California Invasive Plant Council
2007