate and checked monthly for *Vespula* workers. The population monitoring program for yellowjacket wasps will be reviewed and its application to

effective wasp control programs will be discussed.

Session I
Insects
Symposium I

David Foote
U.S. Geological Survey, Pacific Island Ecosystems Research Center, Hawai‘i National Park, HI

Using Rare Hawaiian Picture-Wing *Drosophila* as Targets of Restoration. Because of their host-specificity and attraction to baits, endemic picture-wing *Drosophila* are useful in evaluating the success of habitat restoration programs targeting rare plants. The status of picture-wings in Hawai‘i Volcanoes National Park is discussed in the context of long-term surveys of *Drosophila* communities in montane wet and mesic forests within the park.

Session I
Ecosystem
Services
Symposium

Mark Fox[1], Peter Morgan[2]
[1]The Nature Conservancy of Hawai‘i, Honolulu, HI, [2]Stanford University, Stanford, CA

Policy Dimensions of the Ecosystem Services Approach in Hawai‘i. Changes in governmental policy - at the local, state, or federal level - will play an important role in connecting the scientific understanding of ecosystem services to public and private decision-making. The vital services provided by natural systems are not fully recognized or valued under existing government policies and, as a result, these services are not adequately considered by public and private entities in making land use and other decisions. Hawai‘i’s ecosystems provide services that could be valued at the global as well as the local scale. In some cases, existing laws and regulations can create perverse incentives that actually hasten the destruction of ecosystems. Policies can be changed to promote the valuation of, and compensation for, ecosystem services in two fundamental ways. Under one approach, laws and regulations can be changed to create a structure in which ecosystem services may be traded on the open market. Such markets already exist in Europe and elsewhere for the service of carbon sequestration. Under another approach, policy makers may choose to provide direct payments to landowners in exchange for the provision of ecosystem services that benefit society in general. This talk will describe the ways in which these approaches can be applied in Hawai‘i, including examples of ongoing and potential efforts to create ecosystem service based incentives for the conservation of private land.

Poster 21

Jean Franklin[3], Julie Denslow[1], Melora Purell[2]
[1]Institute of Pacific Islands Forestry, USDA Forest Service, Hilo,Hi, [2]Kohala Watershed Partnership, Kamuela,Hi, [3]Big Island Invasive Species Committee, Hilo,Hi

Using Spatial Data to Inform Strategies for Invasive Species Control. The Big Island Invasive Species Committee (BIISC) is developing strategies for invasive species control on Hawai‘i island. Spatially-referenced data collected by BIISC field crews are essential to building these strategies because they provide information about the presence, extent and density of target invasive species. Analysis of these data provides visualizations of species density and potential distribution. *Miconia calvescens* has been a primary target species for BIISC for the past decade, and extensive data on distribution and density have been collected since 1996 from ground and aerial surveys of both large control blocks and smaller monitoring plots. Interpolation maps which estimate density distribution were created in a GIS using centroid point densities of monitoring blocks. These interpolation maps suggest numerous hotspots within a matrix of low density *Miconia*. Density classifications based on these maps offer BIISC a method of prioritizing population types for containment and control efforts. We utilized the niche modeling program GARP (Genetic Algorithm for Rule-set Production) to map suitable habitat for *Miconia*. This program uses an iterative process to predict the potential distribution of *Miconia* based on the environmental parameters of its current distribution. BIISC will use these maps of suitable habitat to visualize potential threats and to reassess the focus of future control strategies. BIISC field crews have collected spatial data on other invasive species, including fountain grass, *Bocconia* and coqui frogs, and will apply these techniques to plan strategies for these invaders as well.

Plenary Speaker

Holly B. Freifeld[1], Helen Gummer[2]
[1]U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, HI, [2]Private Contractor, Wellington, New Zealand

Seabird Translocation, New Zealand-style: Ideas and Applications for Restoration and Conservation in Hawai'i. The New Zealand/Hawai'i Conservation Exchange Program, sponsored by the Hawai'i Conservation Alliance and Manaaki Whenua Landcare Research in New Zealand, seeks to "enhance communication of approaches, techniques, and philosophies relevant to…common conservation and management issues" through interaction among conservation workers in the two archipelagos. With support from this program and the community non-profit group Friends of Mana Island (FOMI), HBF traveled to New Zealand in January 2007 to assist HG, contractor to FOMI, with the second of three planned translocations of Fluttering Shearwaters (*Puffinus gavia*) to Mana Island, a scientific reserve owned and managed by the New Zealand Department of Conservation. The purpose of HBF's participation was to gain hands-on experience of translocation methods pioneered in New Zealand. Ninety-one chicks between two and five weeks from fledging were transferred from their natal colony on Long Island (Marlborough Sounds) to Mana Island (off the Porirua coast) on 4 January. Under supervision of HG, HBF participated from 4 to 14 January along with other volunteers in preparing artificial burrows, monitoring and hand-feeding chicks, and preparing food and equipment. By 10 February at least 81 chicks or 90% were presumed to have fledged successfully. Field time permitted extensive discussion of the evolution of translocation techniques, critical decision points for individual birds and translocation efforts, and lessons learned for taxa that are similar to Hawaiian seabirds. In addition, ideas and suggestions were raised for the application of seabird translocation as a tool for the restoration and conservation of Hawaiian seabirds.

Poster
Science Fair Student

Jacob Garner
Mililani High School, Mililani, HI

Species Distribution Relative to Soil Characterization in Kalaeloa. This project examined the relationship between plant species distribution and soil characterization in the U.S. Fish and Wildlife Kalaeloa Coastal Preserve. It was hypothesized that the inland soil at Kalaeloa Coastal Preserve will be more nutrient rich (adequate levels of nitrogen, potassium, and phosphate) and have an almost neutral pH compared to the areas of coastal soil will be less nutrient rich and have a more basic pH. It was further hypothesized that the differences in soil would affect plant species distribution. Data was collected in two plots within the preserve, one coastal and one inland. The location of the plots was recorded using handheld GPS units. Plant species distribution data was collected by visually surveying all species within the plots and recording them on graph paper. Dr. Bruce Koebele was present to ensure accurate species identification. Soil characterization was performed on soil samples from each plot collected from the roots of invasive species. Using the LaMotte EL soil testing kit, measurements of nitrogen, phosphorus and potassium were obtained. Soil pH measurements were gathered using an electronic pH meter in slurries made from the soil samples. Significant differences were identified in both the species distribution and soil characterization in the plots studied. These results have implications for the preserve managers as they work to restore native plant species in this preserve.

Session III Conservation Evaluation Symposium

Charles Giuli
Pacific Resources and Learning, Honolulu, HI

Evaluation Practice in 2007: Implications for Evaluation of Conservation Programs. In 2007, evaluation finds itself characterized by the growing call to accountability in government and non-government sectors alike. Those who fund public sector endeavors increasingly call for evidence that the programs they fund are doing what they said they would do and that they result in valued and meaningful outcomes. The field of conservation is also receiving this call. We should expect increasing insistence by program funders that evidence of effectiveness be provided. Most conservation program managers know that there is an increasing importance of the evaluation section of funding proposals, a growing interest by funders on immediate outcomes and longer-term impact,

and a growing focus on the science behind proposed treatments. In the first months or year, then, of program implementation, evaluation will typically focus on getting information about successful implementation to program managers. These near-term corrections in implementation trajectory are called process evaluation or formative evaluation. After implementation seems secured, evaluations will typically focus on measuring how well projects achieve their objectives and how well the project goals and objectives result in beneficial environmental impacts. Because environmental impacts usually take a while to manifest, a project's success in achieving favorable impacts in nature will probably not be available for measurement during the duration of project funding. Accordingly, it will be necessary to devise ways to study the long-term effects or impacts of conservation projects outside the bounds of typical funding cycles for public sector projects.

Session I Ecosystem Services Symposium

Josh Goldstein, Gretchen Daily
Stanford University, Palo Alto

Paying for Ecosystem Services in Hawai'i. Around the world, innovative financial instruments are being created to make conservation economically attractive and mainstream. To be successful, these efforts must find creative ways to integrate conservation and economic production practices on private, working lands – lands that are an important complement to public lands in supplying ecosystem services and conserving biodiversity. Drawing upon conditions in Hawai'i and insights from pioneering conservation payment projects throughout the world, we develop a framework for tiered financial incentives targeting ecosystem services and biodiversity in Hawai'i. These payments would reward landowners with base payments for undertaking minimum levels of conservation actions, as well as bonus payments linked to specific conservation outcomes to encourage management practices that increase the flow of benefits resulting from land management. We explore how these financial incentives for private landowners could be structured on pasture and forested lands in Hawai'i to advance restoration efforts, as well as maintain existing areas of high-conservation value.

Session VIII Monitoring Session

Samuel M. Gon III[1], Theresa C. Menard[2]
[1]The Nature Conservancy, Honolulu, HI, [2]The Nature Conservancy, Kaua'i Program, Līhu'e, HI

A Conservation Analysis of Ecological Systems of the Hawaiian Ecoregion. The Hawaiian Ecoregion is comprised of distinctive species, natural communities, and ecological systems of great conservation value both globally and within the biogeographic realm of Oceania. A conservation analysis of the terrestrial ecoregion identified 10 ecological system types with uneven distribution across the archipelago. Assessment of their relative viability via comparison of size, condition, and landscape context confirms the well-known pattern of greater disturbance and lower viability of systems at lower elevations. A series of assessments exercising principles of conservation goal setting, such as stratification, complementarity, feasibility, and leverage were applied to ecological systems and other conservation targets to ensure redundant, representative protection of highest priority native biodiversity landscapes in the ecoregion. The results are very consistent with cooperative landscape management strategies such as the watershed partnerships, but larger-scale threat abatement must be realized to ensure effective long-term conservation of the ecoregion's biodiversity.

Session III Conservation Evaluation Symposium

Samuel M. Gon III
The Nature Conservancy, Honolulu, HI

Developing a State-wide Hawaiian Conservation Scorecard. Conservation organizations and agencies in Hawai'i have made significant investments in conserving Hawai'i's natural heritage over the past few decades. Despite considerable efforts by a range of agencies and organizations, monitoring and measurement of the effectiveness of conservation have not been coordinated at a state-wide level. To track accomplishments of state-wide conservation goals, definitions and indicators of effective conservation have been needed (change around). Measuring and reporting on a set of indicators would enable the conservation community to collectively communicate the results of

conservation interventions in Hawai‘i to decision makers, stakeholders, and the public. Members of the Hawai‘i Conservation Alliance met in April 2007 to identify measures that could serve as the state’s collective set of indicators for a Hawai‘i Conservation Scorecard and to outline priorities for creating a system of storing and dispensing data for the scorecard. A consensus definition of effective conservation was developed, and initial indicators for four categories of effective conservation (biodiversity, stakeholders, protective designation, and threat management) were proposed. This presentation provides an update on the current effort to develop a Hawai‘i Conservation Scorecard and a system for storing, dispensing, and reporting conservation data.

Session I
Near Shore/
Marine
Symposium

Debbie Gowensmith, Luna Kekoa
Community Conservation Network, Honolulu, HI

Looking Forward to the Past: Community-Based Marine Resources Management in Hawai‘i. Examples from around the world demonstrate that the condition of marine resources and community well-being can improve simultaneously when a community has a significant degree of responsibility for management. In Hawai‘i, many communities are extremely concerned about the loss of natural resources and habitats and equate this decline with further loss of their culture and way of life. Native Hawaiians practiced sustainable management of their marine resources, which in turn provided abundant food, spiritual and cultural elements, and recreational opportunities. With western contact came the removal of local communities from playing an "official" role in marine resource management. Today, many communities in Hawai‘i are using traditional knowledge and practices, combined with modern techniques, to enhance management of marine resources in their areas. Their involvement holds great potential and promise for the future of resource restoration and sustainability. We will review the involvement of some communities in marine resources management in Hawai‘i, the roles they play, the processes they use, the direction they are headed, and lessons learned.

Poster 22
Student

Toni Makani Gregg[3], Nicole Hoku Cody[3], Misaki Takabayashi[3]
[1]University of Hawai‘i, Hilo, HI, [2]Keaholoa STEM, Hilo, HI, [3]Marine Science Department, Hilo, HI

Coral Health in Protected and Unprotected Areas in the Wai‘opae MLCD Tide Pools. Scattered along the east side of Hawai‘i Island are tide pools made of dense porous lava rock. Some of these tide pools are found in Wai‘opae Marine Life Conservation District (MLCD) within which live many of Hawai‘i’s common reef building corals. These corals experience wide ranges of salinity and temperature, and they are exposed to terrigenous materials via runoff or leaching through the porous substrate in the tide pools. Coral health can be disrupted in response to biotic stresses such as bacteria or viruses, and/or by abiotic stresses such as increased seawater temperatures, sedimentation and pollutants. In Hawai‘i, reports of coral diseases appear to have increased over the recent years. However, exact causes for most coral diseases remain unknown. Determination of the causal agent is complicated by the fact that the onset of most diseases likely is a response to multiple factors. Since there is little research conducted on the coral health in these tide pools, we began monitoring the health of corals monthly in and out of the MLCD in June 2006. Randomly selected and repeatedly sampled coral colonies were identified, their diameter measured, photo documented, and their proportion of diseased or unhealthy surface areas determined. Our results so far indicate that growth anomalies were most prevalent in *Montipora capitata* colonies, whereas *Porites lobata* is most vulnerable species to tremetodiasis (“coral zits”). Salinity and temperature were also measured but do not seem to correlate to prevalence of any coral ailments. We are continuing the survey till August 2007 to monitor for any recovery or other changes.

Session VII
Invasives
Session III

John Gutrich[1], Ellen VanGelder[2], Lloyd Loope[3]
[1]Hawaii Pacific University, Honolulu, HI, [2]Pacific Cooperative Studies Unit, Dept of Botany, University of Hawai‘i a Mānoa, Hawai‘i, [3]U.S. Geological Survey, Pacific Island Ecosystems Research Center, Haleakalā Field Station, Makawao, Maui, Hawai‘i

Potential Economic Impact of Introduction and Spread of the Red Imported Fire Ant, *Solenopsis invicta*, in Hawai‘i. The Red Imported Fire Ant, *Solenopsis invicta*, has created billions of dollars in costs annually, spreading as an invasive species across the southern United States. In 1998,

the red imported fire ant spread into California creating a highly probable future introduction via shipped products to Hawai‘i. Our study presents the estimation of potential economic impacts of the Red Imported Fire Ant (RIFA) to the state of Hawai‘i. Evaluation of impacts focuses on the economic sectors of 1) households, 2) agriculture (cattle and crop production), 3) infrastructure (cemeteries, churches, cities, electrical, telephone, and cable services, highways, hospitals and schools), 4) recreation, tourism and business (hotels/resort areas, golf courses, commercial businesses and tourists) and 5) government expenditures (with minimal intervention). The full annual economic costs of the Red Imported Fire Ant to Hawai‘i are estimated (in US$ 2006) to be $211 million/year, comprised of $77 million in damages and expenditures and $134 million in foregone outdoor opportunities to households and tourists. The present value of the projected costs of RIFA over a 20-year period after introduction total $2.5 billion. RIFA invasions in other states and countries indicate that economic cost-effective action in Hawai‘i entails implementation of prevention, early detection and rapid response treatment programs for RIFA.

Session I
Insects
Symposium I
Student

William Haines, Cynthia King, Daniel Rubinoff
University of Hawai‘i Department of Plant and Environmental Protection Sciences, Honolulu, HI

Rethinking Extinctions: Conservation Status of Hawaiian Leafroller Moths in the Genus *Omiodes* (Crambidae). Partly because the genus *Omiodes* (formerly *Hedylepta*) contains the only native Hawaiian insects to be specifically targeted by biological control programs, the conservation status of this group has been of interest to entomologists, conservation biologists, and agriculturalists. Due to suspected pressures of biological control agents, accidentally introduced parasitoids and predators, and habitat destruction, 14 of the 23 Hawaiian species have been listed as extinct since the 1980s. To better understand current distributions and conservation status of *Omiodes* and other Hawaiian Lepidoptera, we have conducted light trapping and host plant surveys on most of the Hawaiian Islands, and have discovered populations of at least 6 “extinct” species. Several species formerly listed as extinct, such as *O. continuatalis* and *O. monogona*, are actually widespread. Other species, such as *O. asaphombra* and *O. anastreptoides*, have a more restricted range. Yet others, such as *O. epicentra* and *O. telegrapha*, have not been recorded for a hundred years, and are likely to be extinct. Controlled exposure trials have also been completed to assess actual parasitism rates in populations of some of the rediscovered species. Systematic analyses of molecular data shed further light on the evolutionary significance of certain populations, suggesting that some morphotypes described as distinct species may be color variants of other species. Our findings highlight the value of focused surveys and phylogenetic analyses when identifying threatened populations of insects and other cryptic organisms.

Session III
NWHI
Symposium

Russell Brainard[1], Dan Polhemus[2], Megan Moews[3], **Amy Hall[3]**, Elizabeth Keenan[3]
[1]Pacific Islands Fisheries Science Center, NOAA, Honolulu, HI, [2]State of Hawai‘i, Division of Land and Natural Resources, Honolulu, HI, [3]Joint Institute for Marine and Atmospheric Research, University of Hawai‘i, Honolulu, HI

Biodiversity Census at French Frigate Shoals, A Baseline Diversity Study. While coral reefs are considered to be the most biologically diverse of all marine ecosystems, most of their diversity remains unknown and significant declines in key indicators suggest a degradation of coral reefs globally. The vulnerability of these ecosystems is anticipated to increase significantly in response to climate change-induced coral bleaching and disease, ocean acidification, sea-level rise, and changing storm tracks. There is clear danger that much reef diversity could be lost before it is documented and managers will be left with a limited understanding of undisturbed reef communities. To effectively manage and conserve these ecosystems, it is first necessary to obtain baseline data and enhance understanding of existing biodiversity and changes over time. As part of the Census of Marine Life, Census of Coral Reefs (CReefs) project, the Pacific Islands Fisheries Science Center’s Coral Reef Ecosystem Division (CRED) led a biodiversity census at French Frigate Shoals in the Papahānaumokuākea Marine National Monument. A multi-institutional team of taxonomists focused sampling efforts on small, poorly known organisms, particularly invertebrate, algal and microbial

species. At least 1600-2100 unique morphospecies were documented during the 16-day field survey, which sampled 14 habitats utilizing 14 unique methodologies designed to minimize ecological impacts. It is estimated that well over 100 new species and/or records were collected during the expedition. As processing and identifications are completed, data will be disseminated for managers, public stakeholders, and the scientific community as a foundation to enhance the capacity for ecosystem-based management and increase the ability to predict ecosystem change globally.

Session VI Bridges to the Future Forum

Neil Hannahs
Kamehameha Schools, Honolulu, HI

Honoring Traditional Values and Becoming People of Place, Caring for Place. The land legacy of Kamehameha Schools provides a link to a chiefly lineage and the special relationship these individuals had to 59 ahupua‘a and ‘ili on five of Hawai‘i’s islands. These lands represent places of significance to the Kamehameha ‘ohana. The privilege of their conveyance into the Trust is associated with a kuleana to honor and mālama ancestral connections to these significant places. Rather than look upon land solely as an economic resource, traditional Hawaiian beliefs hold that humans and land exist in a reciprocal relationship. The ‘āina is imbued with ancestral mana (spiritual force) that is preserved through the generations. The strong connection to one’s surroundings comes from centuries of living, cultivating, learning, sharing, stewarding and dying on the same land. Place-based learning situates the learner in the rich history, stories and oli of the land, thus reinforcing the integral link between ‘āina and identity. This accumulated knowledge is a source of spiritual strength and life force. Kamehameha Schools’ Land Asset Division has two initiatives to achieve its mandate for ethical, prudent and culturally appropriate stewardship of lands, resources, native ecosystems and wahi kūpuna. The ‘Āina Ulu and First Nations Futures programs fortify the connection between people and place. They also shape the values of future Hawaiian resource managers who must assume kuleana for ensuring an ecologically rich and healthy habitat in perpetuity that will enable the existence of a thriving people.

Session V Watershed Session

Katina Hanson, Michael Robotham
USDA Natural Resources Conservation Service, Pacific Islands Area, Honolulu, HI

What You Need to Know if You Want to Use the Results from a Watershed Model: Uncertainties in Erosion and Sediment Delivery Modeling in Pacific Island Watersheds. Increasing awareness of the impact of land based management activities on terrestrial and marine environments has created a high demand for watershed-level models of erosion and sediment delivery. Although model results can be valuable, especially for landscape level decision-making, scientists and managers need to be aware of the limitations and uncertainties related to the types of models typically utilized. This presentation highlights issues associated with the basic data inputs and processes in several commonly used models. It also addresses some of the confounding factors involved in model design and application, especially in Pacific Island environments. These factors include representation of native versus non-native ecosystems, use of sediment delivery ratios and modeling of stochastic events such as fire, landslides and ungulate activity. The assumptions related to these issues are also examined, and how these assumptions lead to uncertainties in the model results are further evaluated. In conclusion, the potential implications of these assumptions and uncertainties on the use of model results to inform management decisions are discussed.

Session IX Ecosystem Management Session

Jeff Hatfield[1], Edward Lindquist[2], Peter Sparks[3], Clytie Mead[3], Jack Jeffrey[4]
[1]U.S. Geological Survey, Laurel, MD, [2]none, Duluth, MN, [3]none, Honokaa, HI, [4]U.S. Fish and Wildlife Service, Hilo, HI

Growth Rates of Trees and Shrubs in Three Forests on the Island of Hawai‘i, 1996-2007. Understanding the dynamics of native forest communities will help guide managers in the preservation and restoration of plant and animal populations in these communities. Growth rates based on the diameter at breast height (DBH) of the 2 canopy species (*Acacia koa* and *Metrosideros polymorpha*) and 11 subcanopy species (*Cheirodendron trigynum, Coprosma* spp., *Hedyotis terminalis, Ilex anomala*,

Melicope clusiifolia, M. pseudoanisata, Myoporum sandwicense, Myrsine lessertiana, M. sandwicensis, Styphelia tameiameiae, and *Vaccinium calycinum*) were measured in the Kulani Forest (July 1996-2006) and Keauhou Ranch (July 2003-2006) on Mauna Loa. Height growth of saplings of the canopy species also was measured, as was trunk height growth of *Cibotium glaucum*. Growth of the 2 canopy species was also measured at the U.S. Fish & Wildlife Service's Hakalau Forest National Wildlife Refuge (July 1997-January 2007) on Mauna Kea. A repeated measures analysis of covariance was used to evaluate differences in growth rates among tree species, time periods and study areas. For most periods growth of *Acacia koa* was greater than that of *Metrosideros polymorpha*. Furthermore, growth at Hakalau was greater than at the other 2 sites, probably because of the more open nature of this forest as it recovers from damage that may have occurred there due to grazing in the past. Recommendations include planting a variety of tree species in reforestation efforts, and factoring into management plans the age necessary before some tree species (e.g., *M. polymorpha*) may become fully utilized by endangered forest birds in the restored forests.

Plenary Speaker

David Helvarg
The Blue Frontier Campaign, Washington, DC

Saving the Ocean. Throughout human history we have lived well on the abundance of our seas and coastlines from the earliest canoe tribes setting fish-traps along the Jersey shore, to the great Polynesian explorers of the Pacific, and beyond. The Pew Oceans Commission of 2003 and U.S. Commission on Ocean Policy of 2004 reports emphasized that America owes much of its wealth, bounty and heritage to the blue in our red, white and blue. Our living waters are today endangered by a cascading series of environmental threats, from over-fishing for the global seafood market to the nutrient pollution of our near-shore seas, from coastal sprawl that destroys the nurseries and filters of the ocean, to global warming that threatens our reefs, shores, and homes with coral bleaching, acidification of seawater, sea level rise, shifting temperature regimes and increased frequency of the most severe hurricanes. In response we need to develop and expand, not only our scientific understanding of the seas, but also an active and educated political constituency for the protection, exploration and restoration of our living oceans. So where are the first ripples in a rising tide of citizen action for the recovery of our Blue Frontier and marine heritage? What solutions can work? Does protecting our nation's watersheds, shorelines, and seas make sense both morally and economically? Indeed there are ways - this is why I'd propose that, after taking a refreshing plunge (or many) into the ocean each of us ought to towel off and consider what role we as individuals can play in this growing seaweed—marine grassroots—rebellion of creativity and solution-oriented efforts taking place across our land, and from sea to shining sea.

Session VI Monitoring Symposium I

Steven C. Hess, Robert M. Stephens
U.S. Geological Survey Pacific Island Ecosystems Research Center, Hawai'i National Park, HI

Effective Ecological Monitoring Symposium: Ungulate Monitoring. There has generally been very little rigor dedicated to monitoring ungulates in Hawai'i because, unlike endangered plants and animals, ungulates are rarely considered the object of conservation efforts. Therefore, it is difficult to justify the expense of sophisticated monitoring schemes, and there are often little or no data to determine if management actions meet stated goals. We detail several effective methods used to monitor ungulates depending on objectives and study conditions that do not require great effort or expense. Methods that have been applied in Hawai'i and other locations for long periods of time, such as feral pig index surveys, line-transect aerial surveys, belt-transect aerial surveys, and group composition surveys can be adapted to provide useful indices of population status and trend. More elaborate schemes can be integrated with vegetation monitoring or other aspects of watershed, ecosystem, and community health in an adaptive management framework.

Session VIII Monitoring Session

Steven C. Hess
U.S. Geological Survey Pacific Island Ecosystems Research Center, Hawai‘i National Park, HI

Ungulates in Hawai‘i: A Literature Review. The peer-reviewed scientific literature on feral ungulates in Hawai‘i has been recently characterized as inadequate and ageing. I reviewed the scientific literature on feral pigs in Hawai‘i and found more than 75 journal articles, technical reports, theses, and dissertations, of which 40 contained systematic analyses of empirical data. For other ungulate species, there were more than 30 journal articles and technical reports, and 19 of these contained systematic analyses of empirical data. More than 40 publications were useful in determining the effects of ungulates on vegetation. More than 20 papers dealt with abundance, distribution, or population dynamics of the animals themselves. Several notable studies examined the effects of exclosures and larger-scale ungulate removal on native vegetation and invasive alien plants. However, at least 70% of this entire body of literature dates from 1994 or earlier. This area of inquiry could benefit from updates and syntheses such as meta-analyses and integration with findings on alien ungulates from other insular and continental settings.

Poster 23

Glenn Higashi[1], James Parham[2], Eko Lapp[1]
[1]Division of Aquatic Resources, DLNR, Honolulu, HI, [2]Bishop Museum, Honolulu, HI

Atlas of Hawaiian Watersheds and Their Aquatic Resources. The Atlas of Hawaiian Watersheds and their Aquatic Resources was created by the Hawai‘i Division of Aquatic Resources and Bishop Museum. The Atlas provides data currently known to State aquatic biologists. The Atlas combines survey information from a relational database (MS Access) with spatial information from a geographic information system (ArcGIS) to provide tabular and map-based results for the State’s main watersheds. The Atlas describes each watershed’s physical information, streams and reaches, sampling effort, species observed, stream status, watershed threats, and provides a bibliography. The Atlas contains 440 watersheds from five main Hawaiian Islands. 12,283 surveys include eight survey types. 91,089 animal observations represented 372 species in nine phyla. Streams were ranked according to biological resources and biotic integrity. Included with each rank was a weighting factor to help readers assess data strength used to develop the ranking. The strength depends on the number, geographical distribution, and taxonomic diversity of surveys. The Atlas provides insight into important factors affecting habitat and distribution of aquatic animals and improves decision-making among the different watersheds. The Atlas’s design allows easy updating of information to allow new survey data to be rapidly included in future web and print versions.

Session IX Ecosystem Management Session

Paul Higashino
Kaho‘olawe Island Reserve Commission, Wailuku HI

Ten Years of Ecological Restoration on Kaho‘olawe. In the last 10 years, efforts to restore Kaho‘olawe include planting more than 250,000 native grasses, shrubs and trees. Over 3000 volunteers have assisted in this effort to revegetate the island and reduce soil erosion. Survival rates of plants have increased from 15% to 80% as 600,000 gallons of water have become available for irrigation on an annual basis. Pili grass bales from Moloka‘i are used for planter boxes and seed capture in areas that were only surface cleared of ordnance. Wattles made of geotextile and pili grass have reduced soil runoff and provided a soil substrate for the plants in some of the most exposed portions of the island. This has improved habitat for native insects and birds, and reduced the amount of soil entering the near shore pristine ocean waters. Coastal areas near Honokanai‘a bay are also being restored with native plant species. With continued assistance from volunteers from the community, the ecological damage from 200 years of goats, cattle ranching, and 50 years of military presence will continue to be repaired on Kaho‘olawe.

Session VII
Invasives
Session III

Robert Hollingsworth[1], Gary Chastagner[2]
[1]US Pacific Basin Agricultural Research Center, Hilo, HI, [2]Washington State University, Puyallup, WA

Measures to Reduce the Risk of Yellowjacket Queens in Christmas Trees Imported into Hawai‘i. Between 1993 and 2006, Hawai‘i imported an average of 350 sea-freight containers each year filled with Christmas trees from the Pacific Northwest. A wide variety of insects, spiders and other organisms have been intercepted by state quarantine inspectors in these shipments, including several different species of yellowjacket wasps. These wasp species represent a significant threat to the biodiversity of endemic Hawaiian arthropods. We applied sprays of pyrethroid insecticides at ordinary rates to Christmas trees growing in the state of Washington at various pre-harvest intervals. We then measured the survival of *Vespula pensylvanica* (Saussure) and several other species of Hymenoptera confined to foliage samples at harvest time. Insects were examined 24 hours following initial exposure, and the number of dead or moribund insects was recorded. Pesticide residues on foliage treated three weeks before harvest caused complete morbidity of the hymenopterous species tested. Pre-harvest sprays of pyrethroid insecticides appear to represent a safe, effective and practical method for controlling yellowjacket wasps in Christmas trees. In combination with mechanical shaking treatments and improved inspection protocols, this control measure could be used to greatly reduce the risk that new yellowjacket species will become established in Hawai‘i.

Poster 24

Nick Holmes[1], Kenneth Wood[2]
[1]Kaua‘i Endangered Seabird Recovery Project, Hawai‘i, [2]National Tropical Botanical Gardens, Hawai‘i

Conservation Status of the Hawaiian Petrel *Pteradroma sandwichensis* on Kaui‘i, Hawai‘i. The Hawaiian Petrel (‘Ua‘u) is State and Federally listed as endangered, with the breeding range restricted to the main Hawaiian Islands. Indirect evidence of Hawaiian Petrels breeding on Kaua‘i is relatively well documented, with adults seen and heard flying inland at dusk, and fledglings rescued from the ground after falling victim to artificial light attraction. Despite the petrels’ documented presence on Kaua‘i, their exact breeding locations within the mountainous interior of the island remain elusive, with inland encounters consisting only of occasional calls heard from flying birds. Identifying breeding sites is a crucial first step for effective management of these birds, including implementing on-ground activities to protect colonies. Recently, burrows of breeding Hawaiian Petrel were discovered in the remote Limahuli valley, the first thought to be documented on Kaua‘i. The habitat type they were encountered in differs in elevation and vegetation type from other known breeding sites in Hawai‘i. These differences are especially marked in comparison with the high elevation Haleakalā population on Maui, the only site where this species has been studied and monitored in any depth. This contrast illustrates the extreme variability of this species’ habitat among islands, and highlights the need for island-specific conservation measures to protect the Hawaiian Petrel. Here we document 1) Hawaiian Petrel encounters on Kaua‘i to date, 2) a brief description of the habitat from a recent discovery of a colony, and 3) an update on the conservation status of the Hawaiian Petrel on Kaua‘i, including known threats and critical management actions.

Session II
Insects
Symposium II

Francis G. Howarth[1], Fred D. Stone[2]
[1]Bishop Museum, Honolulu, HI, [2]Hawaii Community College, Hilo, HI

Rats! They’re Eating Native Insects! Gut content analyses of the two common rat species in Kīpahulu Valley, Haleakalā NP, reveal that both *Rattus rattus* and *R. exulans* consume significant quantities of native arthropods, and both pose serious threats to native species vulnerable to their predation. The rats were collected during 1983 and 1984 as part of a multidisciplinary study of the ecology of Kīpahulu Valley. One hundred fifty-nine *R.* and 174 *R. exulans* stomachs were analyzed. Arthropod remains were separated, mounted on slides and identified. Surface micro sculpture proved useful to match disparate pieces into identifiable composites. Arthropod remains were found in all but one *R. exulans* stomach, and all but five *R. rattus* stomachs. On average, *R. exulans* stomachs contained 9.2 morpho-species/rat, whereas *R. rattus* stomachs contained significantly fewer (5.0 morpho-species/rat), but its prey included more arboreal species. Lepidoptera larvae were the most

abundant food item occurring in 91% of *R. exulans* stomachs and 82% in *R. rattus*. Beetles were next in frequency, 77% in *R. exulans* and 40% of *R. rattus*, followed by spiders, true bugs and crickets. Several rare insects were eaten including some that remain only known from rat stomachs, such as remarkable new species of crickets, beetles, and lacewings. Rat predation is a major factor in the rarity and possible extinction of many native arthropod species. Arthropod populations in our native forests are being managed by rats and other invasive species. It is time for us to improve management of this important natural resource.

Session V
Invasives
Session II

Flint Hughes, Amanda Uowolo
USDA Forest Service, Hilo, HI

Fast, Cheap, and Out of Control; the Fate and Impact of Purposeful Exotic Tree Introductions in Hawai‘i and Other Pacific Islands: *Falcataria moluccana* (albizia) as a Case Study. Hundreds of exotic tree species have been purposefully introduced into Hawai‘i and other Pacific Islands in the name of forest and watershed management. Many introductions occurred during the last century, but the practice continues today. Hawai‘i is the Pacific Island poster-child for this phenomenon and a model to be studiously avoided; between 1920 and 1940, 15 million seedlings of 800 different exotic tree species were planted in Forest Reserves across Hawai‘i; the progeny of these plantings continue to degrade Hawai‘i’s remaining native ecosystems. Here we summarize research documenting the impact of one such introduced exotic tree, *Falcataria moluccana*, on native lowland wet forests of Hawai‘i. Though a perceived benefit from a forest production viewpoint, rapid growth rates of *Falcataria* stands enable it to quickly engulf and overtop stands of native, ‘Ōhi‘a-dominated forests; aboveground net primary production (ANPP) is one to six times greater in *Falcataria* stands compared to native-dominated counterparts. *Falcataria* also promotes the growth of other invasive species; *Psidium cattleianum* growth within *Falcataria* stands was double that *Psidium* growth within native-dominated stands. In contrast, growth of common native understory trees was six to 34 times greater in native-dominated stands compared to *Falcataria* stands. These findings, together with the fact that *Metrosideros* stands suffer nearly 100% mortality following *Falcataria* invasion, provide a clear example of how introduced tree species can rapidly degrade the systems they invade; they underscore the high risks inherent in purposeful introductions of exotic trees, even for well-intended mitigation, restoration, or community-based forest management goals.

Session IV
Forest Health
Symposium I

Guy Hughes
Kalaupapa National Historical Park, Kalaupapa, HI

Response to Erythrina Gall Wasp, *Quadrastichus erythrinae* Kim in Kalaupapa National Historical Park (KALA), Moloka‘i, Hawai‘i. As a management response to *Erythrina* Gall Wasp, *Quadrastichus erythrinae* Kim in Kalaupapa National Historical Park (KALA), Moloka‘i, Hawai‘i, we organized four objectives in the first year: 1) We cut down all non-native *Erythrina* limiting the resources available to the wasps locally and limiting infestation severity to the local native *Erythrina* trees, 2) We collected and stored 293 wiliwili seeds from trees within the three monitoring stands and an additional 680 seeds outside our monitoring stands, 3) We treated a subset of trees using 5% Imidacloprid and the Wedgle-Direct Inject Tree Treatment System and monitored continued seed production of a *Erythrina sandwicensis* population by tracking 27 treated and 39 untreated individuals using a repeated measures analysis of variance monitoring design focusing on: pod count on trees at leaf out (#), pod count recovered (#), seeds produced per recovered pod (#), total seeds recovered (#), Gall infected pod (%), beetle infected pod (%), other infected pod (%), person hours dedicated to seed recovery (#), seed viability (%), and 4) We established a qualitative photo monitoring method to document flower, leaf, and fruit phenology and cover. In the second year we found: 1) No re-growth of the non-native trees we cut down, 2) No seeds were produced by any trees inside or outside of our stands, 3) There are no significant differences between treated and untreated trees, 4) There are a healthy number of leaves on our trees compared to trees located near non-native *Erythrina* in

agricultural areas topside Moloka‘i.

Session IV Fisheries Session

Thomas Iwai Jr., Neal Hazama, Rodney Young, Jason Leonard
Division of Aquatic Resources-Anuenue Fisheries Research Center, Honolulu, HI

The Impact of Recreational Fishing Within the Waīkīki-Diamond Head Shoreline Fisheries Management Area, O‘ahu, Hawai‘i. The impact of recreational fishing within the Waikīkī-Diamond Head Shoreline Fisheries Management Area was investigated over a 16 day period from 0600 to 1800. 653 and 702 fishers were observed-interviewed and their catch recorded in YR 2000 (January 1-17, 2000) and YR 2002 (January 1-17, 2002), respectively. Fishing activity was greatest during the early morning hours on the first two days of opening for both years. In both years, fishing activity steadily decreased over time after opening day. Males represented over 91% of the recreational fishers, with the majority of fishers concentrating their efforts off Kaimana Beach. Among the methods of fishing included spearing, rod-reel, cast net, hand pole, scoop net, and hand. Fishing with spear and rod-reel were the primary methods used and represented 96% of the fishers in both years. While the number of spear fishers (~52%) and rod-reel (~48%) were comparable, spear fishers accounted for the greatest number of fish caught (~85%). Spear fishers were more effective in catching larger and more desirable food fish species (e.g. octopus, uhu, kumu, etc.) compared to the less desirable near shore reef fishes (e.g. trumpetfish, needlefish, wrasse, etc.) that were caught with rod-reel. Also, in contrast to spear fishers who were “selective hunters” after food fish for home consumption, the majority of rod-reel fishers tended to fish for recreation, were likely to release their catch, and had a minimal impact on the fisheries.

Session IV Fisheries Session

Thomas Iwai Jr., Neal Hazama, Rodney Young, Paul Murakawa, Glen Cambra, Jason Leonard, Vince Goo, Tracy Tanaka
Division of Aquatic Resources-Anuenue Fisheries Research Center, Honolulu, HI

Moi (*Polydactylus sexfilis*) Stock Enhancement: Developing a Sustainable Moi Fisheries in Hawai‘i. Despite intense urbanization along the island of O‘ahu’s southern coastline, preliminary field surveys indicated its potential as moi (Pacific threadfin, *Polydactylus sexfilis*) spawning and nursery grounds. A 5.2 km length of coastline which included a year-round fishing area from the Ilikai Hotel to the Kapahulu Groin, a year-round no fishing area (Waikīkī Marine Conservation District-MLCD) from the Kapahulu Groin to the Ewa wall of the Waikīkī War Memorial Natatorium, and an opened-closed fishing area (Waikīkī-Diamond Head Shoreline Fisheries Management Area) from the Ewa wall of the natatorium to the Diamond Head Lighthouse was selected as the study area. Monthly castnet sampling was conducted within the study site to assess the impact of tagged-released cultured moi stocks. Since 1999, approximately 50,000 cultured-tagged moi have been released at 3 different locations along the south shore of O‘ahu. Over the years, a steady increase in moi recruitment has been observed within the study site. In 2006, length frequency measurements indicated multiple recruitments of moilii. Large moilii recruitment occurred both inside (Kaimana) and outside (Royal Hawaiian) of the marine protected areas and appeared related more to the accessibility of suitable moilii nursery habitats. Current DNA analysis of wild moi finclips collected from monthly cast net samples and from finclips submitted by volunteer fishers will provide management with vital information on the successful enhancement of the moi fisheries.

Poster 25

Jefferson Jacobs
Colorado State University, Center for Environmental Management of Military Lands (CEMML), Hilo, HI

Hawaiian Hoary Bat (*Lasiurus cinereus semotus*) Survey and Monitoring at Pōhakuloa Training Area, Big Island of Hawai‘i. The objectives of the Hawaiian hoary bat (HHB) survey and monitoring project at Pōhakuloa Training Area (PTA) are to use automated passive echolocation monitors (Anabat II detectors and Anabat CF ZCAIMs) to: 1) Quantify the annual patterns of HHB occupancy at PTA, 2) Test for habitat selection in five general habitat types, 3) Describe HHB distribution within PTA boundaries, and 4) Continue monitoring to test for relative inter-annual and inter-seasonal

changes in HHB habitat occupancy. Beginning in December 2006, up to five Anabat detectors were used to provide 7-day a week, year-round, automated data-collection at survey sites in each of five different habitat types located throughout PTA. Each detector was moved to a new site approximately once a week. Sampling efforts are concentrated on time-periods relating to seasonal altitudinal migrations during the three reproductive time periods of Pre-pregnancy (January to March), Breeding (April to August) and Post-lactation (September to December) to satisfy the closed population assumptions required by the analytical software PRESENCE. This poster describes the results of the first season of monitoring (January to March 2007), describes the field methods, and the future plans for cooperative studies of HHBs on the big island.

Session IV
Forest Health
Symposium I

Christopher M. Jacobsen[1], Arnold H. Hara[1], Ting Xu[2], Qing X. Li[2]
[1]Dept of Plant and Environ Prot Sci University of Hawai'i at Mānoa, Hilo, HI, [2]Department of Molecular Biosciences and Bioengineering, University of Hawai'i at Mānoa, Honolulu, HI

Imidacloprid Concentrations Within *Erythrina* spp. Leaf Tissue That Control Erythrina Gall Wasp, *Quadrastichus erythrinae* Kim, Infestations. We present results from several imidacloprid efficacy studies that demonstrate control of Erythrina gall wasp with imidacloprid and evaluate different trunk injection treatment methods, equipment and formulations. Leaf tissue concentrations of imidacloprid were reliably determined by ELISA and correlated well with those by HPLC methodology. Concentrations in leaf tissue inversely correlated to infestation severity (galling) and proportionally correlated with wasp emergence. Trees with leaf concentrations above 3 ppm showed detectable benefits from treatment. In our studies concentrations varied from 0.2 to 357 ppm. Variations were observed within replicates of the same treatment as well as among different injection techniques and commercial imidacloprid formulations. Variations suggest differential uptake among trees may be exacerbated by imprecise injection techniques resulting in reduced uptake and efficacy. Observed variations also suggest that quantity of imidacloprid is not the sole factor in determining leaf tissue concentration. A 17.1% formulation applied at 0.77 ml AI/inch diameter consistently had lower concentrations than a 5% AI formulation applied at 0.40 ml AI/inch diameter. Total volume injected and possibly solubility of formulation impacted quantity of imidacloprid within leaf tissue. Concentrations of imidacloprid were found to vary within the tree canopy and generally decreased at greater distance from point of injection. Results from these studies are useful for developing treatment recommendations and visual as well as analytical monitoring techniques can predict retreatment timing.

Poster 26

Shelley James[1], Frani Okamoto[2], Amy Tsuneyoshi[3]
[1]Bishop Museum, Honolulu, HI, [2]Leeward Community College, Pearl City, HI, [3]Board of Water Supply, Honolulu, HI

Genetic Variation in the Endemic Hawaiian *Gardenia brighamii*: Conservation and Horticultural Implications. The endemic Hawaiian species, *Gardenia brighamii* (Rubiaceae - *nanu* or *na'u*), was federally listed as endangered in 1985. Once an important component of lowland dryland forests on all the main Hawaiian Islands, there are currently less than 20 individuals remaining in the wild on leeward sides of Lāna'i, O'ahu, and Moloka'i. The species is considered in immediate danger of extinction due to urbanization, invasive species, and feral animals. Managers of living collections and horticulturalists have recently been concerned about the genetic identity of a robust form of *G. brighamii*, believed to be cultivated from seed from a now extinct individual in the Wai'anae Mountain Range. We have been assessing the genetic structure of extant wild populations and individuals maintained in living botanical collections using the molecular fingerprinting technique known as Amplified Fragment Length Polymorphism (AFLP). The findings of this study have important implications for the conservation and restoration of the species in the wild, for seed stocks, for the maintenance of living collections, and the increasing awareness and popularity of this native species for horticultural purposes.

Poster 27

Stephanie Joe
O‘ahu Army Natural Resource Program, Schofield Barracks, HI

Safety and Efficacy of Molluscicide Deployment in Natural Areas to Control Invasive Slugs. Hawai‘i lacks native terrestrial slugs. A number of introduced species are now established, and become widespread in native forest. Research completed in 2004 showed slugs are responsible for significant declines in seedling survival among two endangered species. In order to protect these and other native species attacked by slugs, the O‘ahu Army Natural Resource Program looked into various methods of controlling slugs and/or protecting natives, including beer traps and copper barriers, but found these methods unsatisfactory. No commercial molluscicides are currently approved for forest or conservation use. Iron phosphate (brand name Sluggo®) is an organic biochemical only recently registered for slug control. Unlike the other two active ingredients commonly found in slug bait, metaldehyde or methiocarb, iron phosphate is not a contact poison (it must be ingested to have an effect) and is not toxic to humans, animals, fish or arthropods. Because of these attributes, Sluggo® has the most potential (among commercial baits) to be used safely in natural areas as part of rare plant recovery programs. Under an experimental use permit Sluggo® was deployed in Kahanahāiki Management Unit, a diverse mesic forest in the Wai‘anae Mountains. The field trial was completed April 2007. Our goal was to investigate the following: 1. the ability of Sluggo® to control slugs in a forest setting, and 2. determine what impacts (if any) Sluggo® has on native snails and non-target invertebrates. Preliminary results show treatment plots, when compared to controls, have moderately reduced slug numbers with no change in native snail numbers.

Session II
Invasives
Session I

Karen Johns, Bill Nagle
Auckland University, Auckland, New Zealand

Communities Applying Science. Pacific Island Countries and Territories face severe threats to their biodiversity, livelihoods and health as a result of invasive alien species (IAS). Pacific Invasives Initiative (PII) is a partnership of seven Pacific regional and international agencies established to “*conserve island biodiversity and enhance the sustainability of livelihoods of men, women and youth in the Pacific*”. PII supports local agencies from French Polynesia to Papua New Guinea and Micronesia that work with local communities to undertake invasive species management projects. By combining best practice, sound planning processes and community engagement, capacity is raised, successful outcomes are likely and support for further support for IAS management is generated. This presentation describes two rat (*Rattus exulans*) eradication projects on islands in Fiji. The Vatu I Ra project, undertaken by BirdLife International, involved hand broadcasting of two applications of at a rate of 13kg per ha on a small uninhabited island which is an important seabird colony. The University of the South Pacific’s Viwa project involved the mobilization of the community to undertake clearing tracks 25 meters apart over the island, and monitoring 1025 bait stations (containing 40 pellets of Pestoff 20R) daily for three weeks. With scientific advice and sound methodology and rat eradication practitioners accessed by PII, the local agencies were able to have confidence in the management strategies adopted. By ensuring that local communities were engaged in every aspect of the project, the ecological and livelihood outcomes have surpassed initial expectations and provide confidence that achievements will be sustained.

Poster 28

M. Tracy Johnson[1], Francisco Badenes-Perez[2], Manuel Alfaro Alpizar[3], Eduardo Chacon[3], Paul Hanson[3]
[1]USDA Forest Service, Institute of Pacific Islands Forestry, Volcano, HI, [2]University of Hawai‘i, Pacific Cooperative Studies Unit, Honolulu, HI, [3]Universidad de Costa Rica, Escuela de Biologia, San Pedro, Costa Rica

Biological Control of *Miconia calvescens*: Attacking Reproduction. Long term management of *Miconia calvescens* in Hawai‘i is expected to require the combined action of a variety of biological control agents. We propose development of one or more agents that can directly reduce reproduction of miconia, for which extremely prolific production of long-lived seed is a key element of invasiveness. Several insect species that attack reproductive structures of *M. calvescens* have been

identified in its native range. In Costa Rica larvae of up to three species of Thecline butterflies (Lepidoptera: Lycaenidae) and a *Mompha* sp. moth (Lepidoptera: Momphidae) have been discovered attacking developing flower buds and fruit. In addition, fruit are attacked by a tiny seed-feeding weevil, *Anthonomus monostigma* (Coleoptera: Curculionidae). In Brazil fruit are attacked by a different tiny beetle, *Apion* sp. (Coleoptera: Apionidae) and by an unusual gall wasp, *Allorhogas* sp. (Hymenoptera: Braconidae). All of these potential biocontrol agents appear likely to be highly host specific, but further evaluation within quarantine will be needed. We hope to identify which among these species might have the greatest impact on miconia, taking into account the nature of their damage and their expected population dynamics in Hawai‘i’s environment.

Session IX
Marine
Vertebrates
Session

Marie Chapla, **Dave Johnston**
Pacific Islands Fisheries Science Center, Honolulu, HI

A Collaborative Hawaiian Spinner Dolphin Photo-Id Catalogue: Science for the Purpose of Better Management. Hawaiian spinner dolphin (*Stenella longirostris*) populations are at potential risk because of their daily need for shallow coastal habitat to rest. Threats include exposure to polluted runoff and emergent diseases, aggressive ecotourism operations, noise from boat and air traffic, and marine debris. The effects of these threats on spinner dolphin populations are unknown. In order to adequately address such conservation issues, managers require information regarding spinner dolphin population abundance, distribution, stock structure and vital rates. The Pacific Islands Photo-Identification Network (PIPIN) was initiated in order to establish a collaborative catalogue of spinner dolphins throughout the Hawaiian Archipelago and eventually the Pacific Islands Region (PIR). The network and catalogue are in the beginning stages of development and have enormous potential for informing managers. Members of PIPIN represent various research organizations within the main Hawaiian Islands that have been studying and photographing spinner dolphins for the past several decades. Existing spinner dolphin catalogues from individual islands will be incorporated into a single catalogue that will encompass the Hawaiian Archipelago. Using existing and new data, PIPIN will address questions regarding abundance (overall and island associated populations), movements (intra- and inter-island), vital rates (fecundity and survival), scarring rates (entanglements/fisheries interactions and cookie cutter sharks/remoras), and individual habitat use patterns. These data will be used to assess the current status of spinner dolphin populations and to monitor them long-term.

Session VII
Monitoring
Symposium II

Tahzay Jones[1], Anne Brasher[2]
[1]National Park Service, Hawai‘i National Park, HI, [2]U.S. Geological Survey, Utah Water Science Center, Moab, UT

Integration of Physical, Chemical, and Biological Monitoring of Water-Quality and Freshwater Animal Communities in Pacific Island National Parks. The National Park Service Inventory and Monitoring Program is developing a long-term ecological monitoring strategy for freshwater ecosystems within the Pacific Island Network that incorporates multiple response variables to assess ecosystem status and long-term trends. This integrated approach is aimed toward detecting change using multiple lines of evidence, and will increase the ability to interpret ecological changes occurring within stream ecosystems by incorporating physical, chemical and biological information to assess ecosystem quality. This is also a cost-effective strategy that reduces the cost per sample through the co-location and co-visitation of field sampling efforts. Monitoring will take place in four National Parks in the Pacific (Kalaupapa National Historical Park [Moloka‘i], Haleakalā National Park [Maui], War in the Pacific National Historical Park [Guam], and the National Park of American Samoa [American Samoa]). The monitoring strategy incorporates physical and chemical water-quality parameters while concurrently sampling for fish, shrimp, and snails. The sampling strategy for these ecosystem variables is based on a rotating split-panel design, and gives unbiased status and trend estimates at fixed and randomly selected sites. The analytical approach will involve back-calculating variances over prior years, thus reducing overall variance and increasing overall power to detect change using statistical analyses. This integrated monitoring approach will provide information to

assist in the development and assessment of management strategies to protect park resources.

Poster 29

Raina Kaholoa'a[1], Paul Krushelnycky[2]
[1]Haleakalā National Park, Resources Management, Makawao, HI, [2]U.S. Geological Survey, Haleakalā Field Station, Makawao, HI

Entomology and Management at Haleakalā National Park. The entomology collection at Haleakalā National Park currently houses approximately 2,900 catalogued specimens of insects. By providing a physical record of when and where various species were found, these specimens represent an important component of the known entomological history of the park. In the past ten years, the insect collection has grown from 8 drawers of curated and uncurated specimens to its present size of 50+ drawers of curated specimens. Contributing to this increase were insect surveys conducted at the request of park management in areas of proposed construction; research in areas infested with the Argentine ant; surveys associated with widespread koa defoliation in Kīpahulu Valley; and general collecting in remote areas that have historically received little entomological attention. A strong collection is a valuable resource for scientists studying Hawai'i's endemic and introduced arthropods. They are also vital in answering specific management questions because they serve as a permanent source of data documenting changes in the park's insect fauna over time.

Session VII
Invasives
Session III
Student

Leyla Kaufman, Mark Wright
University of Hawai'i at Mānoa, Honolulu, HI

Effects of Alien Parasitoid Species on the Hawaiian Endemic Moth *Udea stellata* (Lepidoptera: Crambidae). The impact of alien species on non-target native organisms is a cause for concern. This concern is especially relevant in the Hawaiian archipelago due to its high level of endemicity and long history of biological control introductions. The objective of this study was to assess the current parasitoid community associated with the Hawaiian endemic moth *Udea stellata*, as well as determine the parasitism rates of field collected larvae, attributable to adventive and introduced parasitoids. *Pipturus* spp., the endemic host plants of *Udea stellata* are distributed across a wide range of habitats in Hawai'i, creating the opportunity to investigate various environmental conditions that might influence the infiltration of exotic parasitoids and their levels of attack. Standardized collections of wild larvae were conducted in eight sites, located in the islands on Kaua'i, O'ahu and Hawai'i. Results show that the parasitoid community associated with the immature stages of this moth is composed by seven parasitoid species, all alien to Hawai'i. All larval stages are subject to parasitism by at least one parasitoid species. Adventive parasitoids rather than purposely introduced ones were responsible for an extensive part the mortality. Parasitism by purposely introduced parasitoids was mainly recorded in remote pristine sites. Addressing current ecological impacts of alien parasitoids on native species is of particular importance for developing more efficient means to quantify the risks of future biological control introductions.

Poster 30

Sylvie Bright[2], Lily Edmon[4], Roland Frayne[1], Suzie Ho[3], **Colby Kearns**[1], Robert Lozano[2], Kristi Martines[5], Blake McNaughton[1], Lauren Pagarigan[1], Leayne Patch-Highfill[1], Jessica Schwarz[6], Steven Souder[1]
[1]University of Hawai'i at Hilo, Hilo, HI, [2]Waikoloa Elementary School, Waikoloa, HI, [3]Waimea Elementary School, Waimea, HI, [4]Waimea Middle School, Waimea, HI, [5]Honoka'a Middle School, Honoka'a, HI, [6]West Hawai'i Explorations Academy, Waikoloa, HI

PRISM: Partnerships For Reform Through Investigative Science And Math. Sustained management of Hawai'i's natural resources requires public outreach and education to the broader community. PRISM (Partnerships for Reform through Investigative Science and Math) is a partnership between the Hawai'i Department of Education (HIDOE) and the Tropical Conservation Biology and Environmental Science (TCBES) graduate program at the University of Hawai'i at Hilo (UHH). Core members are: Art Souza (Superintendent of Schools, West Hawai'i Complex Area) and Ania Driscoll-Lind (Education Technology Specialist) of HIDOE, Jan Zulich of UHH's Department of Education, and Donald Price and Elizabeth Stacy of UHH's Department of Biology and TCBES Program. TCBES students are serving as GK-12 Fellows who are working with Partner-Teachers to

adapt and implement investigative science curricula in culturally diverse K-8 classrooms on Hawai‘i Island. A majority of the source curricula are from MARE and FOSS kits, originally developed by the Lawrence Hall of Science at the University of California, Berkeley. Curricula are being enhanced to suit Hawai‘i’s unique natural and cultural environments, meet student content and performance standards, and ensure enhanced learning through the use of multiple instructional and assessment strategies. In the first year of the program, six Fellows are paired individually with six Partner-Teachers from the Hāmākua School Complex Area. These teams are working on creative ways to open students’ minds to science, taking advantage of the incredible living laboratory that is Hawai‘i. A primary goal of PRISM is the development of several complete curriculum modules that will be readily available to, and easily adopted by, other K-8 teachers in Hawai‘i.

Poster 31

Matthew Keir
O‘ahu Army Natural Resources, Schofield Barracks, HI

Managing Mēhamehame: How Science is Saving Giants. *Flueggea neowawraea* (Mēhamehame) is a federally listed Endangered species managed by the O‘ahu Army Natural Resource Program. Management of this species is incorporating tools developed through horticulture research, reintroduction trials and laboratory testing to produce and manage the first new generation of Mēhamehame from O‘ahu in many years. Mēhamehame is a large dioecious tree, becoming 35 meters tall with a basal diameter of up to two meters in the Wai‘anae Mountains of O‘ahu. Most trees left on O‘ahu are in poor condition. Some trees exist only as shoots from old stumps and no juvenile trees have been observed for at least ten years. In addition to the threat of direct browsing by feral ungulates, trees show signs of damage from the Black Twig Borer (*Xylosandrus compactus*). There are 37 trees known on O‘ahu and nine additional trees have been observed to have died in the last five years. Of the remaining trees, six are male, 13 are female and the sex of 18 trees is still unknown. Since there are only three sites on O‘ahu where known male and female trees are within 100 meters of each other, a management strategy to bring all of the known trees into captive propagation has begun. Many of the tools that will be needed for species recovery in the next few years were determined in the process. These include determining successful vegetative propagation techniques, seed storage and propagation methods, beginning pollen manipulation and storage, and field trials to determine reintroduction needs, life history.

Session III
NWHI
Symposium

Jean Kenyon[1], Matthew Dunlap[1], Casey Wilkinson[1], Kimberly Page[1], Peter Vroom[1], Greta Aeby[2], Oliver Dameron[1]
[1]NOAA Pacific Islands Fisheries Science Center Coral Reef Ecosystem Division, Honolulu, HI, [2]Hawai‘i Department of Land and Natural Resources, Division of Aquatic Resources, Honolulu, HI

Coral Community Structure at Pearl and Hermes Atoll in the Northwestern Hawaiian Islands: Unique Conservation Challenges in the Hawaiian Archipelago. The distribution and abundance of scleractinian corals at Pearl and Hermes Atoll, Northwestern Hawaiian Islands, were determined from georeferenced towed-diver surveys covering more than 85,000 m^2 of benthic habitat and site-specific surveys at 34 sites during 2000 – 2002. Three complementary methods (towed-diver surveys, videotransects, and photoquadrats) were used to quantify percent cover of corals by genus or species in the forereef, backreef, lagoon, and channel habitats. Three genera – *Porites*, *Montipora*, and *Pocillopora* – account for 97% of the coral cover throughout the atoll, although their relative abundances vary considerably according to habitat and geographic sector within habitats. Forereef communities are dominated by massive and encrusting *Porites*, while the backreef is dominated by *Montipora*, and the lagoon by *Porites compressa*. All taxa also show habitat-specific differences in colony density and size-class distributions, as assessed through colony counts within belt transects at fixed sites. These demographic data, which provide the most thorough quantitative description of the coral communities at Pearl and Hermes Atoll produced to date, are used to focus a discussion on risks of reef degradation from salient contemporary hazards including bleaching, disease, marine debris, and *Acanthaster* predation. Coral communities at Pearl and Hermes Atoll may be the most vulnerable

in the Hawaiian Archipelago to bleaching and accumulation of marine debris, thus these corals may warrant special management attention. These data also provide a detailed baseline to which population parameters derived from long-term monitoring surveys can be compared to assess the direction, pace, and drivers of change.

Poster 32

Cheryl King
Kaho'olawe Island Reserve Commission, Wailuku, HI

By Air, by Land and by Sea: Assessing Kahoʻolawe's Sea Turtle Population. The Kahoʻolawe Island Reserve Commission Ocean Resources Management Program conducted a baseline assessment of sea turtle ecology and population within the Kahoʻolawe Island Reserve (KIR) from 2002-2006. To survey this approximately 47-km coastline, we designed consistent aerial and in-water research methodologies to be augmented with cultural insight, incidental sightings and opportunistic reports. Sporadic nesting and basking may have occurred historically, but are now very rare occurrences. Turtles were most commonly found swimming individually in clear, shallow water (3-6m depth) coral reef habitats 5-20m from shore. Besides one adult female hawksbill (*Eretmochelys imbricata*) sighting, all were greens (*Chelonia mydas*) with no evidence of fibropapillomatosis. Immature turtles predominated and were fairly evenly distributed with a few areas of higher density. Using photo-identification techniques, an 815-day resight interval was the strongest example of site fidelity. Twenty greens were found foraging, primarily on turf algae (depth mean= 6 m, SD= 3.8m, range 1-11m). Sixty-seven nearly island-wide snorkel transects yielded a 1.31 turtles/hr mean (transect SD= 1.8, range 0-8, n=82). Thirty-eight standardized helicopter surveys averaged 6.9 turtles per ~60-minute circumnavigation (SD= 3.4, range 1-14, n=262). Generating correction factors for submerged turtles during aerial surveys and collating all sightings and references, these results estimate that fewer than 500 turtles inhabit the KIR. This is a relatively insignificant contribution to the extant population of Hawaiian sea turtles. This baseline estimate allows for a) future comparisons using these standardized monitoring protocols, and b) the prioritization of restrictions to important KIR habitats, with implications for management on other islands.

Poster 33
Student

Frances Kinslow[2], Richard Mackenzie[1], Nicole Cormier[1]
[1]USDA Forest Service IPIF, Hilo, HI, [2]University of Hawaʻi at Hilo, Hilo, HI

Fungal Colonization of Leaf Litter from Native and Invasive Riparian Trees in Forested and Developed River Reaches on the Island of Hawaiʻi. Breakdown of inedible compounds in decaying leaf matter in freshwater systems is attributed to the action of fungal processing. In continental systems, this conditioning is the initial step in a food web for shredders and other organisms. However, Hawaiʻi lacks many of the detrital invertebrates typically found in stream communities, making fungal colonization the primary factor in breakdown of leaf litter. Concentrations of ergosterol, a steroid unique to fungal cells, was measured from leaf litter in the Wailuku River on the Big Island to directly quantify fungal colonization, providing us with the first data set ever to consider the role fungal colonies play in leaf litter breakdown in Hawaiian streams. Fungal biomass and decomposition rates were compared between senesced leaves from the dominant native canopy tree *Metrosideros polymorpha* (ʻōhiʻa) and the common invasive N-fixer *Falcataria moluccana* (albizia), in an impacted site in a developed area and a relatively non-impacted forest site along the Wailuku during wet and dry seasons in 2005 and 2006. Preliminary results show no difference between sites. However, although over time fungal colonization on ʻōhiʻa leaves eventually matched or exceeded that of albizia, albizia was found to have significantly higher initial fungal biomass and subsequently, a more rapid rate of decomposition. Substantial inputs of albizia to freshwater streams in Hawaiʻi has the potential to dramatically alter the dynamics of the stream community by aiding in the establishment of introduced exotics, and increasing nitrogen levels in Hawaiian rivers and their downstream coastal areas.

Poster 34

Sarah Knox
Pōhakuloa Training Area, Hilo, HI

Assessing ‘Io and Nēnē Presence at Pōhakuloa Training Area. Surveys for the federally endangered Nēnē, (*Branta sandvicensis*) and ‘Io, (*Buteo solitarius*) were conducted at the U.S. Army’s Pōhakuloa Training Area (PTA) from 2004 through 2006. The area was surveyed to assess their presence with the purpose of establishing management protocols that minimize potential conflicts between Nēnē or ‘Io and military training. Surveys were conducted for both species along hiking transects. Nēnē surveys also included road-side survey points. Recorded Nēnē or ‘Io calls were played at stations along each transect to elicit a response from individuals in the area. After zero target species were observed on any of the surveys, statistical techniques were used to determine if observations reflected true absence or if they were due to “false absences” caused by a low species detectability. Using a model that incorporates species’ detectability, the number of repeated visits needed to each survey point to infer the true absence of a species was determined. After three years of repeatedly visiting points, results indicated that both species were absent during the course of the surveys; therefore, it is not likely a resident or breeding population of Nēnē or ‘Io exists at PTA. Knowing that these birds are not predictably using PTA allows biologists to allocate more time and resources to managing other threatened and endangered species.

Session III
NWHI
Symposium

Donald Kobayashi
[1]Pacific Islands Fisheries Science Center, NOAA Fisheries, Honolulu, HI, [2]Department of Environmental Sciences, University of Technology, Sydney, NSW, Australia

Larval Retention Versus Larval Reception: Marine Connectivity Patterns Within and Around the Hawaiian Archipelago. Metapopulation connectivity of insular populations in the Hawaiian Archipelago is poorly understood, which hinders effective management and assessment of these living marine resources. This study addresses potential connectivity between geographically separated areas via the pelagic egg and larval life history phases assuming that propagules are passively carried by ocean currents. Pelagic transport was investigated using high-resolution ocean current data and computer simulation. Connectivity measures between 25 geographic strata are presented for a suite of pelagic larval durations. In general, adjacent strata in the archipelago were well connected via pelagic larval transport. Retention, i.e., the return of natal propagules, is contrasted with reception, i.e., the influx of propagules from other sources. These two processes appear to be decoupled based on examination of archipelago-wide patterns. Single-generation and multi-generation effects of connectivity are considered using a simple population dynamics model driven by the dispersal kernel probability estimates. The Papahānaumokuākea Marine National Monument appears to be largely self-sustaining based on these results, with differential input to certain of the inhabited islands further southward in the archipelago depending on the pelagic larval duration.

Poster 35

Bruce Koebele[1], Frank Stanton[2], Nancy Hoffman[3]
[1]Ka‘ala Farm, Inc., Wai‘anae, HI, [2]Leeward Community College, Pearl City, HI, [3]USFWS O‘ahu National Wildlife Refuge Complex, Hale‘iwa, HI

Ten Years of Volunteer Conservation at Kalaeloa. What started as a call for help from the U.S. Navy for a tiny population of *Achyranthes splendens* var. *rotundata* has evolved into an enduring conservation/education partnership among Leeward Community College, Ka‘ala Farm and the U.S. Fish & Wildlife Service. Since 1997 over 2,800 volunteers, primarily LCC students, have contributed nearly 10,000 hours of service within the USFWS Kalaeloa Unit of the Pearl Harbor National Wildlife Refuge. This service includes removing alien plants (primarily *Pluchea* spp.) from approximately ten acres of the Unit as well as planting out over 1,500 native plants. Emerging from the seedbank, thousands of native plants, including hundreds of *Achyranthes splendens*, have reclaimed the favorable habitat opened by the volunteers. In conjunction with these volunteer efforts, the USFWS O‘ahu National Wildlife Refuge Complex has encumbered funding to clear over half of the 37 acre Unit of alien plants and revegetate approximately 14 acres with native plants; currently, 13 acres have been cleared and six revegetated. We believe that our three-way partnership of landowner, volunteer

provider and technical coordinator, in which each partner assumes a different set of responsibilities, along with the consistent commitment by each partner, has been the key to the longevity and effectiveness of this project.

Session I
Alternative
Energies
Symposium

Hans Krock
University of Hawai‘i, Honolulu, HI

Ocean Thermal Energy Conversion Systems. The heat energy stored in the tropical ocean constitutes the largest readily available energy resource in the world. As such it will be the energy source that will replace fossil fuel globally over the next few decades. This presentation will describe the ocean thermal resource and review the current status of Ocean Thermal Energy Conversion (OTEC) technology. Included will be a discussion of the environmental and economic context as well as a projected timeline of development of this resource.

Session I
Insects
Symposium I

Paul Krushelnycky
USGS PIERC, Haleakalā Field Station, Makawao, HI

The Effects of Invasive Ants on Hawaiian Arthropod Communities. Since at least the early 20th century, invasive ants have been incriminated as being exceptionally destructive to endemic Hawaiian arthropods, but rigorous quantitative data demonstrating their impacts are limited. I used several approaches to study the separate effects of Argentine ants and big-headed ants on arthropod communities at five natural area sites on Maui and Hawai‘i Island. Although in some cases endemic species appeared to benefit from ant invasion, a much larger number and wider range of species were less abundant in areas invaded by ants. Certain taxonomic and trophic groups appeared to be especially at risk, but despite these trends it was often difficult to predict exactly which species would be most vulnerable. At the community level, impacts ranged from strong declines in endemic richness (over 50%) to no change in endemic richness. This variation was best explained by patterns of prior species loss: communities that had already lost many endemic species, most likely due to the effects of many non-ant introduced species, were relatively resistant to further species loss upon ant invasion, whereas more intact communities were vulnerable to substantial declines in richness when ants invaded. This pattern suggests that ants can exert an impact similar to the combined effect of many non-ant introduced species. But it also implies that a steady accumulation of less notable introduced species, which individually may not be regarded as particularly threatening to endemic biodiversity, may collectively be exerting an impact as strong as that of the worst ant invaders.

Session IV
Fisheries
Session

Ross Langston[1], Ken Longenecker[2]
[1]Windward Community College, Kāne‘ohe, HI, [2]Bishop Museum, Honolulu, HI

Coral Reef Fisheries I: Rapid, Low-Cost Analysis of Life History and Demographic Structure for Three Exploited Reef Fishes. We describe the life history and demographic structure of three reef fish species: *Centropyge potteri*, *Dascyllus albisella*, and *Parupeneus multifasciatus*. Using specimens from the forereef of Kāne‘ohe Bay, we use otolith microstructure to construct age-and-growth curves and standard histology to estimate size-at-maturity and to examine the relationship between fish size and batch fecundity. We use laser videogrammetry to estimate density and size structure of populations from Hanauma and Moanalua Bays. Growth curves are used to convert the size structure of each population to age structure. This above information is ultimately used in fishery yield models to examine biomass production and reproductive output in fished and non-fished habitats.

Session VIII
Winged Vertebrates
Session I

Dennis A. LaPointe[1], Erik K. Hofmeister[2], Carter T. Atkinson[1], Robert J. Dusek[2]
[1]U.S. Geological Survey, Biological Resources Discipline, Pacific Island Ecosystems Research Center, Hawai'i National Park, HI, [2]U.S. Geological Survey, Biological Resources Discipline, National Wildlife Health Center, Madison, WI

Potential Impacts of West Nile Virus (WNV) on Endemic Hawaiian Avifauna: Experimental Infection of Hawai'i 'Amakihi (*Hemignathus virens*) with WNV. Introduced mosquito-borne avian disease is a major limiting factor in the recovery and restoration of Hawaiian forest birds. Annual epizootics of avian pox, *Avipoxvirus*, and avian malaria, *Plasmodium relictum*, likely led to the extinction of some species and continues to impact populations of susceptible Hawaiian honeycreepers. The introduction of a novel pathogen, such as West Nile virus (WNV), could result in further extinctions and population declines. To better understand the possible impact of WNV to Hawaiian avifauna we challenged Hawai'i 'Amakihi (*Hemignathus virens*) with a North American isolate of WNV through needle inoculation and mosquito bite to observe susceptibility, mortality, and illness in this endemic passerine and determine the vector competence of the co-occurring, introduced mosquito, *Culex quinquefasciatus*. All birds became viremic with a mean titer > 10^5 plaque-forming units (PFU)/ml and experienced clinical signs ranging from anorexia and lethargy to ataxia. The overall mortality in three inoculation trials (N = 21) was 43 % but we predict increased mortality in the wild as a result of predation, starvation, thermal stress, and concomitant infections. Surviving birds cleared viremias by 7 – 10 days post-infection (PI) and neutralizing antibodies were detected by PRNT from 8 – 46 days PI. In transmission trials, Hawaiian *C. quinquefasciatus* proved to be competent vectors and Hawai'i 'Amakihi an adequate amplification host of virus suggesting that epizootic WNV could readily become another limiting factor of native Hawaiian bird populations.

Poster 36

Danielle Frohlich[1], **Alex Lau**[1], Clyde Imada[1], Ryan Smith[2]
[1]Bishop Museum, Honolulu, HI, [2]O'ahu Invasive Species Committee, Honolulu, HI

Implementing an Early Detection Program on O'ahu Island: Prioritizing for Weed Control. It is clear that many aggressive plant and animal species not yet established in Hawai'i can, if introduced, permanently alter our unique landscape, leading to species extinction, environmental degradation, and enormous economic strain. The island-based Invasive Species Committees (ISCs) have proven to be effective mechanisms for rapid response to, and control of, incipient pest species. However, historically, the ISCs have lacked a comprehensive early detection program for ensuring the greatest possibility of identifying potential new invaders. In response to this ongoing issue, the O'ahu Early Detection (OED) program was initiated during the summer of 2006. The OED project comprises two stages: stage one consisted of surveys of plant importation "hot spots," including nurseries, botanical gardens, and community gardens; stage two consists of roadside surveys to determine target species distributions and candidacy for rapid-response control efforts. Subsequent to "hot spot" surveys, a system was developed for determining species candidacy for rapid response and control if noted during a roadside survey, a scheme based upon a system developed by the New Zealand Department of Conservation. This "weed-led" system aims to discover and control weedy species at an early stage of establishment, drawing upon documented knowledge taken from the Hawai'i Weed Risk Assessment and distribution information gleaned from the Bishop Museum *Herbarium Pacificum* collection. This system is an essential scientific tool which the ISCs can use to prioritize target species selection.

Poster 37
Student

Johannes Le Roux, Ania Wieczorek
University of Hawai'i, Honolulu, HI

Global Monoclonality of Highly Invasive Fountain Grass Defies the Odds of Nature. The ability to adapt to new environmental conditions as a result of natural selection upon genetic diversity within populations (Darwinian evolution) is an important consideration to the success of invasive species. We studied genetic diversity of the weed *Pennisetum setaceum* (fountain grass) on a global scale. Regions that are affected differently by this species were included in our analysis. We were interested in determining whether highly invasive populations (from Hawai'i),

moderately invasive populations (from South Africa), and introduced, but not invasive, populations (from Namibia) were a reflection in differences in genetic diversity among these regions. This diversity was also correlated to native range populations from Egypt. Numerous DNA gene markers and physiological comparisons indicate complete monoclonality within and among all of these geographic areas. Our results are surprising and in stark contrast to typical Darwinian evolution given that any detrimental condition could lead to extinction due to fountain grass' inability to adapt locally. These findings would have serious implications for the management of fountain grass, as this grass would be unable to develop any resistance to chemical and biological control efforts.

Session VII
Invasives
Session III
Student

Luc Leblanc[1], Daniel Rubinoff[1], Roger Vargas[2]
[1]University of Hawai'i, CTAHR-PEPS, Honolulu, HI, [2]USDA-ARS, PBARC, Hilo, HI

Assessment of Non-target Insect Attraction to Fruit Fly (Tephritidae) Male Lures on Hawai'i and Maui Islands. Successful integrated pest management emphasizes the use of environmentally less toxic control methods for agricultural pests. However, it is possible that some of these more desirable methods may have unanticipated non-target impacts. Field investigations were conducted to assess the possible attraction to fruit fly (Tephritidae) male lures along ecological gradients ranging from native, mixed and secondary forests to agricultural farmlands and residential areas. Traps baited with male lures (cue-lure and methyl eugenol) were maintained and emptied weekly at 35 sites along three transects on Hawai'i Island and 46 sites in native forest and in persimmon and coffee orchards on Maui Island, during the 2005 and 2006 summer seasons, respectively. Trap catches were compared to catches by unbaited control traps. Male lures failed to attract insects other than target fruit flies, except for a weak honeybee and syrphid fly attraction and fungus gnat (Sciaridae) attraction to methyl eugenol. Non-targets were abundant only in male lure traps with large accumulations of dead trapped fruit flies, giving a false impression of lure attraction. Numerous native species were collected at traps artificially baited with decaying fruit flies in native and adjacent mixed forest, but only non-native species were attracted to traps set up in invasive forest, orchards, farmlands and backyards. Traps did not attract beneficial predatory or parasitoid insects. Fruit fly lures are therefore environmentally safe when used in orchards, and their registration process is underway to make them available to fruit growers.

Session VI
Economics of
Invasives
Symposium

Donna Lee, Damian Adams
University of Florida, Gainesville, FL

Quantifying the Risk of Zebra Mussels to Florida Ecosystems: A Comparison of Prevention, Response, and Control Strategies. At 730 square miles, Lake Okeechobee in Florida is the second largest freshwater lake in the United States. Lake Okeechobee is a resource vital to State agriculture, popular among recreational anglers, and key to the sport fishing industry. At present, Florida waterways are free of zebra mussels but these damaging mollusks pose a serious threat. Year around, enthusiasts from all over the country haul their recreation and tournament boats to fish the waters of Lake Okeechobee. As they move from infested to uninfested waters, these boats serve as the primary vector for zebra mussels. Bits of aquatic vegetation covered with live zebra mussels can be tangled in propellers and lodged in the crevices of trailers. The residual water of a boat's live well can hold thousands of zebra mussel larvae. Regrettably, there is no policy in place to prevent the introduction of zebra mussels into Florida waters. This study estimates the expected economic impact of zebra mussels on recreational users, surface water users, and ecosystem services under the following alternative management strategies: prevention, early warning, rapid response (eradication), and long term control. To this end, a stochastic dynamic bio-economic simulation model is developed. For the case of zebra mussels and Florida, a strategy of prevention and monitoring is superior to either eradication or long term maintenance. Prevention and monitoring, while imperfect, can help reduce expected damages in excess of costs. Results show a net expected gain of +$247.71 million over 20

years compared to doing nothing.

Poster 38

David Leonard[1], Jay Nelson[2]
[1]Division of Forestry and Wildlife, Honolulu, HI, [2]US Fish and Wildlife Service, Pacific Islands Office, Honolulu, HI

Using Models to Assist in Conservation Decision Making–An Example Using Hawaiian Passerines. Of the remaining 36 species of native Hawaiian passerines, 23 are Federally listed as endangered, and their population sizes range from 300 to 12,000 individuals. Unfortunately, funds to recover and manage these species are scarce, and Hawai‘i receives far less Federal recovery dollars than states with far fewer listed species. Thus selecting recovery strategies with the greatest potential to effect recovery is critical. Monitoring of many of Hawaiian birds is difficult and expensive, and thus information needed to make such decisions is often lacking or minimal. Here we present output from relatively simple demographic models constructed to evaluate the potential efficacy of various management options for two endangered forest birds, the Puaiohi (*Myadestes palmeri*) and Palila (*Loxioides bailleui*), which number approximately 325 and 2,500 individuals respectively. We focus on testing population responses to releasing captive-raised individuals. Results from species-specific models suggest that annual releases of relatively few captive-raised birds can contribute to the recovery of these species. Based on our results, we encourge the use of similar models as tools for articulating objectives and options and testing the sensitivity of target species to a range of potential recovery actions.

Session VI
Bridges to the Future Forum

John Leong, Julianna Rapu Leong, Matthew Bauer, Gerry Kaho‘okano, Kawehi Leong
Pono Pacific, Kāne‘ohe, HI

Interns: The Untapped Natural Resource. The environment not only sustains life in the islands, but it is a valuable tool to enrich and educate its inhabitants. Hawai‘i’s youth are at a crossroads in which they can either learn to care for, sustain, and perhaps improve the environment or they can become more detached and desensitized to the importance of the environment as Hawai‘i advances into the new century. Youth internships not only provide an invaluable resource for agencies to get work done, but they are also a way to give back to our communities by stewarding, educating, and empowering the next generation. The following will be addressed in this presentation in regards to internships: their importance to both the agencies involved and the youth that participate; long-term and short-term benefits; economic advantages. Furthermore, this presentation will demonstrate the ability of internships to act as a mega-phone into the community to increase environmental knowledge and support of projects. This session will also share information on how agencies can get involved with internships and successful practices to create good and lasting internships. Pono Pacific has coordinated and developed the Hawai‘i Youth Conservation Corps which offers four different types of internship programs. These programs provide over $1.7 million dollars in benefits to Hawai‘i and provide over 71,000 service hours to the conservation community annually. Pono Pacific provides close to 200 state wide internships each year that are part time, full time, and summer internships. In addition, Pono Pacific manages various conservation lands for private and public land owners throughout the state.

Session IV
Fisheries Session

Ken Longenecker[1], Ross Langston[2]
[1]Bishop Museum, Honolulu, HI, [2]Windward Community College, Kāne‘ohe, HI

Coral Reef Fisheries II: Evaluating the Fishery Management Value of No-Take Marine Reserves. No-take marine reserves are increasingly employed in efforts to manage coral-reef fisheries. We argue that to enhance a fishery, some biological parameter inside a reserve must more than double that in fished areas. We use life history and demographic analyses to generate fishery independent estimates of potential yield and reproductive output for each of three exploited reef fishes. These estimates are compared between Hanauma Bay, closed to any form of extraction for 40 years, and nearby Moanalua Bay, an area heavily fished by ornamental collectors. We use these results to evaluate the fishery enhancement potential of a no-take marine reserve relative that of

traditional management strategies such as size and catch limits.

Session V
Forest Health
Symposium II

Lloyd Loope
USGS Pacific Island Ecosystems Research Center, Makawao, HI

The Rust *Puccinia psidii* in Hawai‘i: An Update. The Neotropical rust of Myrtaceae, *Puccinia psidii*, previously referred to internationally as guava rust and eucalyptus rust, became widely known as ‘ōhi‘a rust, soon after it was detected in Hawai‘i in April 2005. That name served to dramatize the true threat of this species of rust to Hawai‘i’s dominant native forest species, ‘ōhi‘a (*Metrosideros polymorpha*), but may have misled concerned people into misgauging the threat – which in retrospect seems not to lie in the billions of spores blowing around these islands but in new strains of the rust that may be traveling in the pathway of myrtle family host plants and foliage coming into Hawai‘i from the U.S. mainland. In its first two years in Hawai‘i, no sexual stage of this rust has been detected, and preliminary DNA analysis has detected no genetic variation. The single strain in Hawai‘i has produced a major, landscape-level impact on non-native rose apple (*Syzygium jambos*) on all major Hawaiian islands but has barely affected ‘ōhi‘a. The decimation of rose apple clearly demonstrates the remarkable potential virulence of this rust species complex, which consists of numerous genetic strains, only superficially documented to date, defined by the suite of host plants they infect. Establishment of the rust as an outlying population in Hawai‘i, bringing the rust to a hub of transportation 8,000 km nearer, has stimulated concern in Australasia, home to over 2000 species of Myrtaceae. This presentation will provide an overview of ongoing research and prevention efforts for this rust in Hawai‘i and elsewhere.

Session VIII
Water Session

Richard MacKenzie[1], Nicole Cormier[1], Francis Kinslow[2], Tracy Wiegner[2]
[1]Institute of Pacific Islands Forestry, Hilo, HI, [2]University of Hawai‘i Hilo, Hilo, HI

Leaf Litter Breakdown of Native and Invasive Riparian Trees in Forested and Developed River Reaches on the Island of Hawai‘i. Hawaiian flora communities are often dominated by invasive plants, especially at lower elevations where human impacts (i.e., agriculture, urbanization) are also greatest. While this threatens Hawaiian biodiversity, invasive N-fixing plants, like *Falcataria moluccana* (Albizia) threaten ecosystem function through alteration of nutrient budgets and cycling. To examine the effects of invasive plants and land use on riverine organic matter dynamics, we compared leaf breakdown of albizia and native *Metrosideros polymorpha* (‘ōhi‘a) trees in forested and developed reaches of the Wailuku River during wet and dry seasons (2005-2006). During 2005, breakdown rates of albizia leaves were significantly faster than ‘ōhi‘a (1.5 – 2X), which was attributed to greater initial fungal colonization. However, by the end of the experiments, fungal biomass on ‘ōhi‘a was similar to and often exceeded that on albizia litter. Breakdown rates of litter from both species did not differ between forested and developed reaches of the river. Breakdown rates were greatest during dry seasons for both litter types, which was attributed to increased river flow (100-500X) resulting from storms. Replacement of native riparian forests by invasive albizia forests could dramatically alter organic matter and nutrient dynamics in Hawaiian rivers and their downstream coastal areas.

Poster 39

Richard MacKenzie[1], Greg Bruland[2], Christina Ryder[3], Adonia Henry[4], Connie Ramsey[5], Meris Bantilan-Smith[2]
[1]Institute of Pacific Islands Forestry, Hilo, HI, [2]University of Hawai‘i at Mānoa, Honolulu, HI, [3]Pacific Coast Joint Venture, Honolulu, [4]U.S. Fish and Wildlife, Honolulu, HI, [5]Army Corps. of Engineers, Honolulu, HI

Fish Community Structure in Hawaiian Coastal Wetlands. Fish were collected from over 35 coastal wetlands across the 5 main Hawaiian islands (Hawai‘i, Kaua‘i, Maui, Moloka‘i, O‘ahu) in an attempt to document the community structure of fish and the habitat value of Hawaiian wetlands. Samples were collected using 2 m^2, 3-mm mesh lift nets deployed along the open water-vegetation interface. Preliminary results revealed that the majority of the wetlands sampled were dominated by invasive poeciliids such as top minnows (*Gambusia affinus*) and Mexican mollies (*Poecilia* sp.). Exotic tilapia (*Sarotherodon melanotheron*) were also prevalent at many sites. While some

information is available on the impacts of tilapia on algal and submergent plant structure in wetlands, very little is known on the impacts of poeciliids. The abundance of poeciliids underscores the need to increase our understanding of the impacts these fish on native birds, native fish, and overall ecosystem function of coastal wetlands. Furthermore, ecological parameters (i.e., secondary production) of these widely distributed invasive fish may prove to be useful indicators of the health of coastal ecosystems.

Session II
Insects
Symposium II

Karl Magnacca, Patrick O'Grady
University of California, Berkeley, Berkeley, CA

Phylogenetics and Ecology in Conservation of *Hylaeus* and *Drosophila.* *Drosophila* and *Hylaeus* are two large radiations where the Hawaiian species make up a large proportion of the world fauna. Both are frequently cited as being high conservation priorities, but they are very different in their life history, ecology, evolution, conservation needs, and many other factors. Nevertheless, integration of ecological and phylogenetic data has proven useful for both in determining conservation priorities for many species. Many species are dependent on rare habitats or plant species, and may be in danger of extinction within a few years or decades. Combining recent phylogenetic and ecological studies on these two groups found a concentration of vulnerable species in a few clades, including the most morphologically and ecologically diverse clades of both: the *modified mouthparts, picture wing*, and *nudidrosophila* species groups of *Drosophila*, and the *flavipes*, *pubescens*, and *kokeensis* species groups of *Hylaeus*. Many of these species remain to be described, particularly in the *modified mouthparts* species group, and reliable survey methods are lacking. Creating such methods targeted at vulnerable species would greatly aid in tracking conservation status and ultimately in management of these important groups.

Session V
Watershed
Session

Alan Mair, Ali Fares
University of Hawai‘i at Mānoa, Honolulu, HI

Spatial Distribution of Groundwater Recharge in the Upper Mākaha Valley, O‘ahu. Changes in land use in many Hawaiian watersheds have impacted the water cycle. The main goal of this study was to determine the impact of the current land use on groundwater recharge in the upper Mākaha valley. Specific objectives of this study were to: i) establish site-specific calibration equations for the capacitance sensor at multiple field locations, ii) determine the soil moisture release curve and hydraulic conductivity function, iii) estimate groundwater recharge at each field location. A commercial capacitance sensor was installed at six (6) locations across a 5.5 km^2 study area. A commercial granular matrix sensor was co-located with each capacitance sensor at four locations. Measurements were recorded using electronic data loggers at 60-minute intervals beginning in 2005. Disturbed and undisturbed soil samples were collected from each location to determine soil physical properties and to calibrate the capacitance sensors. Soil moisture and soil tension measurements were used for quantifying the hydraulic function of unsaturated soils. Gross rainfall, throughfall, streamflow, groundwater levels, and weather parameters were also measured at selected locations over the same monitoring period. Groundwater recharge rates were then estimated using the zero-flux plane method, Darcy’s law, and a water balance method. Results were compared with regional estimates of groundwater recharge.

Session III
Conservation
Evaluation
Symposium

Rusyan Jill Mamiit
JMK Associates, Inc., Honolulu, HI

Lessons Learned: Coastal Zone Management Act Performance Measures in Hawai‘i. The National Oceanic and Atmospheric Administration (NOAA) mandates each coastal zone management program (CZM) across the nation to collect and report performance measures indicators. Since 2005, the Hawai‘i Coastal Zone Management Program has participated in the Coastal Zone Management Act Performance Measurement System (CZMA PMS) data collection. The CZMA PMS aims to track and evaluate indicators of effectiveness of the coastal management programs at the national level. The assessment of the effectiveness of the coastal programs requires data from state Coastal Zone

Management (CZM) programs. Coastal states are asked to collect and compile data on Public Access, Government Coordination and Decision Making, Coastal Habitats, Coastal Water Quality, Coastal Hazards and Community Dependent Uses and Community Development. In the last two years, the Hawai‘i CZM Program and its partners learned the complexity of the data collection process involved with the CZMA PMS. This paper presents a compilation of the lessons learned in the implementation of CZMA PMS in Hawai‘i. It also describes the tools and approaches employed in overcoming the challenges in the data collection process.

Session V
Invasives
Session II

Shenandoah Marr
University of Hawai‘i, Hilo, HI

The Enemy Release Hypothesis and the Success of the Puerto Rican Tree Frog (*Eleutherodactylus coqui*) in Hawai‘i. Introduced to the Hawaiian Islands in 1988, the Puerto Rican tree frog (*Eleutherodactylus coqui*) has reached population densities far exceeding those in its native range. Initially confined to areas immediately adjacent to nurseries, *E. coqui* populations have rapidly spread to recreational, commercial, and residential areas of Hawai‘i. The enemy release hypothesis (ERH) proposes that invading species lose many of their co-evolved parasites in the process of invasion, thereby allowing invaders to reach higher population densities than in their native habitats. I tested the enemy release hypothesis as it relates to *E. coqui* in Hawai‘i. I collected parasite data on 160 individual coqui frogs sampled from eight populations in Puerto Rico and Hawai‘i between January-April 2006. Results are consistent with the enemy release hypothesis; Puerto Rican coqui frogs have higher higher species richness of parasites than Hawaiian coqui frogs. Parasite prevalence and intensity were significantly higher in Hawai‘i, however this is likely the product of the life history of the dominant parasite and its minimal harm to the host. This suggests that the scarcity of parasites may be a factor contributing to the success of *E. coqui* in Hawai‘i. Hawai‘i has no native amphibians, and with careful and extensive testing, a parasite that specifically targets amphibians may be a way to effectively manage *E. coqui* in Hawai‘i.

Poster 40

Ann Marshall[1], Kathleen Misajon[2], Darcy Hu[2], Ronald Salz[1], John Jeffrey[1], Joaquin Mello[3], John Polhemus[3], Megan Laut[3]
[1]U.S. Fish and Wildlife Service, HI, [2]National Park Service, HI, [3]DLNR, Division of Forestry and Wildlife, HI

Hawai‘i Island Nēnē (*Branta sandvicensis*) Restoration Planning. The Nēnē Recovery Action Group (NRAG) is a multi-agency, statewide organization focused on management and recovery of Nēnē. A primary recovery goal is to reestablish a statewide metapopulation by linking isolated sub-populations and establishing new population nodes within each island. NRAG is working to develop island-specific implementation plans to form the basis of a statewide plan toward this goal. Planning began with Hawai‘i Island where Nēnē populations declined following several years of drought in the 1990s. For example, an approximately 50% decline in the wild population was noted at Hawai‘i Volcanoes National Park during that time. To identify potential sites for Nēnē reestablishment on Hawai‘i, we overlaid GIS layers of pre-historic and historical ranges with current Nēnē use areas, incorporating breeding sites (low-mid elevation) and nonbreeding/flocking sites (mid-high elevation). The analysis suggests that Nēnē were present in lowland dry forest and shrubland, montane dry forest and shrubland, and grassland habitats across the island except for the windward coast. Considering habitat types, land protection status, management potential, and current population sites, we identified priority Nēnē management areas on Hawai‘i Island including: ‘Āinahou, Kahuku, Pu‘uanahulu, Pu‘u Wa‘a Wa‘a/Hualālai, upper Keauhou, Mauna Loa, Hakalau/Pu‘u ‘Ō‘ō. Several Nēnē populations on Hawai‘i are now increasing, presenting notable opportunities for dispersal. Encouraging movement between populations and establishing new management areas will reduce impacts of future stochastic events, such as droughts. To link populations we plan to establish regular movement patterns by translocating and monitoring pairs with goslings between key areas over the next five years.

Plenary Speaker

Gerald Marten
East-West Center, Honolulu, HI

EcoTipping Points. EcoTipping Points are levers for turning around environmental decline. The problem with environmental problems is they are frequently driven by vicious cycles, powerful social and ecological forces that nullify efforts to solve the problems. The EcoTipping Points Project has assembled approximately a hundred environmental success stories from around the world to show what it takes to be successful (www.ecotippingpoints.org). The key is catalytic actions (EcoTipping Points) that combine an appropriate environmental technology with the social organization to put it into effect. For success, the ensuing chain of effects must turn around the vicious cycles with sufficient force to transform them into virtuous cycles, mobilizing natural ecological and social forces to redirect change toward sustainability. The EcoTipping Points principle is illustrated by success stories from Asia and the United States: rescuing an island's coral-reef fishery; escaping pesticide addiction; restoring a region's underground water; turning around urban decay; and saving a nation's forests. The stories show how the restoration of ecosystem biodiversity and health goes hand in hand with restoring valuable services those ecosystems provide for human welfare. Application of the EcoTipping Points principle for communities to create more success stories is a matter of identifying vicious cycles that are driving the problem and homing in on levers to reverse them.

Session VII Aquatic Biota Session

Gerald Marten
East-West Center, Honolulu, HI

Controlling Mosquito-borne Diseases with Cyclopoid Copepods. Cyclopoid copepods ("cyclops") provide a classic example of the benefits that biodiversity can offer for human welfare. It was 25 years ago in Hawai'i that I discovered the significance of these tiny crustaceans for mosquito control. Subsequent research around the world showed that the larger cyclops species prey voraciously on mosquito larvae, naturally eliminating mosquito production in many habitats were it might otherwise occur. Introducing local cyclops species to mosquito breeding sites where the cyclops are not already present can lead to the same result. Cyclops have been used to eradicate *Aedes aegypti*, the principal vector of dengue hemorrhagic fever, from villages and urban neighborhoods occupied by nearly a million people in Vietnam (www.ecotippingpoints.org/DENGUE-COPEPODSTORY.doc). *Mesocyclops aspericornis* is a cyclops in Hawai'i that could have a significant role in controlling the Asian Tiger Mosquito (*Aedes albopictus*), which was responsible for the dengue fever outbreak here several years ago. However, success would require a degree of neighborhood organization and participation that does not exist for mosquito control in Hawai'i at the present time.

Session VIII Monitoring Session

Roberta E. Martin, Gregory P. Asner
Carnegie Institution, Stanford, CA

Leaf-level Biochemical and Optical Diversity Within and Across Native and Non-Native Hawaiian Rainforest Species. We used leaf-level hyperspectral measurements (400-2500 nm) indicative of light capture and use in concert with field and laboratory analyses to assess variation in photosynthetic capacity, a key determinant of plant growth, within and across native and non-native rainforest species in Hawai'i. The expansive range of the dominant native tree species, *Metrosideros polymorpha*, permitted us to determine the variability in optical, biochemical (nitrogen and photosynthetic pigments), and physiological properties, and the relationships among these constituents, within a species as they respond to climatic and substrate differences. These data were then compared to leaf-level measurements collected across native and non-native species to determine whether the magnitude of variability in these properties across species was comparable to that measured within species, and whether the relationships among leaf constituents were similar. We hope to use the understanding of these basic leaf-level linkages to inform us about species specific photosynthetic performance at the canopy- and landscape-scale throughout the Hawaiian Islands. These data will not only aid in the mapping and monitoring of invasive species for conservation purposes, but will also yield a manner in which to assess ecosystem function and health (i.e. growth

rates, drought stress).

Poster
Science Fair Student

Riles Martinez, **Guy Miller**
Kaua‘i High School, Līhu‘e, HI

Comparison of hydrated lime and citric acid and return to soil neutrality. Our project compares how quickly soil returns to neutral (pH 7.0) following the application of the two pesticides that are most commonly used in Hawai‘i to kill coqui frogs. These pesticides must come directly in contact with the frogs in order to kill them. There is no eradication value in persistence of these pesticides in the soil or water. Since extremely acidic (low pH) or alkaline (high pH) pH soil levels can damage or even kill organisms, we wanted to see which pesticide treatment returned to neutrality first. We sprayed 25 ml of citric acid (pH0) at the recommended dose (25 ml citric acid with 25 ml water) and sprinkled 25g of hydrated lime (pH14) (dry application recommended) respectively onto Kaua‘i soil samples and then flushed them with water. We also field tested soil and soil runoff in Lawai Valley, where actual sprayings for coqui extermination are being done. We found that hydrated lime returned to neutrality faster than citric acid. The implication from this finding is that hydrated lime dissipates in the environment faster than citric acid.

Session V
Invasives
Session II

Francis Benevides[1], **William Mautz[2]**, Miyako Warrington[2]
[1]FB Engineering, Hilo, HI, [2]University of Hawai‘i at Hilo, Hilo, HI

A Sound Pressure Level Model of Overnight Vocalization by Coqui Frogs (*Eleutherodactylus coqui*). The nighttime chorus of the invasive Puerto Rican coqui frog (*Eleutherodactylus coqui*) is a new prominent feature in Hawai‘i. Sound pressure level (SPL) of a frog chorus is easily measured with an SPL meter, but interpretation of this signal must consider the temporal progression of the chorus. We characterized the overnight progression of SPL from coqui populations in Hawai‘i (n=34) and Puerto Rico (n=4) using data logging SPL meters. Sound measurement was equivalent continuous sound, $L_{Aeq(1sec)}$. A bandpass filter range 1–3.15 kHz encompassed the coqui audio spectrum and excluded most sound energy emanating from other sources. Simultaneous audio recordings were used to detect and identify other noise sources. The coqui chorus rises from daylight ambient SPL shortly before sunset. A relatively rapid rise is followed by a plateau phase when SPL is relatively constant within 1 dB of maximum SPL. The plateau phase is followed by a slow decline in SPL until ambient daytime levels are reached shortly after sunrise. We applied a two-pass moving average filter in the pressure domain (anti-logarithm of dB) to derive reference points and parameters of the chorus phases. Moving averaged data converted back to the dB domain were used to define a piece-wise linear SPL model of the chorus phases: ambient daytime, rise, plateau, and fall. The plateau phase, duration from 0.38 ± 0.22 SD to 1.78 ± 0.68 SD hours after sunset, is the best opportunity to study coqui behavior consistent with the highest (68.1 ± 3.2 SD dB) levels of vocalization.

Session VII
Aquatic Biota
Session

Karla J. McDermid[1], George H. Balazs[2]
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Making a Living on *Limu*: Nutritional Composition of Marine Plants in the Diet of the Green Sea Turtle (*Chelonia mydas*) in the Hawaiian Islands. Over 275 seaweeds and two seagrasses are eaten by Hawaiian green turtles, *Chelonia mydas* Linnaeus, the most common sea turtle and the largest marine herbivore in the Hawaiian Islands. The Hawaiian green turtle population has increased in numbers since protection under the U.S. Endangered Species Act; however, there has been a long-term decline in immature turtles' somatic growth rates. Because forage type and nutrition may have a role in green turtle growth, reproduction and long-term species viability, 16 macroalgal species, two seagrass species, and multi-specific turf from turtle foraging areas on four different islands were analyzed for protein, lipid, carbohydrate, water, ash, energy, amino acid, vitamin and mineral content. A rhodophyte, *Pterocladiella capillacea* (Gmelin) Santelices & Hommersand, a prominent dietary item, and a chlorophyte, *Rhizoclonium implexum* (Dillwyn) Kützing, an infrequently consumed species, ranked highest in total protein content. Most species contained <10% crude lipid. Soluble

carbohydrates ranged from 3.2-39.9 % dry weight. Ash values ranged from 13.7-81.4% dry weight. Energy content of *Pterocladiella capillacea* was >14 kJ g^{-1} ash-free dry weight. All species tested contained measurable quantities of 11 minerals. Vitamin A was detected in all marine plants tested; most contained Niacin; and *Enteromorpha flexuosa* (Wulfen) J.Agardh, a chlorophyte, had the highest amount of Vitamin C (3 mg g^{-1}). Samples contained measurable amounts of all essential amino acids, except tryptophan. These data provide new information about Hawaiian green turtle feeding ecology, and factors that may influence somatic growth rate.

Plenary Speaker

Carl McGuinness
Department Of Conservation, Wellington, New Zealand

Evolution of an Organisation: The New Zealand Department of Conservation. An outline of how the Department of Conservation (DOC) has changed since its inception in 1987, implications of its new Strategic Direction, and how this will shape the Department into the future. The following aspects will be covered: a brief look at New Zealand history and the social drivers that led to the formation of DOC; key phases in the Department's evolution over the last 20 years; an overview of the new Strategic Direction and implications for DOC's business; how the Department aims to embed the Strategic Direction into its work and culture; how the Department's monitoring aids strategic planning. Concluding with an 'outsiders' impression of strategic conservation issues that are facing both Hawai'i and New Zealand, and how DOC is planning to address those issues in New Zealand.

Session V Invasives Session II *Student*

Raymond McGuire, William Mautz
University of Hawai'i at Hilo, Hilo, HI

Does the Invasive Tree, *Falcataria moluccana*, Facilitate a Large Population Density of the Invasive Puerto Rican Treefrog, *Eleutherodactylus coqui*? Since introduction to Hawai'i, the Puerto Rican treefrog, *Eleutherodactylus coqui*, has quickly spread through the major Hawaiian Islands. Hawai'i's climate is similar to Puerto Rico, yet Hawai'i coqui populations can reach three times the density of Puerto Rico. Preliminary surveys suggested that *E. coqui* has high population densities in albizia (*Falcataria moluccana*) dominated forests. Because albizia is a nitrogen-fixer, we hypothesized that albizia dominated forests promote higher population densities of coquis than in native 'ōhi'a (*Metrosideros polymorpha*) dominated forests. We compared populations of frogs at two study sites, Lava Trees State Monument (LTSM) and Nanawale Forest Reserve (NWFR). Each site contained both 'ōhi'a and albizia dominated forest and at each site and forest type, three replicate 20x20m plots were established for mark-recapture analysis of frogs. All frogs were measured for mass, snout-vent length and position within the plot. Frogs larger than 17mm were individually marked with subcutaneous tags. Contrary to hypothesis, population densities were greater in both forest types at LTSM compared to NWFR. LTSM is a popular tourist destination, while NWFR is much less accessible to people. The LTSM substrate is also younger (~214 ybp) compared to NWFR (400-550 ybp). It is not yet clear what the primary determinants of coqui density are at these sites, however, it is clear that the dominant forest tree does not have a primary effect on coqui population density. Furthermore, it is possible for native 'ōhi'a dominant forests to support coqui densities larger than those found in Puerto Rico habitats.

Poster 41

Tahzay Jones[1], **Danielle McKay[1]**, Fritz Klasner[2]
[1]National Park Service, Hawai'i National Park, HI, [2]National Park Service, Seward, AK

Utilization of Inventory and Monitoring Program Data in Evaluating Environmental Impacts for National Parks. National parks throughout the Pacific islands are routinely faced with evaluating environmental impact statements (EIS), draft environmental impact statements (DEIS), and planning documents for activities taking place both within and external to national park boundaries. Evaluation of these documents is often a lengthy process that involves a considerable amount of research on biological, ecological, physical, and chemical processes. The Inventory and Monitoring program began data mining in 2003 to gather and centralize biological, ecological, physical, and chemical

research relevant to national parks within the Pacific Island Network (Guam, Saipan, American Samoa, Oʻahu, Molokaʻi, Maui and Hawaiʻi). Utilizing a national framework to categorize environmental components affected by stressors in the ecosystem, a significant amount of research was synthesized and applied to develop long term ecological monitoring strategies for high priority ecological parameters within the network. It was quickly apparent that this framework could also be utilized to provide feedback and comments on EIS, DEIS, and planning documents awaiting management considerations. This data has been used to support park efforts such as the replacement of the USS Arizona Memorial visitor center and has provided considerable information on the impact of the proposed Honokōhau small boat harbor expansion at Kaloko-Honokōhau National Historical Park.

Session II
Native Biota
Session
Student

Dean Meason[1], Travis Idol[1], J.B. Friday[1], Paul Scowcroft[2]
[1]University of Hawaiʻi at Mānoa, Honolulu, HI, [2]US Forest Service, Hilo, HI

Potential Mechanisms That Limit Koa Growth and What It Could Mean for Koa Management–A Case Study. Little is known about how to best manage *Acacia koa* (koa) for restoration or commercial purposes. Traditional methods to assess management options are site specific and costly. We wanted to investigate the mechanisms of koa's response to several management prescriptions to provide an understanding on what most limits koa. A silvicultural study was conducted at Keauhou Ranch on 23 year-old koa located on young Andisols with 1,800 mm yr^{-1} precipitation. The split plot study involved a thinning main treatment, and sub-treatments of exotic grass competition control (CC), and a CC treatment combined with several applications of phosphorus (P) fertiliser (CC+P). Five years later, koa responded most positively to the thinned CC+P and we analyzed several variables to understand the response. There was a sustained increase of CC+P soil resin extractable P of 6.8 µg P 10 cm^{-2} (1020%). Litterfall biomass, nutrient concentration, or decomposition rates could not explain this effect. Hedley fractionation indicated that the NaOH extractable inorganic P fraction was likely the primary source of this P. CC+P volumetric soil water content (0.13 m^3 m^{-3}) was lower than the CC (0.16 m^3 m^{-3}) and the Control (0.17 m^3 m^{-3}). These variables suggest that koa does not adhere to traditional models of forest resource limitation. Soil P limitation was a greater limitation for koa than competition for soil water, applied P cycled primary through the mineral soil than through litterfall, and organic matter is important for this cycling. How these results relate to Laupāhoehoe and Kōkeʻe forests will be discussed.

Session IV
Forest Health
Symposium I

Arthur Medeiros, Lloyd Loope
USGS Pacific Island Ecosystems Research Center, Makawao, HI

Biological Invasions Threaten Native Hawaiian Canopy Tree Species: The Erythrina Case Study. The global transport of forest pests has had devastating effects on forests worldwide, best documented in the eastern United States, and increasingly is recognized as a serious international problem. In Hawaiʻi, this problem had received little attention until recently, although a number of tree genera, apparently formerly common, have declined catastrophically and disproportionately post-1778. Traditionally, the "big three" (fire, ungulates, weeds) are cited as the primary threats to native Hawaiian plant species. Although these substantial forces degrade native forests, blights of dominant native tree species can potentially collapse native forests, triggering landscape level replacement by invasive tree species. With arrival and establishment of the Erythrina gall wasp, *Quadrastichus erythrinae*, (Hymenoptera: Eulophidae), and ʻōhiʻa rust (*Puccinia psidii*) within the past two years, Hawaiʻi has gained new awareness of a potentially catastrophic problem with profound biological and economic impacts. This talk will provide an overview of the distribution, status, and ecological role of the endemic Hawaiian wiliwili (*Erythrina sandwicensis*) and its sudden degradation by *Quadrastichus erythrinae*. Prior to the arrival of Erythrina gall wasp into Hawaiʻi three years ago, wiliwili was considered one of the most resilient of native tree species, thriving even adjacent to human habitations. As a nitrogen-fixer and overwhelmingly dominant native tree species, wiliwili is a so-called keystone or foundation species of lower elevation Hawaiian dryland forest. Wiliwili forests are

now in grave danger archipelago-wide, and *Q. erythrinae* may even pose a threat to the genus *Erythrina* worldwide.

Session VI
Bridges to the Future Forum

Loyal Mehrhoff
Pacific Island Ecosystem Research Center, Honolulu, HI

The Value of Students and Interns to Research. Students and interns unquestionably play a valuable role in accomplishing management-oriented research. However, the value of this workforce goes beyond simply getting a project finished. Many students and interns go on to become the next generation of researchers and resource managers. Proper mentoring of students and interns can be extremely time-consuming. However, mentoring has long-term benefits to agencies and communities.

Session III
NWHI Symposium

Daniel Merritt[3], Christopher Kelley[1], Michael Parke[2], Kevin Wong[2]
[1]Hawai‘i Undersea Research Laboratory, University of Hawai‘i, Honolulu, HI, [2]NOAA Pacific Islands Fisheries Science Center, Honolulu, HI, [3]Joint Institute of Marine and Atmospheric Research, University of Hawai‘i, Honolulu, HI

Monitoring Hawai‘i’s Bottomfish Complex Using Fishery-independent Methods. Hawai‘i’s commercially-important bottomfish species have been overfished in the main Hawaiian Islands, leading to a complete closure of the fishery to both commercial and recreational fishers in federal waters. At the same time, the State of Hawai‘i has implemented new bottomfish restricted fishing areas. Non-extractive methods are needed to monitor the success or failure of these and future management actions. NOAA Pacific Islands Fisheries Science Center, in collaboration with the Hawai‘i Undersea Research Laboratory (HURL), has developed a bottom camera bait station (BotCam) designed to monitor and study bottomfish and essential fish habitat (EFH) in depths between 100 and 300 meters. We will present an overview of the capabilities of the BotCam, along with the sampling methods developed using multibeam bathymetry and backscatter data, as well as derived mapping products and geographic information system software. Video analysis methods and results from a pilot experiment done in and around a restricted fishing area (RFA) in Hawai‘i will be presented.

Poster 42
Student

Wallace Meyer, Robert Cowie
University of Hawai‘i at Mānoa, Honolulu, HI

Recognition of Succineid Land Snail Diversity in Hawai‘i: The Beginnings of a New Conservation Challenge. Correct identification is a primary requirement of biodiversity management. Unfortunately, traditional taxonomies may not summarize true genetic biodiversity, a problem exemplified by the succineid land snails of the island of Hawai‘i. The species of succineids that occur between the ‘Ōla‘a portion of Hawai‘i Volcanoes National Park and the Hilo Forest Reserve were previously thought to belong to two relatively common species, *Succinea cepulla* and *S. thaanumi*. However, phylogenetic analysis of partial mitochondrial DNA cytochrome *c* oxidase subunit I sequences from 382 individuals from 13 sites suggests that there are at least nine robustly supported monophyletic species-level groups. Distinguishing these taxa in the field is impossible because most shell morphology characters are uninformative, and the taxa are not obligately associated with specific plant types. Of the 382 individuals sampled, 279 (73%) and 84 (21 %) belonged to two widely distributed groups. The other seven are rare (< 3 % each) and have restricted ranges. It is unclear if the rarity of these seven taxa is attributable to their cryptic ecology and behavior, or the timing of sampling. These findings demonstrate that biotic surveys remain critical even in presumed well inventoried areas and for well known taxa. Assessment of these snails’ conservation status is ongoing, with a goal of providing managers with information to preserve as many distinct lineages as possible.

Session II
Big Picture
Session

Stephen Miller, Jeff Burgett
U.S. Fish and Wildlife Service, Honolulu, HI

Climate Change and Endangered Species Conservation. Tropical storms are identified in recovery plans as one of the stochastic events that can impact the stabilization and recovery of endangered species in Hawai‘i. An analysis of changes in storm frequency, strength, and duration indicate that the potential impacts from these storms have increased over time. Actions needed to enhance the survival of endangered species are presented, including an assessment of where habitat will be available over the next 100 years, given temperature and precipitation changes that may occur due to global warming.

Session I
Alternative
Energies
Symposium

Eric Miller, Richard Rocheleau
University of Hawai‘i at Mānoa, Honolulu, HI

Photovoltaics in Hawai‘i. The sun is our “ultimate” renewable energy source: Every second of every day, about 120,000 trillion watts of solar energy is striking the earth’s surface- at the same time humankind’s current consumption of electricity is averaging a “mere” 15 trillion watts (give or take a trillion!) But, what does this really mean when it comes to developing practical solar-to-electricity conversion systems for meeting world needs, and in particular, Hawai‘i’s needs? This talk discusses the current technological and economic status of semiconductor-based photovoltaic systems for direct solar-to-electric energy conversion in Hawai‘i, and describes some interesting and important results from photovoltaic demonstration projects already operating on O‘ahu (including the Navy’s Ford Island “Hangar 54” Installation, and HECO’s “Sunpower for Schools” Program).

Poster 43

Michelle Montgomery[1], Karl Magnacca[2], David Foote[3]
[1]U. S. Geological Survey Hawai‘i Cooperative Studies Unit, Pacific Aquaculture and Coastal Resource Center, University of Hawai‘i at Hilo, HI, [2]University of California at Berkeley, Berkeley, CA, [3]U. S. Geological Survey, Pacific Island Ecosystems Research Center, Hawai‘i National Park, HI

Use of Springtails as Indicators of Feral Pig Disturbance in Hawaiian Montane Forests. Springtails (Order Collembola) are one of the most numerous arthropods in forest ecosystems. They along with other soil invertebrates play an important role in decomposition, nutrient cycling and mineralization; and are widely used as biological indicators of disturbance to terrestrial ecosystems. In Hawaiian native forest communities, springtails have been used to document the effects of feral ungulate disturbance, non-target effects of pesticides, and long-term ecosystem processes. Previous research on the soil ecology of Hawaiian montane rainforests indicates that endemic springtails are proportionally more common in older feral ungulate exclosures. This suggests that restoration of native soil fauna is possible as a result of resource management efforts to exclude ungulates from rainforests. We examined the relationship between springtails and the history of disturbance from feral pigs by comparing and contrasting springtail communities over small and large spatial scales in different aged feral ungulate exclosures and areas with active pig populations. The most common species of springtail in the understory leaf litter was the adventive Entomobryid, *Salina celebensis*. The species that showed greatest sensitivity to exclosure age was the introduced Isotomid, *Isotoma trispinata*. Our results suggest that contrary to previously published results, there is no simple relationship between levels of endemism in springtail communities and the past history of feral pig disturbance.

Session VII
Aquatic Biota
Session

Anthony Montgomery, Ivor Williams, Jason Leonard
Hawai‘i Division of Aquatic Resources, Honolulu, HI

The Hawaiian Black Coral Fishery: Science and Management. Hawai‘i has had an active fishery for black coral (Order Antipatharia) since the late 1950s. During this time, the intensity of fishing effort has fluctuated moderately. However, in recent years there has been an increase in landings and growing uncertainty of the future sustainability of this fishery. With increased landings and a potentially significant impact from the invasive species, *Carijoa riisei*, the Hawaiian black coral fishery is undergoing a fundamental change in management. Historical surveys have produced a

baseline as well as more than 20 years of history in the population dynamics of this fishery. However, recent surveys conducted have shown significant changes in the population structure in a relatively short time period. These surveys coupled with research on *C. riisei* have now provided resource managers with a tremendous amount of information to base management decisions upon. This fishery is managed by the State of Hawai'i (within 3 miles of shore) and the United States Government (outside 3 miles). Both management agencies have worked together to address this fishery as a single stock rather than separate stocks. Continued communication through the sharing of ideas, workshops and fishery council meetings has begun to produce a comprehensive management approach to this fishery. Although the proposed management options largely deal with black coral as a single species rather than an ecosystem, they deal with the immediate issues of resource sustainability.

Session III Conservation Evaluation Symposium

Shawn Morford
Benchmark Consulting, Forest Grove, Oregon

The Emerging Field of Conservation Evaluation: An Overview. Conservation practitioners are increasingly asked to demonstrate impacts of their actions on resources they are trying to protect or restore or on human behaviours they are trying to affect. Yet, historically, resource management and conservation have been more focused on prescriptive actions ("doing things") than measuring outcomes of their work. Conservation evaluation – a growing field – brings together science and management to systematically investigate the impacts of programs. Many organizations such as the National Fish and Wildlife Foundation are establishing evaluation offices to assist field personnel to design evaluation projects to measure impacts of conservation and community initiatives. Some evaluations are done for accountability, while others are done to improve how organizations function internally in accomplishing objectives. Some academics believe that indicators of conservation success must include both social and biological factors, and that evaluations should report on both biological and socio-political indicators. Some evaluations take an economic approach (cost-benefit), while others focus on both the substance (what was accomplished) and the process used (how it was carried out). Because a program's ultimate goals often cannot be reached for decades, measures of success must be defined—and measured - in a stepwise fashion. Long-term goals such as maintaining species population numbers need to be measured through the use of proxies such as habitat or even human behaviour or polices that affect habitat, if short-term demonstration of results is required.

Plenary Speaker

Dieter Mueller-Dombois
University of Hawai'i at Mānoa, Honolulu, HI

A Silvicultural Approach to Restoration of Native Hawaiian Rainforests. Restoration of native Hawaiian rainforests should be based on a silvicultural rather than horticultural approach. A silvicultural approach applies knowledge from forest ecological research and focuses on simulating and enhancing natural processes for "low input management." Historically, a horticultural approach of planting alien trees was used to restore Hawaiian watersheds. This form of "high input management" was the result of insufficient understanding of how the Hawaiian rainforest perpetuates itself. It left out a major component, the change of substrate in mature rainforests. Mature rainforests usually have an abundance of decaying moss-covered nurse logs on the ground and a sufficient availability of tree fern trunks, both of which serve as the principal germination sites for native ferns and seed plants. A set of seven silvicultural tasks is suggested for application on an operational experimental basis. They begin with partially delimbing or cutting of alien trees and allowing their larger limbs and trunks to rot *in situ*. A special task is undermining alien forests with reintroduction of native tree ferns in *kīpuka*-like fashion combined with out-fencing feral pigs. Other important tasks involve weed control, inoculation of moss-covered rotting logs and tree fern trunks with disseminules of robust native seed plants (wherever they are not anymore in seeding range), frequent monitoring, and for koa in particular, soil scarification.

Session IV Landscape Management Session

Christine Mullen
U.S. Fish and Wildlife Service, Honolulu, HI

The Environment of Wine: A Global Concept. The wine industry has been criticized for misuse of the land. However, many wine grape growers are leading the agricultural industry in a wholistic environmental approach to land management. I will discuss the old and new environmental ethic of many in the wine industry, both in the United States and world-wide and look at the model many are using to "positively infect" those in this industry and others. Work with the wine grape growers began through a Safe Harbor Agreement with a California vineyard. Further exposure to family-led and operated vineyards revealed a land use ethic that was surprising and yet logical. I found that growers also employed an unusual, if not unique, model for self-education. Through a secondment with the IUCN, I found similar pro-environmental management in most of the wine-grape growing nations of the world and was introduced to the "slow food" movement and the meaning of "terroir".

Poster 44

Nikhil Narahari, Mark Montgomery, Erin Foley
Colorado State University, Fort Collins, CO

The Importance of Collaborative Research in Developing Effective Management Strategies for a Subalpine Tropical Dryland Ecosystem at Pōhakuloa Training Area, Hawai'i. The saddle region of Hawai'i Island contains some of the last remaining sub-alpine tropical dryland ecosystems in the world. The unique natural resources in this area provide excellent opportunities for science and research; specifically, studies that facilitate the preservation and restoration of these rare ecosystems. The Pōhakuloa Training Area (PTA) comprises 53,750 hectares of the saddle, and contains 19 federally designated threatened and endangered plant and animal species. The primary threats to ecosystem health at PTA come from changes to the landscape brought by feral ungulates, invasive weeds, and fire. To counter these impacts, the Natural Resources Office (NRO) at PTA controls invasive weeds, propagates and outplants rare plants, monitors rare species, and fences large tracts to facilitate removal of ungulates. However, to most effectively manage PTAs sizeable land area with limited human and financial resources, it is essential to incorporate the latest and best scientific knowledge available. Thus, the NRO has forged collaborations with several federal, state, and community organizations. To date, collaborations have yielded knowledge ranging from optimal fountain grass control techniques to recommendations for effective protocols to assess habitat preferences for endangered Hawaiian hoary bats. Despite progress, there remain significant questions about the ecology of PTA's unique natural systems. Scientists and students are therefore strongly encouraged to take advantage of research opportunities at PTA. Possible areas of research include rare plant pollination, interspecific competition in a limited resource environment, microsite influences on community structure, fire ecology, mycorrhizal and microbial contributions to growth, and rare plant ecophysiology.

Poster 45

Corbett Nash
Research Corporation of the University of Hawai'i, Hawai'i National Park, HI

Sharing Mana'o in Pacific Island Network: Arrows of Information in the Sea of Natural Resources. The NPS Inventory and Monitoring (I&M) Program is charged with many and various tasks in America's national parks. Outreach and science communications play a strong, albeit secondary, role in the Nation's I&M program. So how do we get this information where it needs to go? Many NPS networks are championing methods of sharing the information they collect with parks, resource managers, and the public. The Pacific Island Network (PACN) is no different. The PACN has devised several methods of science communications aimed at both the network parks and the public. Newsletters, species lists, educational programs, participation in local fairs and festivals, web links, and a brochure are just the tip of the iceberg. The PACN has also had success in an innovative program of engaging park staff and cultural advisors in a quest for two-way information sharing. These myriad approaches to outreach have had resounding positive effects.

Session IV
Fisheries
Session

Robert Nishimoto, Troy Shimoda, Troy Sakihara, Lance Nishiura, Tim Shindo
Hawai‘i Division of Aquatic Resources, Hilo, HI

Waiākea Fish Pond/Wailoa River System in Hilo: A Significant Nursery Habitat for the Native Mullet (*Mugil cephalus).* ‘Ama‘ama or gray mullet, *Mugil cephalus*, is a popular gamefish species well known in Hawaiian culture and history. The general decline of marine coastal fishes prompted the Division of Aquatic Resources (DAR) to develop a prototype marine stock augmentation program in 1990, focusing on the recreational pole and line mullet fishery in Hilo, Hawai‘i. The release of 275,000 cultured mullet fingerlings from 1990-2000 made a significant contribution to this unique recreational fishery. However, the high number of cultured mullet in the fisher creel, ranging from 8.9-61.1%, in this popular fishery prompted DAR to focus on a possible root cause - habitat degradation. The Waiākea/Wailoa river system was identified as a mullet nursery which precipitated more restrictive management rules with fisher support, followed by restoration and out planting of native riparian cover for new recruits, and deliberating on options to control the invasive alien Kanda mullet, *Valamugil engeli*, which competes with the native mullet for food.

Session II
Big Picture
Session

Zoe Norcross-Nu‘u[1], Charles Fletcher[1], Thorne Abbott[2], Matthew Barbee[1], Ayesha Genz[1], Brad Romine[1], Chris Bochicchio[1], Matthew Dyer[1]
[1]University of Hawai‘i, Honolulu, HI, [2]Maui County Department of Planning, Wailuku, HI

A Coming Calamity, Management Response to High Waters, Receding Coasts, and Low Lands. Hawai‘i’s shorelines are feeling a tightening squeeze from development pressure pushing coastal land use boundaries makai, and coastal erosion and sea level rise pushing the ocean’s boundaries mauka. Erosion and beach loss resulting from these opposing forces have been worsening yearly and resource management agencies are struggling to balance protection of public beach resources with protection of private property rights. Rising sea levels and associated increases in the elevation of the water table will threaten low-lying lands within coming decades. Even before rising groundwater breaks the surface, subsurface drainage infrastructure such as leach fields, perforated pipes and retention basins will stop functioning when they become submerged by groundwater.

Cutting-edge technology employed by the University of Hawai‘i to determine historic rates of coastal erosion have led to the adoption of the first science-based coastal management tool in Hawai‘i, by Maui County. Erosion rate-based shoreline setback rules adopted in 2003 require the placement of structures at a distance from the shoreline of 50 times the annual erosion rate plus a 25 foot buffer. Honolulu and Kaua‘i Counties are now conducting erosion rate studies and Kaua‘i recently adopted interim setback rules providing even larger erosion rate-based setbacks than Maui. High accuracy LIDAR topographic land elevation data is now being used by the University of Hawai‘i to create sea-level rise inundation maps. These maps will be one of the most critical tools for land-use management and planning by identifying areas at risk of inundation. Management alternatives will primarily involve adaptation, relocation and long-term retreat.

Poster 46

Michelle Norman, Rebecca Ostertag
University of Hawai‘i at Hilo, Hilo, HI

Effects of a Multiple Species Invasion on Decomposition and Decomposer Communities. *Falcataria moluccana* (albizia) is a nitrogen-fixing tree that has invaded native *Metrosideros polymorpha* (‘ōhi‘a) forests in Hawai‘i. Studies have shown that albizia increases primary productivity and decomposition rates in Hawaiian forests. In addition, albizia may be facilitating invasive *Eleutherodactylus coqui* frog populations by increasing their food source (invertebrates). These multiple invasion may have detrimental effects on decomposition and may be altering the roles of microbial and invertebrate populations. To investigate the effects of albizia and *E. coqui* on decomposition and decomposer communities, leaf litterbags with different mesh sizes and naphthalene were utilized to find percent mass remaining over time. Preliminary results after four months have shown albizia litter is significantly decomposing faster than ‘ōhi‘a litter, and litter in

sites with the presence of *E. coqui* decomposed significantly faster. Furthermore, there were significant interactions between tree type, mesh treatment, and *E. coqui* frog presence. Large mesh litterbags located in sites with albizia and the presence of *E. coqui* were almost decomposing two times faster than ʻōhiʻa plots without frogs. However, microbial decomposers seem to be more stimulated by the presence of *E. coqui* than litter type. Overall, there has been a shift in microbial and invertebrate decomposer roles as a result of the albizia and *E. coqui* frog invasion and this shift is likely to also affect primary and secondary productivity and trophic interactions. Eradication and/or control of *E. coqui* from Hawaiian forests is recommended to lower nutrient cycling rates.

Session I
Insects
Symposium I

Darcy Oishi
Hawaiʻi Department of Agriculture, Honolulu, HI

The Importance of Diagnostics for Conservation. Diagnostics is an important but often overlooked aspect of both conservation and agriculture. It is to the diagnostician that the questions "what is it," "where did it come from," and "what will it do" are asked. These questions determine the type and degree of response to either control or preserve the organism. Yet if you analyze the structure of the Hawaiʻi Conservation Alliance, none of the agencies have dedicated identifiers within their ranks. Of the agencies that employ dedicated identifiers or diagnosticians, only the Bishop Museum focuses on conservation related issues. The identification of pests posing a threat to conservation invariably falls to the identifiers of the Hawaiʻi Department of Agriculture. Diagnostics within the state, and the nation at large, is faced with impending retirements stretching diagnostic resources even thinner. Diagnostics must therefore move forward into the 21st Century. Diagnostics must become "virtual" to account for losses in expertise and to facilitate communication with experts around the world for pressing identification needs. Distance diagnostics is only the beginning. Virtual reference libraries, both of identification keys and actual specimen archives will be critical for the rapidity of identification. Movement away from binomial identification keys to pictorial or feature-based keys can assist in enhanced diagnostic ability. However, all of this support material is irrelevant without the creation of more diagnostic positions that will facilitate mentoring and allow for ample coverage to address agricultural, environmental and public health needs. Without diagnosticians, all of us, in both agriculture and conservation, will have nothing to do.

Session III
NWHI
Symposium

Frank Parrish[1], Gregory Marshall[2]
[1]Pacific Islands Fisheries Science Center NOAA Fisheries, Honolulu, HI, [2]National Geographic Missions Program, Washington, DC

Foraging Competition Between Monk Seals and Other Apex Predators. CRITTERCAMs were deployed on 42 monk seals at French Frigate Shoals Atoll in the Northwestern Hawaiian Islands. Sixty-nine hours of video, comprised of 3192 recording segments collected at standardized intervals, revealed the presence of sharks, jacks, and large- bodied snappers around the seals roughly 17% of the time. Present at all but the deepest depths (>100 m), the predators were most conspicuous during the seals' dives to foraging grounds (60 m), particularly on the summits of neighboring banks. Predators were encountered as individuals and in large schools (46 max no.) that closely escorted the foraging seals except during their oceanic swims between the atoll and bank. The predators exploited the seals' superior ability to flush cryptic prey from bottom cover by the probing, digging, and flipping of rocks. In many instances, the seal and predators competed for the same prey item. The jacks (*Caranx ignobilis* and *Seriola dumerili*) were the most aggressive, but carcharhinid sharks also competed with the seals and, in one instance, a shark was seen to repeatedly ram a seal in an attempt to dislodge the prey item it was handling. Competition is clearly part of the monk seals' foraging landscape, and the abundance of predators and concerns about reduced oceanic productivity make it an important consideration in the recovery of the endangered Hawaiian monk seal.

Session I
Insects
Symposium I

Robert Peck[1], Paul Banko[2], Justin Cappadonna[1], Melody Euaparadorn[1]
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Developing Management Tools for Invasive Ants in Hawai‘i Volcanoes National Park. Approximately 20 species of invasive ants have been recorded from Hawai‘i Volcanoes National Park. The ecological impacts of these species are unknown, but three species, the long-legged ant (*Anoplolepis gracilipes*), big-headed ant (*Pheidole megacephala*), and Argentine ant (*Linepithema humile*) form large colonies and are highly aggressive towards other arthropods. Each ant is capable of impacting native arthropod communities and the processes that they influence. Unfortunately, few options are available to park managers for controlling these ants. As the first part of a multi-year effort to develop tools for controlling ants, we tested three baits on Argentine ants: two use acute toxins (Maxforce® and Xstinguish®) and one uses a hormone to regulate insect growth (Australian Distance®). None of the baits eradicated ants, but Xstinguish® and Maxforce® performed the best, decreasing ant abundance by 99% and 92%, respectively, after one week, and by 98% after approximately eight weeks. In contrast, Distance® decreased ant abundance 82% after one week but ants rebounded to at least 39% of control levels after the ninth week. In measurements of presence or absence of ants at bait cards, Xstinguish® out-performed Maxforce®, particularly over the first four weeks, as ants were found on 6.3% of cards within Xstinguish® plots compared to 45.3% in Maxforce® plots. Our results indicate that further work is needed before eradication of this species, even on a relatively small scale, can be expected. Future research, including the use of novel bait on both Argentine and big-headed ants, will be outlined.

Session VIII
Winged
Vertebrates
Session I

Liba Pejchar, Gretchen Daily
Stanford University, Stanford, CA

Hawai‘i’s Last Abundant and Native Frugivorous Bird Provides Key Seed Dispersal Services. Forest restoration is an important component of conservation efforts, yet high costs and limited funds pose formidable financial challenges. Could harnessing a natural process, seed dispersal by birds, provide a cost-effective means of catalyzing forest regeneration? Fifty percent of Hawai‘i’s native plants require avian seed dispersal yet only one native frugivore, ‘Ōma‘o (*Myadestes obscurus*), remains in sufficient numbers to perform this function. Although ‘Ōma‘o are restricted to less than half their original range, introduced frugivorous birds pervade Hawai‘i’s forests. We collected fecal samples, set seed traps and measured habitat preferences at sites with and without ‘Ōma‘o to address the question: do exotic birds provide the same seed dispersal services as native birds or does the absence of ‘Ōma‘o strongly limit forest regeneration? We found that ‘Ōma‘o dispersed a greater richness and abundance of seeds than exotic frugivores. Although exotic birds also dispersed native seeds, >90% were from just two common, small-seeded species. Additionally, because ‘Ōma‘o spend most of their time in canopy trees, thus depositing seeds where microclimatic conditions for seed germination may be better, we hypothesize that seed dispersal by ‘Ōma‘o could result in higher germination. These results call for further study but suggest that reintroducing ‘Ōma‘o could be an important part of a strategy for forest regeneration.

Session IX
Winged
Vertebrates
Session II

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The Lāna‘ihale ‘Ua‘u Colony: Management Guided By Research Results. We present two examples of research results carried into the field to enhance and protect the endangered ‘Ua‘u (Hawaiian petrel, *Pterodroma sandwichensis*, HAPE). We also suggest that the observation of Robert Cabin (2007) that ”the sympatric implementation of ecological restoration and scientific research programs can lead to valuable synergies” is true for endangered species management leading to population enhancement and potential down-listing as species recover. Fences in and around seabird colonies present collision hazards to night flying birds returning to burrows and or engaging in mating behavior (Simons 1985, Hodges 2001). Roberta Swift (2004) working in Hawai‘i Volcanoes National

Park, identified appropriate visibility enhancement treatment for fences in an ʻUaʻu colony. We show how we have applied her research results to reduce the potential for fatal fence collisions. Feral cats are well known to predate nesting seabirds resulting in dramatically reduced reproductive success and severely depressing or eliminating colonies or species (Hodges & Nagata 2001, Keitt, *et al.* 2002, Oliver 1930). Various control programs have been developed and practiced throughout the world (Keitt & Tershy 2003, Wood *et al.* 2003). We present evidence of cat predation on ʻUaʻu in the Lānaʻihale colony: feline feces containing HAPE feathers, feline intestinal contents which include ʻUaʻu feathers and cat predated ʻUaʻu remains. Our trapping protocols are explained. Results of continuing surveys show reduced presence of feral cats in the colony.

Session II
Insects
Symposium II

Dan Polhemus
Division of Aquatic Resources, DLNR, State of Hawaiʻi, Honolulu, HI

What the Databases Don't Tell You: Hidden Biodiversity in Hawaiian Heteroptera. Although great strides have been made over the past decade in compiling the available information regarding the status of the formally described biota of the Hawaiian Islands, for many groups these authority files represent a significant underestimate of the true species richness extant within the islands. For example, in the Heteroptera, or true bugs, many genera indicated as having only included two to four species in fact contain upwards of 20 species each; such genera include *Sulamita*, *Koanoa*, and *Pseudoclerada*. Similarly, even certain genera such as *Nabis* and *Orthotylus*, which contain a large number of described endemic species and could on that basis be assumed to be moderately well documented, will in fact double in size once the additional species now present in collections are described; for *Nabis*, this will bring the total included endemics to over 70 species, and for *Orthotylus* the total will likely exceed 150 species. Many of the undescribed species that make up this "hidden biodiversity" have only been collected for the first time in the past 15 years, as helicopter-assisted surveys have allowed access to more remote sites. This pattern of significant additional discovery in turn indicates that despite serious ecological perturbations, the Hawaiian Heteroptera biota retains robust faunal integrity, and is not yet in an acute state of retreat or collapse.

Poster 47

Faith Inman[1], **Linda Pratt[2]**, Lloyd Loope[3]
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Limiting Factors of *Portulaca sclerocarpa* A.Gray In Hawaiʻi Volcanoes National Park. *Portulaca sclerocarpa* is a small, succulent plant found in montane dry shrubland. Listed as an endangered species in 1994, it is recorded from Hawaiʻi, Maui, and Lānaʻi. Hawaiʻi supports most of the known plants of *P. sclerocarpa* with the largest population at Puhimau geothermal area in Hawaiʻi Volcanoes National Park. Despite protected status, the Puhimau population has declined by 93% from 1983 to 2006. At Puhimau and two separate outplanted populations we monitor survival and reproductive phenology and quantify flower and fruit. In addition, we measure effects of invasive grasses on outplant growth, determine rates of fruit predation by rodents and conduct field germination trials on different substrates. Preliminary greenhouse seeding trials yielded 16-38% germination. We have found that plants are fertile throughout the year and that 74% of buds and flowers produce ripe capsules containing 230 seeds on average. Outplants in plots without grass grew more over six months than those planted in plots with grass, but the difference was not significant. The proportion of branches with fruit tripled for plants in rodent exclosures after three months, thus rodent predation at Puhimau may be an important limiting factor. Of 4000 seeds planted in seed plots at Puhimau, none have germinated and all of several hundred germinants found at the Crater Rim outplanting site have died. An understanding of the reasons for population decline at Puhimau and the factors limiting successful restoration at other locations will provide park managers with information essential for the preservation of *P. sclerocarpa*.

Session VI
Monitoring
Symposium I

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Beyond Traditional GAP Analysis: Identifying Gaps in Management of Hawaiian Plants and Birds. Traditional GAP analysis utilizes species range maps and land stewardship maps to identify gaps in conservation protection. In the Hawaiian Islands the level of protection a species receives may range from simply having habitat protected from future development to having habitat intensively managed through invasive species control and active restoration. We analyzed projected ranges and known occurrences of all Hawaiian plant and forest bird species to assess their presence in areas with different intensities of management. We recognized three categories of management intensity: little or no management, moderate management (designated conservation reserve or preserve areas), and intense management (specifically areas where ungulates have been removed). Our projections indicate that ~30% of plant species are absent from moderately managed areas, and ~50% are absent from intensively managed areas. However, comparisons to available plant lists indicate that projections somewhat overestimate the number of species present, and therefore underestimate the number of protection gaps. Plant species that are absent from intensively managed areas are primarily lowland dry and mesic species. Birds are well represented in intensively managed areas on Maui and Hawai'i but not on Kaua'i. Even for species that do occur within managed areas, the amount of habitat managed varies considerably among species. These results provide information that may be used to identify additional areas for both protection and management of Hawaiian ecosystems.

Session VIII
Monitoring
Session

Melora Purell[1], Julie Denslow[2]
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GARP Habitat Models as a Tool for Invasive Species Management. The Genetic Algorithm for Rule-set Production (GARP) is a machine-learning program that creates predictive habitat models. These maps of suitable habitat are produced using an algorithm that relates spatially-explicit environmental variables like elevation and rainfall with known presence localities, then extrapolates the relationships across a landscape. Habitat models for invasive species can be used in cost-benefit analyses and to guide strategies for monitoring and control. The Desktop GARP modeling program was used to create predictive habitat maps for four invasive alien plants (*Psidium cattleianum*, *Tibouchina herbacea*, *Miconia calvescens* and *Bocconia frutescens*) and one alien amphibian (*Eleutherodactylus coqui*). Presence location data were collected from researchers and land managers from across the state and input into the GARP program along with four environmental predictors: elevation, rainfall, slope and windwardness. Optimal models with low error were chosen from hundreds of runs compiled for each species. GARP models for invasive species are limited by their reliance on presence locations in Hawai'i, and will only predict habitat suitability for environments that have already been invaded. The models for newly introduced species will only be as accurate as the presence locations that are used as input. A strength of GARP models for invasive species comes from the fact that many alien species inhabit a different niche in Hawai'i than elsewhere, and these unique habitat parameters are captured in the iterative process incorporated in the GARP algorithm. Land managers will find GARP models very useful to inform strategies for invasive species control.

Poster 48

Erin Raboin[1], David Foote[2]
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The Status of Yellowjacket Wasps in Mixed Koa Forests of Hawai'i. Introduced western yellowjacket wasps, *Vespula pensylvanica*, are a threat to native ecosystems throughout the state. These social hymenopteran predators forage for arthropod prey in montane forests and shrublands. Surveys for western yellowjackets were conducted in mixed koa (*Acacia koa*) forests on Hawai'i and Kaua'i from 1999 to the present. Wasp populations were surveyed using non-toxic funnel traps baited with heptyl butyrate and checked monthly for *Vespula* workers. Surveys in koa forests were conducted in Hawai'i Volcanoes National Park (Keamoku and Nāmakani Paio), and in Hakalau

National Wildlife Refuge on Hawai‘i Island, and Waimea Canyon State Park on Kaua‘i. All sites exhibited distinct annual peaks in abundance during the summer or fall months. Wasps were most abundant during the late summer, with populations declining during the winter. There were significantly more wasps trapped at Waimea and Nāmakani Paio compared with Keamoku and Hakalau. The average numbers of wasps in the two former sites were close to an order of magnitude higher than the latter two and may relate to higher public use of these locations. Wasps are commonly encountered scavenging around picnic tables and trash cans at day-use and camp sites. Both locations also differed in having planted eucalyptus that is absent from Hakalau and Keamoku. The relationship between wasp population size and vegetation deserves further study. However, these data suggest that koa forests with public use areas support higher wasp densities and native koa arthropod communities in these locations may experience higher levels of wasp predation as a result.

Session VIII
Water Session

Guy Ragosta[1], Mark Walker[2], Carl Evensen[3]
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Enterococci Surface Soil and Water Analysis of a Rural Tropical Island Stream and Tributaries. Recent research suggests that in some environments enterococci may be free-living in soil and water, especially in tropical climates. We hypothesize that enterococci are not an indigenous source of tropical island soils and waters. To test this hypothesis, we treated Waipā Stream and tributaties as discrete sections in a tropical island watershed on north side of the heavily forested Hawaiian island of Kaua‘i. We randomly located four plots within each section to test surface soil for enterococci. Seventy-five percent of composite soil samples tested were below the detectable limit for enterococci (< 3.3 MPN/g). We located water quality monitoring sites at the start and end points of each discrete section along Waipā stream and tested water samples for enterococci from 2004-2005. The geometric mean for enterococci in water samples collected over all dates atop Waipā Stream was 10 MPN/100 ml, and at Waipā Stream mouth at MSL was 335 MPN/100 ml. Data from this study indicates that enterococci are a reasonable indicator organism to use, given the results of synoptic stream sampling and accompanying soil sampling. Data from this study also suggest that riparian soils and water are not a predominant source of enterococci in the rural watershed considered. Further verification of data is necessary before making any management decisions. But, if enterococci are not indigenous to tropical island soils and waters, than enterococci levels in many streams and beaches (especially after heavy rains), could be a potential health risk for ambient water users in many watersheds of Hawai‘i.

Session IV
Forest Health
Symposium I

Mohsen Ramadan
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Two Trips to Tanzania for Potential Biocontrol Agents of the Erythrina Gall Wasp, *Quadrastichus erythrinae*, a New Invasive Species in the Pacific Region. The Erythrina gall wasp (EGW), *Quadrastichus erythrinae* Kim (Hymenoptera: Eulophidae), invaded Hawai‘i in April 2005 and has rapidly dispersed throughout all the major Hawaiian Islands in less than a year. Severe infestations have devastated native and introduced trees of the genus *Erythrina* in the Western Pacific and Hawai‘i and recently in Florida. Pruning and chemical control measures have failed to contain this pest and biocontrol is thought to be the only long-term solution. An exploratory trip in Tropical East Africa was undertaken during January - February 2006 to determine the origin of this pest and survey for its associated parasitoids in its native range. Tanzania was selected as the starting point of exploration because of the number of *Erythrina* species recorded to be endemic to this country; more than anywhere else in Africa. Leaves and stems of nine Erythrina species were lightly attacked by gall wasps. Examination of the gall former of *E. abyssinica* showed its great similarity to the gall former of *E. variegata* in Hawai‘i. The female gall former differs only in the coloration of the hind legs. It is determined that the gall formers from Morogoro Province, Tanzania, are the same *Quadrastichus erythrinae* present in Hawai‘i. A follow up survey conducted during January - February of 2007

revealed that a handful of hymenopteran parasitoids, three of which are the major biotic mortality factor in Tanzania, killing most of the gall formers immature stages. They are ectoparasitoids; a eurytomid (*Eurytoma* sp.) and two eulophids (*Aprostocetus* spp.), whose larvae develop within the galls on larvae and pupae of the gall former. Erythrina trees in Tanzania were very healthy and showed few leaves with galls as a result of the parasitoids' activity. Several shipments of infested Erythrina leaf and stem samples were shipped to the HDOA for parasitoid emergence. Parasitoids from the Tanzanian collection were amenable for insectary rearing on EGW from Hawai'i. Experiments are being conducted to understand the biology and host range of these parasitoids. Host specificity testing will involve determination of the response of these parasitoids to beneficial gall formers already established in Hawai'i for weed biocontrol, native gall formers, and representatives of other insects residing in plant tissues. Studies on the *Eurytoma* parasitoid have been completed and a report submitted to regulatory agencies for permission of field release.

Poster 49

Sharon Reilly[1], Joanne Woltmon[2]
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Recent Advances in the Rehabilitation, Aging, and Sexing of Kaua'i's Seabirds. Introduction: The Save Our Shearwaters was initiated in 1979 to assist in recovery of thousands of grounded Newell's Shearwaters (*Puffinus auricularis newelli*). Methods: SOS team members conduct health assessments to determine if birds are immediately releasable or need rehabilitation and also collect key morphometrics (wing cord, culmen, head beak, tail, tarsus lengths, and beak height). A rehabilitation treatment plan was established for injured birds. Feathers and blood were collected for genetic testing. Age class was determined using key external features, plumage color, feather-wear and beak morphology. Results: Since 2005, ~960 seabirds were recovered and 86 seabirds from 11 different species were rehabilitated and released. Morphometric measures were collected in 2006 and initial analysis suggests there is a pattern in identifying sex in the field. From photographs and field observations, an age class key was developed. Biological materials were collected for future genetic analysis. Discussion: Over the past two decades Newell's Shearwater populations have dramatically declined, creating a ongoing need for an SOS program that includes a rehabilitation component. Every bird now represents a greater proportion of the species population and survival of the individual is key to the survival of the species. Newly refined rehabilitation protocols showed greater success in 2006. Field and lab techniques developed to determine age, sex, genetic diversity of the Newell's population will provide greater understanding of the current demographics of the species on Kaua'i. This information will assist managers working on Habitat Conservation Plans to guide them in developing effective mitigation efforts for unavoidable fallout.

Session VI
Monitoring
Symposium I

Michelle Reynolds[1], Mark Vekasy[1], John Klavitter[2], Leona Laniawe[1], James Breeden[1], Nathaniel Seavy[3], Lisa Crampton[3]
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Pre- and Post- Translocation Monitoring of Endangered Laysan Teal on Midway Atoll and Laysan Island. Translocation is a conservation tool often used to restore endangered species. However, most translocations lack the post-release monitoring needed to assess population establishment or failures. To reduce the high extinction risks to the species, we translocated 42 wild Laysan Teal (*Anas laysanensis*) to a portion of their presumed prehistoric range. We monitored the source population on Laysan to time the removal of birds during a period of population increase. Post-translocation, we monitored the fate of the birds using radio telemetry for 2 years after the first release. Post release survival of 42 founders was 0.857 (95% CI 0.86-0.98). Mortality factors identified from recovered carcasses of founders and F1 generations in 2005 and 2006 were random including trauma from an albatross attack (*Diomedea* sp.), an overhead power line collision, raptor predation (*Falco peregrinus*), radio transmitter entanglement, and yolk sac infection. Two years post release, the effective founding female population (Ne) was 13 of 18. Successful breeding males are

more difficult to determine, yet 13 of 24 male founders seemed to form pair bonds with successfully breeding females. In two breeding seasons, founding hens produced 20 broods and raised 67 ducklings to independence. The 2005 F1 generation's post-fledgling survival (from fledgling to 1 year post fledge) (N=11) was 0.90 (95% 0.71-1.0). The nascent population size increased to >100 after only two years. We describe demographic and habitat use plasticity between Laysan and Midway, and use demographic monitoring data to project the population size on Midway at year 10, if the entire Atoll were suitable habitat.

Poster 50

Matt Rosener
Hanalei Watershed Hui, Hanalei, HI

Erosion Control on a Forest Trail Using Bioengineering Methods in Hanalei, Kaua'i. The Hanalei Watershed Hui has completed a project to arrest erosion on a steep forest trail and restore hydrologic function and native vegetation in the area. The Okolehao Trail, located near Hanalei on the north shore of Kaua'i, was initially cut as a forest access road, with no drainage or erosion control measures. The result has been continuous erosion, culminating in gullies several feet deep, and subsequent down-slope sedimentation. The project objective was to reduce the sediment load to the Hanalei River by controlling sediment at its source. Several bioengineering methods were used for soil stabilization and vegetation re-establishment on the badly eroded trail surfaces. These included installing waterbars and culverts for trail drainage, loosening compacted soils and protecting with erosion control fabrics, and planting native vegetation on and alongside the trail. Extensive use of volunteer labor, through school group and community work day events, helped to make the project a success. As expected, results of this project have been mixed. The project demonstrated that certain erosion control practices work well in this environment if properly planned and implemented. It also made clear the difficulties in performing this type of work due to the sensitive nature of the work environment (steep slopes, bare soils, heavy rainfall zone). The management practices implemented through this project demonstrate the potential for science and engineering knowledge to guide the development of management solutions to the numerous and significant problems that exist in Hawai'i's forested watershed areas.

Session VI
Economics of
Invasives
Symposium

Kimberly Burnett, **James Roumasset**
University of Hawai'i, Honolulu, HI

How to Use Your Economist for Invasive Species Management. Economics is the science of choice and incentives oriented to public policy analysis. It is not a discipline to answer ill formed questions such as "what is the value of the forest" or what will be the monetary impact of a particular invasive species. To illustrate, we provide policy questions about prevention and control of Brown Tree Snakes and *Miconia calvescens*. Preliminary analysis suggests that more resources should be devoted to ED/RR and that status quo control policies for Miconia are largely futile.

Session IV
Forest Health
Symposium I

Daniel Rubinoff, Alexandra Shibata, Russell Messing, Mark Wright
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Geographic Origin and Identity of Hawai'i's Devastating Erythrina Gall Wasp (*Quadrastichus* sp.) invader based on DNA analysis. The Erythrina gall wasp has caused rapid and widespread destruction to both ornamental and native Erythrina trees across the Indian and tropical Pacific Oceans. In Hawai'i, the wasp reached all islands in a matter of months after the invasion began in the Indian Ocean. The origin of this pest, and the species, or group of species, causing the damage has been unknown. The identification and origin of the Gall Wasp is an essential first step in developing control measures, such as the selection of biological control agents specific to the pest species. We sequenced both mitochondrial and nuclear DNA from over 85 Quadrastichus wasps from more than 20 locations in both their original range in West, East and South Africa and invaded regions in Japan, Guam, Samoa, and Hawai'i. DNA sequence was used to construct phylogenetic trees which indicate relationships between populations and species. Preliminary results suggest that there are dozens of

species of Erythrina Gall Wasp in Africa but only a single haplotype has invaded the Indian and Pacific Oceans. This result suggests the existence of a 'super genotype' or chance as the main cause of the invasion. Development of Biological Control agents may benefit from knowledge of the geographic origin and range of the invasive Gall Wasp species. Quarantine should continue to work to prevent additional introductions of *Quadrastichus* since introduction of additional species may have unforeseen impacts not exhibited by the single invasive species currently targeted for control.

Poster 51
Student

Kayla Saenz
St. Joseph Jr./Sr. High School, Hilo, HI

Decomposition of Leaf Litter: Ainako Stream, Wailuku Tributary. The purpose of this project is to assess factors influencing leaf litter decomposition in Ainako stream over a specific period of time. The project was divided into five sections: 1) subject selection – focus of project; 2) gathering of subject matter – gathering, packing, weighing of leaf packs; 3) information notation – numbering of leaf packs, submerging leaf packs into various areas of the stream, documenting location of leaf packs; 4) assessment of leaf litter decomposition; and, 5) research – effects of stream water in leaf litter decomposition.

Session V
Watershed
Session
Student

Mohammad Safeeq, Ali Fares, Nghia D Tran
Natural Resources & Environmental Management Dept. University of Hawai'i, Honolulu, HI

Modelling Surface Water Flow and Quality in Mānoa Watershed. The change in water quality is very important element for evaluating environmental quality changes. Investigation of sediment transport characteristics of a watershed area provides essential information for developing watershed management practices. The objectives of this research are to evaluate 1) the rainfall/runoff and rainfall/sediment yield relationships in Mānoa stream and 2) the performance of two watershed models, AnnAGNPS and NSPECT, in simulating this system. A long-term stream water quality monitoring program has been initiated since October 2005 where a daily grab water sample has been collected form the stream. During several storms, multiple water samples were collected simultaneously at 5 different locations throughout the watershed. The samples were analyzed for total suspended sediment (TSS) and total dissolved sediment (TDS), Nitrate, electric conductivity and pH. The results show that there are positive and statistically significant correlations between the stream flow discharge and daily loads of TSS and TDS. The results also showed a very short lag between peaks of the stream flow discharge and those of TSS and TDS. These results also indicate that more samples with shorter intervals should be taken during and after heavy rain events to establish a better relationship between rainfall, runoff, TSS, and TDS concentrations in the stream. The modelling component of the study helped us better understand the water cycle and sediment loading from different locations of the watershed.

Poster 52

Heather Sahli[1], Don Drake[2], Tad Fukami[2], Andy Taylor[2], Elizabeth Stacy[1]
[1]University of Hawai'i at Hilo, Hilo, HI, [2]University of Hawai'i at Mānoa, Honolulu, HI

Characterizing Plant-Pollinator Interaction Webs in the Hawaiian Islands. Trophic interactions between species are key to understanding the generation, maintenance, and conservation of biodiversity. Unfortunately, there have been few studies of trophic interactions in Hawai'i. Plant pollinator interactions are essential trophic interactions for many plants and animals, and can be studied in a network-based manner similar to any food-web study. Due to the importance of pollinators at the species, community, and ecosystem levels, the understudied pollination webs in Hawai'i have great conservation implications. A multi-institutional project has recently begun to quantify pollinator visitation rates to plant species in communities on young lava flows on Hawai'i island, dry forests of Hawai'i island, and in the coastal community at Ka'ena point Natural Area Reserve. We are addressing several questions: 1) How are native and non-native species integrated into pollination webs? 2) How do pollination webs change along an elevation gradient? 2) How have pollination webs changed at Ka'ena point over the past 10 years? and 3) What are the conservation

implications of generalization and specialization in plant-pollinator interactions in Hawai‘i? We are also facilitating future pollination studies in Hawai‘i by developing interactive, web-based taxonomic keys for all of the pollinator species discovered in our studies. This is the first comprehensive, community-wide study of plant-pollinator interactions in Hawai‘i and one of the few studies to quantify pollinator visitation rates to native Hawaiian plants.

Session VI
Bridges to the Future Forum

Pauline Sato
The Nature Conservancy, Honolulu, HI

Bridging to the Future: Building our Environmental Workforce through Partnerships. Seeing a gap in qualified local applicants for conservation job openings, The Nature Conservancy of Hawai‘i (TNC) began summer internship programs for local youth more than 15 years ago. Through the Hoa‘aina program and island internships, TNC has trained more than 100 interns born and raised in Hawai‘i. Many have moved on to join the conservation work force at a variety of places including the U.S. Fish and Wildlife Service, Dept. of Land and Natural Resources, U.S. Army, University of Hawai‘i, Kaho‘olawe Island Reserve Commission, Hawai‘i Audubon Society, Hawai‘i Nature Center, and TNC. Two years ago, TNC initiated the Assistant Natural Resource Manager program, an intensive two-year, full-time training program for five promising individuals early in their careers. Graduates of this program are now working full-time for conservation agencies and organizations in Hawai‘i. These experiences and that of our partners such as UH-HIP and Youth Conservation Corps have demonstrated the long-term value of investing in Hawai‘i’s youth and encouraging their exploration of conservation careers. Fifteen years ago, the conservation work force was smaller, less diverse, and largely non-local. Today, the fruits of these investments are maturing, and the interest of youth in environmental careers appears to be growing. The challenge of the conservation community is to maintain these “feeder” programs and provide career opportunities that will attract, fulfill, and fully utilize the strengths of local applicants.

Poster 53

Pamela Scheffler, Orlo Steele
Hawai‘i Community College, Hilo, HI

Designing College Education to Address Both Science and Management. The Forest TEAM (Tropical Forest Ecosystem and Agroforestry Management) Program at the Hawai‘i Community College started in 2002 and offers students an opportunity to earn an Associates Degree (A.S.) in two years or a Certificate of Achievement (C.A.) in a year. Our program is unique in that it is succeeding in introducing traditionally under-represented students to the natural sciences and to the issues affecting the science and management of Hawaiian ecosystems. Students take applied courses such as forest surveying and forest pest management as well as courses in environmental studies and Hawaiian natural history. Learning occurs in a hands-on interactive environment where lectures are combined with field work and visits to local projects. We combine the teaching of basic scientific and field methods with that of high-demand skills such as GPS and GIS mapping. In one current project, students are learning surveying and management techniques while contributing to the initial surveys of the Hawai‘i Permenant Plot Network (HIPPNET) site in Laupāhoehoe, Big Island. The twenty graduates of our program are all either employed in the natural science field in Hawai‘i or have gone on to a 4-year education. We believe that the model on which we have developed this program is a successful example of making both basic science and ecosystem management accessible to a wide range of students, many of whom will join the next generation of scientists and managers here in Hawai‘i.

Session IV
Forest Health Symposium I

Mark Schmaedick, Neil Gurr, Eric Hanson
American Samoa Community College, Pago Pago, American Samoa

Erythrina Gall Wasp Advent and Initial Impact in American Samoa. The erythrina gall wasp was already widespread on Tutuila Island by the time of its initial detection in December 2005. In less than a year its effects became evident on all the major islands of the Samoan Archipelago. We will

describe the wasp's spread, efforts to thwart it, and levels of damage observed in American Samoa's Erythrina species.

Poster 54

Jerrod Schreck, Sam Gon, Jason Sumiye
The Nature Conservancy, Honolulu, HI

Feral Ungulate Control and Monitoring in Hawai'i Using Contract Specialists. Recent worldwide successes in the control of feral ungulates demonstrate the efficacy of employing specialized teams of professional animal control experts to manage populations of feral and pest animals. Such third-party contractors have been involved in the establishment of sanctuaries for threatened and rare plants and animals by removing invasive animal species from offshore islands. Similar techniques are increasingly being applied to achieve breakthroughs in the intensive conservation management of "mainland islands." Following a successful contract feral pig control effort on Santa Cruz Island (CA), The Nature Conservancy plans to conduct a series of research and demonstration projects to test these control and monitoring strategies on "mainland island" conservation landscapes in Hawai'i. Employing techniques similar to those used on Santa Cruz Island and elsewhere, the contractor will actively test natural and manmade ungulate barriers by displacing radio and GPS-collared animals across fences and gulches. Additionally, strategic and rigorous animal control efforts will be applied across a broad spectrum of landscapes, from open systems to semi- and fully-enclosed preserves. These management techniques will be statistically analyzed to determine their efficacy in Hawaiian ecosystems. Measures of effectiveness will be developed to record impacts on conservation targets.

Plenary Speaker

J. Michael Scott
U.S. Geological Survey, Idaho Cooperative Research Unit, Moscow, ID

Hawai'i: A Window to the Future of Conservation Biology? Hawai'i's endangered species provide opportunities to study the processes of extinction and recovery across the full range of a species ecological and genetic expression. My experiences to date suggest that Hawaiian species provides a window to the future of conservation practice. Species occur in areas small enough to allow ecological studies and implementation of recovery actions at scales that are ecologically relevant and consistent with recovery plan objectives. I will relate my experiences and lessons learned in developing management relevant questions and attempting to share the results of my research with managers and policy makers: the decision makers. I will use the process that led to establishment of Hakalau Forest National Wildlife Refuge as an example of a scientist management partnership. I will use Hawaiian birds as examples of how Recovery Management Agreements and Strategic Habitat Conservation to implement conservation actions at ecologically relevant scales that can lead to recovery and de-listing of species even though they are conservation reliant and may require continuous management intervention delisting. The majority of Hawaiian species are conservation reliant.

Session II
Big Picture
Session

Paul Scowcroft[1], James Friday[2], Dean Meason[3]
[1]USDA Forest Service, Hilo, HI, [2]University of Hawai'i at Mānoa, Honolulu, HI, [3]University of Hawai'i at Mānoa, Honolulu, HI

Plantation Koa: Another Inconvenient Truth? Landowner investment in koa (*Acacia koa*) forestry can provide ecological, economic, and social benefits. Because koa is Hawai'i's most valuable hardwood and sells for a high premium, returns on investment are projected to be significantly greater than alternative land uses. Although predictions can be made regarding growth rates of koa trees, the actual timber yield of plantation koa in most cases is likely to be disappointing, based on current observations of immature stands. Poor stem form of plantation koa is generally the main problem. Even when grown from seed collected from superior parent trees, the stem form of out-planted progeny has been abysmal. This contrasts with naturally regenerated stands, which are usually well-stocked with single-stemmed, straight trees with clear boles that have potential for yielding a significant volume of high-quality timber. Several factors probably contribute to poor form including insect and ungulate herbivory, low planting densities, and high genetic diversity within local populations. Potential remedies would differ depending on the causal factor. Use of clonal progeny

from superior trees would ensure plantations of trees with good genetics. Cluster planting to mimic high stand density and use of established plantation stands to "train" interplanted seedlings might encourage early shedding of undesirable lateral branches and prevent formation of multiple leaders. Improved silvicultural treatments could speed height growth and crown closure. Breeding may improve stem form and insect and disease resistance. We suggest that a combination of approaches will be needed to ensure quality plantation koa.

Session IX Marine Vertebrates Session

William Seitz[1], Kyle Kagimoto[1], Lawrence Katahira[2], Rhonda Loh[2]
[1]Pacific Cooperative Studies Unit, Hawai'i Volcanoes National Park, HI, [2]National Park Service, Hawai'i Volcanoes National Park, HI

Nesting Hawksbill Turtles (*Eretmochelys imbricata*) on the Island of Hawai'i. The hawksbill turtle is indigenous to Hawai'i and is the rarest sea turtle species in the Pacific Ocean. In the United States, recent hawksbill nesting has been documented only in southern Florida and the Hawaiian Islands. In the Hawaiian Islands, regular nesting has been documented on the islands of Moloka'i, Maui and Hawai'i with nearly 90% of nesting turtles documented on Hawai'i. From 1989 to 2006, the Hawksbill Turtle Recovery Project has located thirteen nesting beaches and regularly monitored the principal sites. During this period, project personnel have tagged 73 nesting turtles, protected 619 nests, and helped over 67,000 hatchlings reach the ocean. The nesting season (egg laying to hatchling emergence) began around late May and extended to January with peak egg laying from late July to mid September. Individual turtles laid between one and six clutches per season. Mean nest success was 73.1%. The mean interval from nesting to renesting within a season was 20.1 days, the mean clutch size was 179.5 eggs, and the mean incubation period was 63 days. Following the nesting season, hawksbill turtles migrated to their resident foraging habitat primarily along the Hāmākua coast of Hawai'i. After two to six years, these turtles returned to their same nesting beaches, demonstrating a high degree of nest site fidelity. The primary limiting factors affecting nesting and hatchling success were predation by mongooses, alien plants, artificial lights, hatchling strandings, vehicular traffic, and recreational use of nesting beaches.

Session V Watershed Session

Chelsie Settlemier, Josh Ballauer
University of Hawai'i at Hilo, Hilo, HI

An Evaluation of the Effectiveness of the Wai'ōpae Tide Pools' Marine Life Conservation District in East Hawai'i to Improve Management of the Natural Resources of the Tide Pools. A Marine Life Conservation District (MLCD) was implemented in East Hawai'i at the Wai'ōpae tide pools in June 2003 in response to the community's concern about the degradation of the coral reef, near shore fisheries, and water quality of the tide pools. In May 2003 we established the Kapoho Reef Watch Project to monitor the patterns of human uses and the health of the marine resources in the MLCD and the area adjacent that is open to fishing and commercial activities. During a three-year period between May 2003 and July 2006, we conducted 331 human use surveys, 42 fish surveys, and collected 108 water samples. We saw an increase of visitors from 46,000 people in year one to 87,000 in year three. Our results show federal holidays having the highest average number of visitors with an average of 394 visitors per day with 90% of these visitors using the tide pools within the MLCD. Although visitor rates are increasing, no public restrooms are available, therefore visitors have no choice but to use the tide pools as their restroom. Seven of the ten tide pools sampled for water quality were in violation of the state's standard of *Enterococcus.* Our fish surveys indicate an overall decrease in fishes with the area open to fishing experiencing a greater decline. Although the marine resources in the MLCD are protected from fishers, anthropogenic impacts such as sewage inputs may have a greater impact on the overall health of the tide pools.

Session IV
Landscape
Management
Session
Session

Janna Shackeroff
Duke University Marine Lab, Beaufort, NC

Human Dimensions and Historical Ecology of Kona Coast Coral Reefs: Applications to Ecosystem-Based Management of Social-Ecological Systems. Science and management of marine systems have failed to reverse pandemic, human-caused declines in ocean ecosystem function. The current paradigm shift towards ecosystem-based management (EMB) is regarded as promising, largely because it recognizes oceans as complex, adaptive, social-ecological systems (SES) and encourages managing resilience. Marine science conventionally has focused on ecological or social systems, rather than integrating the two, thus the details and approaches to integrating marine EBM and SES's are rather lacking. My research investigates SES resilience and historical ecology on the Kona Coast, Hawai'i by integrating theory and approach from both biophysical and social sciences. Kona's tightly coupled system of coral reefs and diverse ocean peoples provide a prime case for examining the co-evolution and linkages between a marine environment and its human dimensions. Investigations of SES change were conducted through semi-directive interviews, participant observation, and social network analysis with local reef "experts" (Native Hawaiians, dive shop operators, tropical aquarium collectors, fishermen, scientists, managers). Findings indicate an Hawaiian SES and another local SES operate in concert on the Kona Coast. Both have undergone social regime shifts in response to local and remote ecological disturbances. Belief in the 'process' of community-based management indicates its social success and newfound resilience among local Western SES. Shifts continue in the Hawaiian SES, including a broad movement to reassert Hawaiian ecological authority, driven by length and breadth of ecological observations, worldview, and socio-political history. Analyses suggest practical ways to bridge EBM and diverse local perspectives, and how to foster resilient, sustainable SES's.

Session VII
Aquatic Biota
Session

Alison Sherwood, Gernot Presting
University of Hawai'i, Honolulu, HI

Utility of DNA Sequence Comparisons for Identification of Algae in the Hawaiian Islands. The Hawaiian Islands are home to a diverse algal flora that spans the marine, freshwater and subaerial realms. This diversity has been previously investigated to varying degrees, but based mostly on morphological and anatomical characteristics. Although much of the biology of algal species must be understood by careful examination of specimens, identification of taxa can be greatly aided by the use of molecular markers, especially in instances of partial or damaged specimens, or missing life history stages that are required for identification. We are developing and testing DNA-based tools for identification of a number of different algal groups (similar to the concept of DNA barcoding), and have acquired DNA sequence data for a wide variety of lineages of Hawaiian algae in different habitats. We are using a universally amplifying fragment of the plastid 23S rRNA gene as a comparative tool among all collections, and compare these sequence data to those obtained for more traditionally accepted markers for individual groups (e.g. 16S rRNA for cyanobacteria, mt COI for red algae). Several hundred 23S sequences (primarily representing the red, green, brown and cyanobacterial algae, but with representation from tribophyte, euglenoid and diatom lineages) have been assembled thus far. Examples of the application of the 23S rRNA plastid marker sequence framework as a tool for identification (for example, in stream algal surveys) will be presented. These DNA barcodes, currently representing approximately 20% of the Hawaiian algal flora, already provide a useful diagnostic tool to identification of these difficult-to-identify organisms. Visit these projects at http://www.botany.hawaii.edu/faculty/Sherwood/alison.htm.

Session II
Invasives
Session I
Student

Aaron Shiels, Alex Wegmann, Donald Drake, Terry Hunt
University of Hawai'i at Mānoa, Honolulu, HI

Impacts of Rats on Islands: Integrating Historical and Contemporary Ecology. Over 80% of islands world-wide have been invaded by rats (*Rattus* spp.), resulting in dramatic transformations of island environments by causing extinctions and disrupting ecological processes. Here we review the

concepts and advances presented at the international conference on the ecology of invasive rats on islands, held at the University of Hawai‘i at Mānoa in March 2007, attended by 134 scientists from 18 countries. Our review focuses on the direct and indirect effects of rats on island ecosystems, including paleoecological and contemporary studies. Archaeological evidence from Hawai‘i and other Pacific Islands suggest that rats were an important force contributing to the decline and extinction of several groups of both plants and animals. Contemporary examples of direct effects include rats destroying plant reproductive parts, birds and bird eggs, and insects. Indirect effects of rats on ecosystems are much more complex, and may include losses of pollinators or seed dispersers that further cause plant decline or extinction, effects on nutrient cycling between land and sea, meso-predator release, and trophic cascades. Additionally, understanding the direct and indirect effects of rats in island ecosystems will allow better anticipation of the effects of rat removal. In order to establish solutions that will alleviate the negative effects of introduced rats, we review the research priorities identified by participants in this conference, and present a framework addressing current and future research and management needs in the Hawaiian Islands.

Poster 55
Student

Lisa Shizuma, Kai‘ena Bishaw, Flint Hughes, Tracy Wiegner
[1]University of Hawai‘i at Hilo, Hilo, HI, [2]USDA Forest Service, Hilo, HI

Impacts of *Falcataria moluccana* on the Water Quality of Hawaiian Streams. *Falcataria moluccana*, a non-native nitrogen-fixing tree, has invaded native-dominated wet lowland forests in Hawai‘i. Its presence has been speculated to increase the amount of nitrogen (N) exported from streams, possibly altering nutrient cycling within these streams. Potential impacts of *F. moluccana* on stream water quality were examined in five streams across three watersheds (Ainako, Kolekole, Kohala) on the Island of Hawai‘i, where the age of parent material varied. Nitrate, total phosphorus and silicate concentrations in each stream were quantified under base flow conditions. Water samples were collected above, within, and below *F. moluccana* stands at all five streams. Nitrate concentrations increased four-fold and by 30% at the Ainako and Kolekole streams, respectively. In contrast, nitrate concentrations were variable in the Kohala streams (Waipuhi and Waipunalau). Total phosphorus concentrations varied across watersheds, with the highest total phosphorus concentration found in the Kohala streams, which was unexpected because older parent materials are usually phosphorus-limited in Hawai‘i. Silicate in stream water may be derived from groundwater or terrestrial leaf litter inputs; however, the source of silicate cannot be determined from our measurements. Silicate concentrations varied, but overall increased within *F. moluccana* stands at all streams. *Falcataria moluccana* appears to be affecting nitrate concentrations in streams as suggested by the higher concentrations of nitrate within the *F. moluccana* stands. Further research is required to determine whether the increased nitrate is derived from *F. moluccana* and to assess the effects of this excess nitrogen on ecological processes in streams and downstream marine ecosystems.

Poster 56
Student

Steven K. Souder[1], M. Tracy Johnson[2]
[1]University of Hawai‘i at Hilo, Hilo, HI [2]USDA Forest Service, Institute of Pacific Islands Forestry, Volcano, HI

Host-Specificity of *Syphraea uberabensis* for Biocontrol of *Tibouchina herbacea*. We are evaluating *Syphraea uberabensis* (Coleoptera: Chrysomelidae), a flea beetle from Brazil, as a potential agent for biological control of the noxious weed *Tibouchina herbacea* (Melastomataceae). Adult and larval feeding, oviposition, mortality, and behavior of *Syphraea uberabensis* have been examined on the target weed, related species and native non-target plants, utilizing the centrifugal phylogenetic method to determine host range. Conservative no-choice tests (in the absence of the target weed) indicate that *S. uberabensis* may survive and reproduce on several members of the family Melastomataceae, including *Tibouchina herbacea*, *Tibouchina longifolia*, *Pterolepis glomerata* and *Melastoma candidum*. Less suitable are the melastomes *Heterocentron subtriplinervium* and *Dissotis rotundifolia*. Other melastomes including *Tibouchina urvilleana*, *Medinilla cummingii*, *Clidemia hirta*, *Miconia calvescens* and *Arthrostema ciliatum* appear to be unsuitable as host plants. Although adult feeding produced damage on a variety of non-native plants outside the melastome family,

Syphraea uberabensis did not feed or lay eggs on any of the native species tested. Results to date suggest that impacts of this biocontrol agent would be confined to a few weedy melastome species.

Keynote Speaker

Michael Soulé
Environmental Studies, University of California at Santa Cruz, Santa Cruz, CA

Is Island Conservation Fundamentally Different from Continental Conservation? Conservationists don't need reminding that context must be considered and somehow dealt with in doing conservation work in real places. There are several kinds of context: geographic context (e.g., climate, topography, biogeography), economic context (e.g., poverty levels, income disparities, investment in women's education), political context (e.g., civil rights, political access, freedom of the press, fair elections, rights and sovereignty of indigenous peoples), and culture context (e.g., religion, literacy, corruption, diversity, history). As biologists, we are best able to consider the biogeographic and scale issues. For example, it may be informative to compare the conservation visions and challenges of large continents versus small ones, or compare continents to islands. I will compare the conservation challenges in three places that span such a range. These are (1) mainland North America; (2) the island-continent of Australia; and (3) the archipelago of Hawai'i. I will discuss how these three places differ with respect to (a) threats such as exotics/ferals and future "invasibility," (b) history such as extinction episodes in pre-history and in recent history, (c) sensitivity to climate change, (d) the kinds, scales, and relevance of dispersal behaviors and adaptive evolutionary potential for different taxa, and (e) the role of large, highly interactive species in maintaining biological diversity.

Poster 57
Student

Evann Souza[1], Peter Follett[2]
[1]University of Hawai'i Hilo, Hilo, HI, [2]USDA-ARS Pacific Basin Agricultural Research Center, Hilo, HI

Field Control of the Invasive Little Fire Ant, *Wasmannia auropunctata* (Roger) (Hymenoptera: Formicidae) in Tropical Fruit Orchards. The little fire ant (LFA), *Wasmannia auropunctata* (Roger) (Hymenoptera: Formicidae) is an invasive fire ant that forms supercolonies when it successfully invades new areas. LFA was first reported in Hawai'i in 1999 and has since invaded a variety of sites including nurseries, farms, orchards, pastures, playgrounds, and homes. LFA has also been shown to have detrimental effects on native habitats and invertebrate populations. Amdro (hydromethylnon; in bait stations), Esteem (pyriproxyfen; broadcast bait), and Conserve (spinosad; spray) were tested for their efficacy against LFA in a tropical fruit orchard by making biweekly treatments for 16 weeks. Amdro and Esteem treatments showed a significant reduction in LFA and associated Homoptera on weeks 12 and 16 compared with untreated control treatments. None of the treatments eliminated LFA. Many LFA were found nesting in protected sites in the orchard trees, which may compromise ground-based control methods. Absolute density estimates from thatch samples taken from the orchard suggested the supercolony exceeded 95 million ants per acre. The results of this study are important due to the economic importance of small agriculture in Hawai'i, the quarantine status of this ant and the their threat to native ecosystems. The results of this study may also help in the management of problematic non-stinging ants, which also tend Homopterans and can cause exportation delays during product shipment. Reducing populations of LFA in agricultural areas in Hawai'i may reduce spread of these highly invasive ants into native ecosystems and therefore decrease their negative effect on native habitats and invertebrate populations.

Session I
Near Shore/
Marine
Symposium

Russell Sparks
DLNR, Div. of Aquatic Resources, Wailuku, HI

The Decline of Maui's Coral Reefs, the Rise of Invasive Algae, and the Need for Herbivore Management. The results of seven years of coral reef monitoring around Maui will be presented, with a description of some alarming trends in coral reef declines. Maui's reefs are experiencing increasing stresses from overuse, problems with coastal water quality, depleted fish species including reductions in important herbivores, and the rapid growth of invasive algae. These alarming declines are even more troubling when combined with available monitoring data from the early 1990s. These

study sites suggest that many of Maui's coral reefs are quickly sliding down the slippery slope to slime. The question is: What if anything can be done about it? An experimental marine managed area is being planned for the popular North Kā'anapali coastline. This MMA will be designed to protect and enhance important herbivores, with rules established to protect key herbivore fishes and invertebrates from harvest, while continuing to allow harvest of other popular marine organisms. The intent will be to see if increased grazing pressure can help control the invasive algae *Acanthophora spicifera*, and lessen stresses on the corals.

Session I
Alternative
Energies
Symposium

Gregory Spencer, David Cowan, Ian Bordenave
UPC Hawai'i Wind, LLC, Maui, HI

Renewable Energy and Resource Conservation in Motion: Implementing a Habitat Conservation Plan in West Maui, Hawai'i. In June, 2006 Kaheawa Wind Power, LLC began operating a 30 mega-watt wind energy facility in West Maui, Hawai'i. A Habitat Conservation Plan was developed to apply minimization, avoidance, and mitigation measures aimed at providing a net ecological benefit to the four ESA-listed species covered by the plan. These species include the endangered Nēnē, Hawaiian hoary bat, Hawaiian Petrel, and the threatened Newell's Shearwater. Since the project's inception, a series of monitoring, assessment, education and reporting programs have been performed that are designed to evaluate potential interactions between covered wildlife and operational elements of the project while providing a means of exchanging results and observations between project biologists, staff and contractors, resource managers, and the public. This program offers exciting insights and considerations into the coupling between renewable energy initiatives, resource conservation, and species recovery goals.

Session IV
Landscape
Management
Session

Bill Standley
U.S. Fish & Wildlife Service, Honolulu, HI

Overview of Safe Harbor Agreements in Hawai'i. Agencies responsible for the recovery of endangered species must increasingly rely on the assistance of private landowners in order to accomplish their goals, but many landowners are reluctant because of the fear of increased regulatory requirements. Safe Harbor Agreements (SHAs) are legally-binding documents that provide landowners who voluntarily carry out management activities that benefit endangered species assurances that they won't be subject to increase land-use restrictions or liabilities because of their actions. The Hawai'i Department of Land and Natural Resources was authorized by the State Legislature to enter into SHAs in 1997. While there are some differences between the State of Hawai'i and U.S. Fish and Wildlife Service regulations regarding SHAs, both agencies work together to develop a single agreement that meets both agencies' requirements. There have been five SHAs finalized in Hawai'i to date; three of which are associated with efforts to reintroduce the Hawaiian Goose (Nēnē) to the islands of Moloka'i and Maui, another that involved the creation of ponds that provide nesting sites for the Hawaiian Duck (Kōloa), and another to manage wetland habitat at the Chevron Refinery on O'ahu as Hawaiian Stilt nesting and foraging habitat. Current efforts are focusing on streamlining the process by creating SHAs that allow multiple landowners to participate under one agreement.

Session II
Invasives
Session I

James Stanford[1], Ginger Haddock[1], Kristin Winford[1], Rebecca Stafford[1], Robert Reed[1], Gordon Rodda[1], Julie Savidge[2]
[1]USGS, Fort Collins, CO, [2]CSU, Fort Collins, CO

The Brown Treesnake Rapid Response Team. The Rapid Response Team (RRT), funded by the U.S. Department of the Interior's Office of Insular Affairs, was established in 2001 to provide a multi-agency network of trained personnel to respond to brown treesnake (*Boiga irregularis* or BTS) sightings of either recently transported snakes or incipient BTS populations. The RRT office is located on Guam to facilitate BTS search training. Training with wild snakes on Guam increases the effectiveness of searchers many fold. The RRT is coordinated by the USGS and is supported by a staff

of research biologists. Team members attend three weeks of initial training on Guam, and periodic refresher short courses. A wide array of BTS skills are covered during the three weeks, including visual searching, trapping, working with detector dog teams, handling venomous and non-venomous snakes, and detection strategies. The RRT has continued to grow since its inception and now has roughly 50 trained searchers spread across 13 Pacific Islands and the U.S. mainland. In 2007, we anticipate increasing the number of trained team members, furthering our outreach efforts to the U.S.-associated independent nations of Micronesia, and fine-tuning our detector dog efforts. Detector dogs have the potential to improve cost-effectiveness of locating incipient snake populations in complex forested and urban environments, but further testing in conjunction with the RRT is needed to quantify the benefits and costs of detector dogs for wild snake populations.

Session II
Invasives
Session I

James Stanford[1], Nate Hawley[2]
[1]USGS, Guam, [2]USFWS, Saipan

A Major Search Effort to Resolve Whether Brown Treesnakes are Present on Saipan. From February 20 to March 12, 2007, a major multi-agency search effort took place on the island of Saipan within the Commonwealth of the Northern Marianas Islands (CNMI), as part of an attempt to determine if a brown treesnake (*Boiga irregularis* or BTS) population is already established on the island. Members of several agencies funded by the Office of Insular Affairs were involved in this initiative, which was coordinated by the CNMI Department of Lands and Natural Resources, Division of Fish and Wildlife. The effort encompassed 21 nights and over 1,100 person-hours of searching. The primary area searched was focused on the vicinity of Saipan International Airport, due to multiple BTS sightings and specimens recorded in this area over the past 25 years. Visual searchers, detector dog teams, and trapping were all used during this search effort. Results are pending.

Session I
Alternative
Energies
Symposium

William Steiner
University of Hawai‘i at Hilo, Hilo, HI

The State of the Biofuels Industry in Hawai‘i. Currently there is no working biofuel industry in Hawai‘i but a variety of organizations are working to put one in place in the next few years. What needs to be done to accomplish this huge task? Experiments need to determine what should be grown where, what the quality of the oil will be, and what the economic model will be to encourage growers to plant. The right kind of oil crops must be selected for planting. A variety of crops are available but the highest producing plants are trees and three seem of particular interest. Nurseries must be developed to grow out the hundreds of thousands of trees that will be required. Mills and possibly harvesting equipment must be designed and built. Two competing models currently exist (point and dispersed) for refining the vegetable oil into a usable fuel and each have different ramifications on local economies. Delivery systems should not be a problem though some infrastructure will have to be built. New technologies related to gasification and pyrolysis hold promise to double production and even produce ethanol. The promise here is that fuel can be made available for utilities as well as transportation but a tight timeline for development is required. It will take three years starting now to reach production levels of several hundred thousand gallons per year. This fits well with the planned refinery development by four competing companies in Hawai‘i. Total production capacity and its economic impact in the islands will be discussed.

Poster 58

Fred Stone[1], Francis Howarth[2], Henrietta Croom[3]
[1]University of Hawai‘i, Hawai‘i Community College, Hilo, HI, [2]Bishop Museum, Honolulu, HI, [3]University of The South, Sewanee, TN

Conservation of Hawaiian Nemobiinae Crickets. Endemic Nemobiinae crickets in the genus *Caconemobius* occur in moist bare-rock environments throughout the Hawaiian Islands, including coastal wave-splash zones, barren lava flows, wet cliffs, caves and mesocaverns (underground spaces between 5-25 mm width). Determining conservation needs and management strategies for this group depends on knowing what species exist, their ranges, and the threats to each species. In the past, species have been characterized based on morphology, chromosome differences and habitat. Current

work on mtDNA (see poster by Croom, Stone, Shelley and Howarth) is giving a clearer picture of the variability within and among species, and of the species ranges. Threats to Nemobiinae cricket species vary according to their habitat, range and ecology. *Caconemobius sandwichensis* occurs in the coastal wave splash zone of all the main Hawaiian islands where it is protected from introduced predators such as ants by the high energy saline habitat. *Caconemobius fori* lives on barren lava flows on Hawai‘i Island, where its habitat is regenerated by recurring lava flows. Cave species on Hawai‘i are dependent on food sources such as *Metrosideros polymorpha* root communities. Protection of these species depends on preservation of the native forests. Two cave species, *Caconemobius uuku* and *C. varius*, have a wide range on the Big Island. However, mtDNA results indicate that *C. varius* and *C. uuku* may include more than one species. Two additional cave species, *C. albus* and *C. paralbus*, are known only from Hawai‘i Volcanoes National Park which has an active cave management plan.

Poster 59

Tiana Sudduth
Pōhakuloa Training Area, Hilo, HI

Māla Hō‘ike‘ike O Pōhakuloa (The Pōhakuloa Interpretive Garden): Exhibiting Hawai‘i’s Unique Natural and Cultural Resources. In 2001, an interpretive garden was built at Pōhakuloa Training Area (PTA) on the Island of Hawai‘i as part of the Army’s natural resources program. The garden emphasizes the importance of conservation while educating military and civilians on the unique natural and cultural resources found at PTA. The garden contains several species of plants that are federally listed as threatened or endangered, as well as common native and alien dryland plants. Some of the rare plants featured in the garden, including *Hedyotis coriacea*, *Schiedea hawaiiensis*, *Solanum incompletum* and *Tetramolopium arenarium*, are deemed top management priority by PTA natural resources staff. The garden also showcases replicas of native Hawaiian archaeological features typical of the Pōhakuloa plain, such as a rock shrine and a recessed fire pit. There are hundreds of archaeological sites found at Pōhakuloa, attesting to the fact that Hawaiians utilized the area for several hundred years. The garden is fenced to exclude ungulates such as feral pigs, sheep and goats, which roam the cantonment area. The garden hosts a variety of annual visitors, including troops deployed to the installation, VIP military officers, school groups, government officials, teachers and administrators, and other community groups. As a highly visual component of the natural resources program at PTA, the garden also demonstrates the Army’s commitment toward positive public relations and responsible stewardship of the land.

Session IX
Winged Vertebrates
Session II

Kirsty Swinnerton[1], Eric VanderWerf[2], David Leonard[3]
[1]Maui Forest Bird Recovery Project, Makawao, HI, [2]Pacific Rim Conservation, Honolulu, HI, [3]Dept. of Land and Natural Resources, Division of Forestry and Wildlife, Honolulu, HI

Using Population Viability Analysis to Guide Management Strategies for the Recovery of the Maui Parrotbill. The Maui Parrotbill *Pseudonestor xanthophrys* is one of Hawai‘i’s rarest birds. This critically endangered species exists in one small population, estimated at 500 ± 230 individuals, that is restricted to 50 km^2 of high elevation rainforest on the north-east slopes of Haleakalā, East Maui. Several management options have been proposed to facilitate the species’ recovery, but the outcome of the various options is difficult to predict. Population Viability Analysis can be a useful tool with which to model management strategies and estimate the relative risks of each. In addition, PVA can help identify knowledge gaps for the species modeled and so help to refine further research goals. Using life-history data known for Maui Parrotbill, we performed a PVA using the program VORTEX™ to project the possible outcomes of several management strategies: (1) do nothing, (2) implement rat control, (3) implement habitat improvement through ungulate exclusion, (4) supplement the existing population with captive-bred and released birds, and (5) create a second discrete Maui Parrotbill population. We also examined the effect of potential catastrophic threats to Maui Parrotbill including a disease outbreak and hurricanes. In addition to demonstrating the relative values of different management strategies for Maui Parrotbill recovery, the PVA process highlighted the need for more complete data on demographic parameters for Maui Parrotbill, and the effect of

stochastic variables on these demographic patterns.

Poster 60

Lori Tango[1], Stephane Willis[2], David Foote[3]
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Size-Specific Predation Rates of the Beautiful Hawaiian Damselfly on the Southern House Mosquito Under Three Different Temperatures. Larvae of the endemic Beautiful Hawaiian damselfly (*Megalagrion calliphya*) prey upon microcrustaceans and a variety of aquatic Diptera, including the larvae of the Southern House Mosquito (*Culex quinquefasciatus*). Even very small damselfly larvae have been observed to feed upon mosquito larvae, but the relationship of damselfly size to diet is unknown. Both damselflies and mosquitoes occur over a wide altitudinal range with corresponding changes in temperature. In order to better understand the predator-prey interactions between damselflies and mosquitoes, we observed predation among three damselfly size classes under three different constant temperatures (15, 22, and 28°C). Generally, higher proportions of damselfly larvae exhausted prey supply at 28°C compared to those at lower temperatures. Sixty percent of large damselfly larvae at 15°C and 22°C, and 90% of those at 28°C consumed all available prey. Of the remaining damselfly larvae (n = 162), medium sized larvae at 22°C consumed 91.4% of mosquito larvae offered on a daily basis. Those larvae ate more mosquitoes than the large-sized damselfly larvae at 22°C (88.5%), and their medium sized counterparts at 28°C (89%). Damselfly larvae of all sizes ate significantly fewer mosquitoes at 15°C, compared to those at 22 and 28°C. These data provide evidence that the predation rate of damselfly larvae on mosquitoes is affected by developmental size of the damselflies and water temperature. The role of native damselflies as predators of mosquitoes should be examined further in the context of mosquito population suppression in natural areas.

Poster 61

Jarrod Thaxton[1], James D. Jacobi[2], Paul Banko[2], Kevin Brinck[1], Chris Farmer[1]
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Fuel Loading and Potential Fire Behavior in Sub-alpine Forests on Mauna Kea. Wildfires fueled by invasive grasses are a major threat to māmane (*Sophora chrysophylla*) dominated sub-alpine forests on the slopes of Mauna Kea. These forests are of extremely high conservation value, because they contain the only extant population of the endangered bird Palila (*Loxioides bailleui*). Invasion by exotic grasses has the potential to alter fuel and microclimate conditions in ways that increase frequency, spread and severity of both anthropogenic and naturally-ignited fires. To assess the effects of grass invasion on potential fire danger, we are quantifying fuels from lower slope pastures into upper elevation forests. The data will be used to develop custom fuel models and fuel maps for sub-alpine vegetation types on Mauna Kea. Further, we will use fuel and weather data to parameterize a fire behavior model (BehavePlus) to predict under what conditions fire is likely to spread from pastures into forest. Our goals include an understanding of the effects of variation in grass cover, canopy tree cover and elevation on potential fire behavior, and an assessment of the potential for restoration of woody cover to reduce fire intensity and spread. Given the limited distribution of native dominated sub-alpine forest on Mauna Kea and the highly endangered status of Palila within the forest, developing ways to reduce fine fuels and mitigate fire risk are likely to be a conservation and management priority.

Poster 62

Christopher Todd[1], Marcos Gorresen[1], Adam Miles[1], Frank Bonaccorso[2], Ted Weller[3]
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Assessing Bat Detectability and Occupancy With Multiple Automated Echolocation Detectors. Occupancy analysis and its accommodation of differential detection probabilities is of considerable importance for studies in which echolocation is used as a measure of bat occurrence and activity. We examined the feasibility of remotely acquiring bat encounter histories to estimate detection probability

and occupancy. Echolocation detectors coupled to digital recorders operating at a series of proximate sites and consecutive nights were used in trial surveys of the Hawaiian hoary bat (*Lasiurus cinereus semotus*). Results confirm that the technique is readily amenable for use in occupancy analysis. We also conducted simulation exercises to better understand the effects of sampling effort on parameter estimation. Results indicate that detectability had a greater effect on the precision and accuracy of parameter estimates than actual occupancy. We also found that estimates were more influenced by number of sites sampled than number of visits. The method has significant potential for use in monitoring bat trends and comparative studies of habitat use.

Session V
Forest Health
Symposium II

Janice Uchida
University of Hawai‘i, Honolulu, HI

Pathogenicity and Biology of *Puccinia psidii*, the ‘Ōhi‘a Rust, in Hawai‘i. In Hawai‘i and in many countries, the uredinia stage of this rust has been the most common. Bright, yellow urediniospores are produced by the billions on highly susceptible rose apple (*Syzygium jambos*). These spores have also been found on ‘ōhi‘a (*Metrosideros polymorpha)*. Urediniospore formation has been easily reproduced on ‘ōhi‘a by taking a wet brush, touching a pustule of urediniospores and brushing the abaxial surface (undersurface) of young leaves. Plants are maintained indoors at a window, receiving about 12 hr of light/day. Pustules develop in seven to ten days. Urediniospores are the repeating stage and are responsible for spreading the rust. In nature, urediniospores land on leaves, germinate with moisture present, form an appressoria, and penetrate the host. The rust is an obligate pathogen and cannot be cultured on agar. Based on other *Puccinia* species, the urediniospore must germinate and grow over or near stomata. The rust commonly penetrates the stomata directly. It grows inside the host, feeding on cytoplasm, increasing in mass, producing new uredinia and repeating the cycle. Later, orange, teliospores develop, which represent the beginning of the sexual cycle. Teliospores germinate to form basidiospores. Reports from Brazil indicate that the basidiospores infect rose apple and form the aecial stage that looks identical to the uredinial stage or uraecium aeciospores. Aeciospores form uredinia to complete the life cycle. The sexual stage has not been observed in Hawai‘i. This presentation will review the life cycle and pathogenicity of ‘ōhi‘a rust, enabling better detection and management this disease.

Poster 63

Kimberly Uyehara[1], Andrew Engilis, Jr.[2], Michelle Reynolds[3], Ann Marshall[4], Bruce Dugger[5]
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Conservation of Hawaiian Duck: Research and Management Needs. The Hawaiian Islands once fostered a very diverse assemblage of waterfowl. Today, one endemic duck, the endangered Hawaiian Duck or Kōloa maoli (*Anas wyvilliana*), remains in the main islands. The principal threat to persistence of Kōloa is currently hybridization with feral Mallards (*A. platyrhynchos*). Island isolates, like Kōloa, are vulnerable to feral Mallard invasions, particularly when already required to cope with habitat loss and introduced predators. However, islands also present unique opportunities to control invasive species. Mallard imports began in the late 1800s. During this period, the Kōloa was common. Today, only about 2200 genetically-pure Kōloa are thought to remain on Kaua‘i-Ni‘ihau and portions of Hawai‘i with predominantly Mallard/Kōloa hybrids on other islands. Removing the Mallard threat is a primary recovery objective for Kōloa, and genetic and phenotypic techniques to differentiate Mallards and hybrids from Kōloa are currently being developed (Fowler, Eadie, and Engilis). We discuss (1) research and management needs to first address feral Mallards; (2) basic research needs into species ecology and population dynamics that would guide recovery, assuming hybridization can be controlled; and (3) opportunities to study a vagile species in a true island as well as multi-island environment.

Session IX
Marine
Vertebrates
Session

Alecia Van Atta[1], Dave Johnston[2], Lesley Thorne[3]
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Rest for the Weary: Protecting Hawaiian Spinner Dolphin Resting Habitat Identified by Predictive Modeling. Hawaiian spinner dolphins (*Stenella longirostris*) exhibit predictable daily movement patterns, foraging offshore at night to follow the vertical migration of prey species, and resting in bays during the day. Sheltered and varied shorelines, shallow depths, and flat, sandy bottom types are thought to be important characteristics of spinner dolphin resting habitat, but a quantitative analysis of resting habitat in the Hawaiian Islands has not previously been conducted. Such an analysis is necessary in the development of appropriate management strategies for the species. As a first step, we have quantified the following habitat characteristics in known resting bays using GIS techniques: benthic complexity, rugosity, bottom type, bay area, the ratio of coastline to bay area, coastline orientation, depth, distance to particular depth contours, slope, windshade, and the proportion of area in various depth classes. Further predictive modeling using maximum entropy (MaxEnt) and ecological niche factor analysis (ENFA) methods will determine which of these characteristics influence spinner dolphin resting habitat and will reveal other important areas for this species. Results from the predictive modeling will be used by NOAA Fisheries to develop management measures aimed at preventing disturbance to resting spinner dolphins from increasing human interaction. These interactions have the potential to result in adverse individual and population-level effects to the species. NOAA Fisheries is currently in the process of drafting an Environmental Impact Statement and proposed regulations under the Marine Mammal Protection Act that will consider partial (time-area) closures for certain specified spinner dolphin resting habitat identified by the modeling.

Poster 64

Arthur Medeiros[1], **Erica vonAllmen**[3], Keahi Bustamente[2]
[1]USGS Pacific Island Ecosystems Research Center, Makawao, HI, [2]Pacific Cooperative Studies Unit, Honolulu, HI, [3]Hawai‘i Cooperative Studies Unit, Hilo, HI

Spontaneous, Unassisted Reproduction of Native Dryland Species Following Restoration, Auwahi Forest, Maui, Hawai‘i. Though Auwahi was historically noted as the most diverse forest habitat in the islands, ungulates, invasive plants, and wildland fires degraded this dryland forest to the point where most had abandoned hopes of restoration. In 1997, however, a partnership with ‘Ulupalakua Ranch, federal biologists, and government agencies formed to restore Auwahi by providing semi-shaded microsites intended to spur long-inhibited establishment of seedlings. The methodology has been to exclude ungulates, apply Roundup™ herbicide to non-native kikuyu grass (*Pennisetum clandestinum*) mats, and, with human volunteers, outplant numerous small seedlings of regional native tree, shrub, vine and grass species. ‘A‘ali‘i (*Dodonaea viscosa*) has been frequently used to exclude non-native species and reestablish semi-shaded, filtered light microsites. After seven years of restoration within the exclosure, 31 of 48 native plant species are now reproducing by seed whereas outside the exclosure, reproduction by seed is occurring in only two of 48 native plant species. Within the exclosure, native plant cover in randomly-located plots and along point intercept transects has increased dramatically over the past five years while outside the exclosure, native plant cover has declined. Though most non-native species within the exclosure have declined, one notable exception is *Bocconia frutescens* (Papaveraceae), a Neotropical soft-wooded tree whose range appears to be rapidly expanding on leeward Haleakalā.

Poster 65

Mashuri Waite
University of Hawai‘i at Mānoa, Honolulu, HI

Trying to Put the ‘Ōhi‘a Back into Pu‘u ‘Ōhi‘a. Proximity to Honolulu made Pu‘u ‘Ōhi‘a (a.k.a. Tantalus) a site favored by visiting biologists to observe and collect native biota. This same proximity also exposed the area to early resource exploitation and alien species invasion. Three plant checklists of the Mānoa Cliff Trail by subsequent generations of botanist from 1961 to 1997 are compared to document changes in species composition. The checklists show a slow decline in native plant species

numbers and an increase alien plant species. In 2005, we started manual removal of alien weeds from the sides of Mānoa Cliff Trail to stop the loss of native species from the trailside. Preliminary signs of success, as judged by photo points, are improved growth of amau and hāpuʻu ferns, and improved koa and kokio keʻokeʻo seedling growth. Unfortunately, there is less evidence for potential recruitment by ʻōhiʻa.

Session I
Alternative
Energies
Symposium

David Waller
Hawaiian Electric Co., Honolulu, HI

Meeting Hawaiʻi Electricity Needs with Renewable Energy. In Hawaiʻi, our dependence on fossil fuels and distance from sources of those fuels has created a long standing objective to increase the use of renewable energy. For the electricity sector, this policy objective resulted in the state's renewable portfolio standard, which calls for 20 % of electric utilities sales to come from renewable and energy efficiency sources in the year 2020. Given this context, the presentation will discuss the following items: a review of renewable energy sources providing electrical energy to the utility system; a summary of Hawaiʻi projects being developed in the immediate future; unique challenges with integration of intermittent renewable energy into a utility grid; the role of energy efficiency programs to make renewable energy development more effective; and the biofuel strategy that is emerging for the electrical utility systems. The final item, the biofuel strategy, will highlight how the electric utilities are approaching the conversion of existing electric generation systems to biofuels and unexpected challenges encountered in the project. One result of the biofuel strategy has been the development of a world scale biodiesel plant on Maui. The presentation will describe how this project is emerging, and how it will change the production of electricity in Hawaiʻi.

Session I
Near Shore/
Marine
Symposium

William Walsh
Division of Aquatic Resources/Department of Land and Natural Resources, Kailua-Kona, HI

Historical Overview of Resource Enforcement in Hawaiʻi. An essential and fundamental premise of all resource management is that pertinent rules and regulations are enforceable and adequately enforced. In Hawaiʻi public concern over enforcement of fishing and marine resource laws is widespread and frequently voiced. The Division of Conservation and Resources Enforcement (DOCARE) is the state's primary agency for enforcement of natural resource regulations. It was consolidated as a separate Division within the Department of Land and Natural Resources (DLNR) in 1978. For the previous 50 years enforcement was under the aegis of the Division of Fish and Game. In 1981 Legislative Act 226 expanded DOCARE's traditional duty of enforcing the laws, rules and regulations concerning the preservation and conservation of Hawaiʻi's natural resources to enforcing all state laws and county ordinances on all state lands, beaches, shore waters and county parks. As a result the proportion of citations (including arrests) related to natural resource violations has decreased markedly in recent years. Although the number of enforcement officers has increased substantially over the past seven decades the number of resource citations has not increased commensurately. It is widely acknowledged that present staffing is wholly inadequate for the tasks at hand. To further impede enforcement, Hawaiʻi DOCARE officers are prohibited from inspecting the bags, containers or vehicles of any non-commercial fisher unless there is 'probable cause' that a violation has in fact taken place. Preemptory inspections to determine compliance with regulations governing seasonal closures, bag and size limits, etc. are thus prohibited. This limitation combined with ongoing enforcement trends undermines the effectiveness of existing and future resource regulations and threatens the health and well being of Hawaiʻi's marine ecosystems and the sustainability of the its fisheries.

Session V
Invasives
Session II
Student

Miyako Warrington[1], Francis Benevides[2], William Mautz[1]
[1]University of Hawai'i at Hilo, Hilo, HI, [2]FB Engineering, Hilo, HI

Monitoring Coqui Frog (*Eleutherodactylus coqui)* Populations Using Sound Pressure Level. As the invasive frog, *Eleutherodactylus coqui,* continues to expand in Hawai'i, attempts to control its populations are in progress, and there is a need to measure frog abundance quickly, inexpensively, and with reasonable accuracy. Current methods for assessing coqui frog populations include mark-recapture analysis of population density and census counts of active frogs. Mark-recapture analyses are more accurate but they are very labor-intensive and expensive. Male coqui frogs call at night and their loud continuous chorusing commonly reaches levels of 70 decibels in dense populations. Sound pressure level (SPL) is relatively simple and inexpensive to measure, but its accuracy as a measure of frog abundance or activity is not known. We used parameters of an overnight chorus SPL model described elsewhere in the conference (Benevides *et al*.) to examine variation in SPL in separate populations of frogs. We repeatedly recorded coqui choruses in lowland wet forests of southeast Hawai'i Island in 2006-2007 using a data logging SPL meter with band pass filtering (1-3.15 kHz) to exclude sound energy outside the range of the coqui call. Results showed that chorus model parameters are subject to large variability, and dense populations of frogs ranging from 2,800-9,800 adult frogs per hectare (mark-recapture analysis) were not readily distinguished by SPL. Lower temperatures significantly reduced SPL of population vocalization. Knowledge of variability due to temperature and probably to the immediate past history of rainfall is critical to the use of SPL in assessing local abundance of coqui frogs.

Session IX
Ecosystem
Management
Session

Lauren Weisenberger
O'ahu Army Natural Resources, Hawai'i

Seed Conservation Research for Rare Plant Management. O'ahu Army Natural Resources Program (OANRP) works to stabilize populations of 50 endangered plant species in the Wai'anae and Ko'olau Mountains. OANRP has been supporting and/or conducting research on and storing their seed collections for genetic storage and propagation goals for nine years. Researchers have been able to provide feedback for the management plans of these rare plants, addressing topics from seed set and initial viability to long-term storage potential. Studying fresh and stored seed viability from fruit at various stages of ripeness defines the best time to collect, maximizing the quality of the collections. Soil seed bank studies determine how long seeds, both rare and invasive, will remain viable in the field. Germination studies have identified dormancy-breaking methods to better serve propagation needs, assess viability, and indicate when and how seedling recruitment can occur in the field. Storage viability tests determine the storage conditions necessary for maintaining collections the longest. A database maintains records for OANRP by founder, so an estimate of the number of viable seeds stored at any given time can easily be calculated. Lastly, over the past three years, collections have been withdrawn from storage for OANRPs reintroductions. This research has allowed for OANRP to determine the necessary amount of seeds to withdraw for propagation. This prevents removing too many seeds from the bank and creating and excess of plants in the greenhouse, as well as not removing enough seeds and falling short on reintroduction goals. Seed research has fine-tuned management practices for OANRPs rarest plants.

Poster 66

Kemble White, Steven Carothers
SWCA Environmental Consultants, Austin, TX

Field Methods for the Identification and Characterization of Potential Habitat for Rare and Endangered Hawaiian Cave Fauna. Caves in the Hawaiian Islands contain a unique diversity of troglobitic biota. These species face most of the threats normally associated with other native Hawaiian fauna, but their management is further hampered by the cryptic nature of their subterranean habitat and the often elusive lifestyle of the organisms themselves. Only a small portion of their habitat is accessible by humans. Informed partially by experience with endangered troglobites of the central Texas karst, field methods for identifying potentially suitable habitat have been drawn from

the areas of ecology, geology, geomorphology, and geophysics. Methods include pedestrian surveys to locate the surface expression of cave systems, mapping of accessible tubes segments, correlating vegetation patterns with cave morphology or species ecological requirements, and refined geophysical techniques which provide non-invasive methods of mapping habitat without disturbing either the species of concern or sensitive archaeological resources. Case studies from the islands of Hawai‘i and Kaua‘i are discussed.

Poster 67

Kristin White
Escarpment Environmental Consulting, Austin, TX

Comparison of the Results of a Ground Penetrating Radar and Very Low Frequency Study Used to Detect Cold Lava Tubes (potential habitat for cave-adapted species), Hualālai Volcano, North Kona, Hawai‘i. This poster presents the procedures and results of surface geophysical surveys performed at three selected parcels at Hualālai Volcano, North Kona district, Hawai‘i County (Big Island) in 2006. This study contains general information about the environmental setting, lava tube morphology, anomaly descriptions, an overview of the geophysical methods used, data acquisition parameters, processing steps, interpretations of each method, and a comparison of the accuracy of the two methods. This report will be of interest to conservation biologists who are interested in identifying potential cold lava tubes and caves that may provide habitat for cave-adapted species. Currently, several geophysical methods exist to locate subsurface voids. Each geophysical method has limitations such as resolution and depth accuracy due to geological conditions, void size, shape, and orientation. Ground-penetrating radar (GPR) and very low frequency (VLF) data were collected over known cold lava tubes (caves) and along lines both perpendicular and parallel to known lava tubes. In some places where lava tube caves are known, geophysical measurements were conducted to establish the usefulness of GPR and VLF measurements in this setting. To help identify possible voids, non-invasive geophysical methods were used to (1) characterize the presence and range of vertical/ horizontal extent of voids, (2) to identify anomalies in the field and on a site map for planning purposes, and (3) to compare the results of two different geophysical methods (ground penetrating radar and very low frequency) to look for these features.

Session VIII
Water Session

Tracy Wiegner[1], Randee Tubal[1], Richard Mackenzie[2], Mark Manuel[1]
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Concentrations and Bioavailability of Organic Matter and Nutrients During Base and Storm Flow Conditions in the Wailuku River, Hawai‘i. Hawai‘i’s economy relies on the quality of coastal waters. Thus, impacts of terrestrial inputs to coastal waters need to be quantified. Hilo Bay is an ecologically, culturally, and economically important estuary that is listed as impaired by USEPA. The Wailuku River is the largest source of surface water to Hilo Bay; however, little is known about it with regards to its organic matter and nutrient loads, and their effects on Hilo Bay’s water quality. Our study examined how the quantity and quality of dissolved organic matter (DOM) and nutrients from the Wailuku River differed spatially and temporally. Water collected from forested and developed regions of the Wailuku River during base and storm flow were analyzed for DOM and nutrient concentrations. Dark bioassays evaluated DOM quality. Forested and developed sites had similar water chemistries. During storms, dissolved organic nitrogen (DON) and carbon (DOC) concentrations tripled, while nitrate decreased by a third. Distribution of N and C forms changed between base and storm flow. The N pool was dominated by nitrate during base flow and particulate N during storms. DON comprised a similar percent of the N pool under base and storm flow. The C pool was dominated by DOC during base flow and particulate C during storms. Both DON and DOC bioavailability decreased during storms. Changes in DOM and nutrient concentrations and bioavailability with rainfall suggest that their sources differ under base and storm flow conditions. Our data will be used to develop a water quality management plan for Hilo Bay.

Session II
Big Picture
Session

Howard Wiig
Department of Business, Economic Development, & Tourism, Honolulu, HI

A Portable Refinery for Wake Island and Remote Pacific Islands. Wake Island disposes of its trash either by open burning in violation of EPA regulations or by shipping the waste to the O‘ahu landfill. The trash problem is worsening on low-lying islands of the former Micronesian chain as ocean levels rise. Another problem is the lack of affordable electricity. Diesel oil is literally rolled onto beaches in barrels on some islands and generators are often old, inefficient, and produce excessive emissions. The solution may be a portable waste-to-energy machine that turns waste into electricity. Developed by scientists at Purdue University for the Department of Defense, the machine is three technologies in one: a bioreactor that uses enzymes and micro-organisms to turn food waste into ethanol; a gasification unit that turns plastics, paper, and other residual waste into methane and low-grade propane; and a modified diesel engine that can burn gas, ethanol and diesel fuel in variable proportions. The main by-product is a benign ash. This presentation will: a) estimate the weight and composition of waste generated on Wake Island and select islands in the Micronesian chain; b) estimate CO2, particulates and hazardous emissions generated by current waste disposal methods; c) estimate emissions from a portable refinery processing the same waste; d) estimate the amount of diesel oil displaced by refinery-generated fuel; and e) compare the cost of a refinery on site with the economic and environmental benefits derived and conclude with a cost/benefit analysis.

Session I
Near Shore/
Marine
Symposium

Ivor Williams[1], Bill Walsh[2]
[1]Hawai‘i Coral Reef Initiative, Honolulu, [2]Hawaii Division of Aquatic Resources, Kailua-Kona

Effects of 25 Years of Rotational Management at the Waikīkī-Diamond Head Fishery Management Area. Using data taken from the state of Hawai‘i’s long term reef monitoring program, we assess the effects of more than two decades of rotational management (i.e. alternately closing and opening the area to fishing) on fish stocks at the Waikīkī Diamond-Head Fishery Management Area (FMA) on O‘ahu. Between 1978 and 2002, total fish biomass declined by around 2/3rd, and coincident with that decline was the virtual disappearance of large fishes (>40 cm) of fishery-target groups: surgeonfish; parrotfish; jacks; and goatfish. Overall, rotational management as implemented at the Waikīkī FMA has not been an effective means of conserving fish stocks or of revitalizing public fishing.

Session II
Native Biota
Session

Kenneth R. Wood, David Lorence
National Tropical Botanical Garden, Kalāheo, Hawai‘i

Marquesan Pteridophytes: Diversity on an Isolated Hot-spot Archipelago in the Pacific. The extremely rugged, mountainous interiors of the high Marquesas Islands (French Polynesia) have evidently limited the prevalent patterns of anthropogenic deforestation found on nearby smaller islands and at lower elevations, thus allowing certain species to survive longer. Recent botanical explorations using rough terrain inventory techniques have resulted in a 10% increase to the previously known Marquesan fern flora of approximately 100 species, including new endemic species within Dryopteridaceae, Pteridaceae, and Thelypteridaceae. Rapid assessment and inventory of such biologically rich ecosystems, documenting and mapping their diversity, and understanding and describing previously unknown taxa are all fundamentally linked to the conservation of the biota of oceanic islands and to human welfare. The process of discovering, describing, and conserving the diversity of island ecosystems is a time sensitive discipline as we witness the rapid disappearance of biodiversity within tropical areas. Our studies also include the collection of material for DNA sequence studies and utilize recent advances by other researchers in molecular genetic methods. Phylogenetic reconstructions are being used to better understand the evolutionary relationships of species and their floristic uniqueness, and add to our criteria for evaluating future conservation priorities.

Poster 68

Corie Yanger[1], Rhonda Loh[2], Alison Ainsworth[3], Sierra McDaniel[1], David Benitez[1]
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Fire Effects in Coastal Grasslands of Kealakomo Waena, Hawai'i Volcanoes National Park. In 1999 a 103 acre prescribe burn was conducted in kīpuka Kealakomo Waena to evaluate recovery response of the native grass *Heteropogon contortus* (pili), alien grasses, and alien shrubs christmasberry (*Schinus terebinthifolius)* and lantana (*Lantana camara)*. Twenty-four vegetation cover transects and twenty-two biomass transects were established prior to the burn and read over the course of five years. Cover was recorded using a 100-hit modified pole-intercept technique. Biomass transects placed in areas with dominant pili, natal redtop (*Melinus repens*), and molasses grass (*Melinis minutiflora*) were sub-sampled using 25x25 cm squares. The response of pili varied among the four cover transects where plants were present. In two transects, pili recovered its preburn abundance by year five. In the remaining two, pili decreased by over half its former cover abundance. For two other native species present in the study site, *Waltheria indica* abundance increased and *Ipomoea indica* abundance remained unchanged in response to fire. Among alien species, natal redtop and molasses grass showed no significant change between preburn and 5-yr post burn cover abundances. Alien shrubs were significantly reduced by the burn. The number of individuals of christmasberry dropped from 290 individuals to 14 individuals, and the cover of lantana dropped from 22% to 0% cover at five years. No natural regeneration by seedlings was evident. These results identify fire as a method for excluding exotic woody species from coastal grasslands. Additional experiments to increase pili abundance using a combination of planting and prescribe fire are planned for Summer 2008.

Session V
Forest Health
Symposium II

Alvin Yoshinaga
University of Hawai'i, Honolulu, HI

Wiliwili (*Erythrina sandwicensis*) Germplasm Seed Bank. In response to destruction of wiliwili by the Erythrina gall wasp, a wiliwili germplasm seed bank has been assembled to provide a source for restoration material after control measures for the wasp are developed. In 2005, a statewise seed collection program was organized. Seeds were deposited at the Seed Conservation Laboratory operated by the University of Hawai'i Center for Conservation Research and Training at Lyon Arboretum. As of March 2006, the collection consisted of ca. 100,000 seeds. The source of these collections, in format island/# of collections, is as follows: Kaua'i/11, O'ahu/50, Moloka'i/2, Maui/77, Lāna'i/3, Kaho'olawe/3, Big Island/11. Seeds are stored in refrigerators and freezers. The Laboratory is conducting research to refine storage methods. Results suggest a potential storage life of decades.

Session VIII
Winged
Vertebrates
Session I

Brenda Zaun, John Burger, Jayme Patrick
[1]U.S. Fish and Wildlife Service, Kīlauea, Kaua'i, HI, [2]U.S. Navy, Pacific Missile Range Facility, Kekaha, HI, [3]Animal and Plant Health Inspection Service, Wildlife Services, Līhu'e, HI

The Albatross Egg Swap: Three Years Later. In January 2005, the U.S. Navy Pacific Missile Range Facility (PMRF) on Kaua'i's south shore had a dilemma: what to do with ready-to-hatch Laysan Albatross (*Phoebastria immutabilis*) eggs. Because albatrosses could pose air strike hazards to aircraft, PMRF has utilized the U.S. Department of Agriculture's Wildlife Services since the late 1980s to manage their albatross abatement program including relocation of birds and, if necessary, destruction of eggs. Conversely, on the north side of the island, the U.S. Fish and Wildlife Service's Kīlauea Point National Wildlife Refuge (refuge), is managed to promote and encourage albatross nesting in order to increase Kaua'i's population. As a result, three agencies worked together to achieve a positive result for a challenging problem: how to ensure survival of the eggs without compromising aircraft safety. The viable eggs from PMRF were placed under adults incubating inviable eggs on the refuge resulting in increased hatching success. The program continued the following two years with improvements and modifications. In the second and third years, eggs were removed from the PMRF birds at lay and placed in an incubator which resulted in increased egg

mortality. Failure to hatch was inversely proportional to time in incubator suggesting that earlier placement of the eggs and/or longer natural incubation of the eggs could increase their hatching success. This paper summarizes three years of results, lessons learned, and recommendations for reducing egg mortality and increasing the success of the project.

Session VI
Bridges to the Future Forum

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Back to the Future: Hawai‘i's Future Conservation Community. Our region’s future environmental workforce will “look” much like those students currently pursuing science degrees and starting new careers. Opportunities such as environmental education programs, internships and mentoring programs, offered by school, university, government and non-profit groups have helped connect more local students to conservation issues in Hawai‘i and the region. This presentation looks at trends in environmental education programs in the state, the changing faces of interns in the UH Hawaiian Internship Program (UH-HIP) over the past decade, and the host agencies which have contributed to preparing our future environmental leaders, managers and engaged community members.

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ANNOUNCEMENT: 2008 HAWAI'I CONSERVATION CONFERENCE

16th Annual Hawai'i Conservation Conference

July 28 – August 1, 2008
Hawai'i Convention Center

Proposed theme
Island Ecosystems: The Year of the Reef

Symposia, forums and workshops for 2008 may include:

- Coral reef ecosystems
- Communities going green and blue
- Reporting effective conservation
- Permits permitting
- Improvements in biosecurity
- Bioinvasion and rapid response
- Advances in landscape restortation
- Finding the ecotipping points
- Global trends – local management

If you wish to lead a symposium, forum or workshop on any of the above or another topic in 2008 please contact the organizing committee before November 22, 2007.

There is new content almost daily at your Portal for Hawai'i Conservation

www.hawaiiconservation.org

- ✓ Conservation issues in our local newspapers daily, organization press releases, recent publications, and upcoming conferences, forums and workshops
- ✓ Find out about the Hawai'i Conservation Alliance, HCA Position Papers, HCA Distinguished Service Awards and other awards, HI-NZ Exchange Program, and HCA Grants Program.
- ✓ Links to most other Conservation organizations in Hawai'i.

We take your conference evaluations seriously. Please complete them and return them to us promptly.
Also please consider joining the HCC organizing committee and subcommittees.
Contact Mariza Silva for details (silvam@hawaii.edu or hcastaff@hawaii.edu).

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Hawai'i Conservation Week July 27 - August 2, 2008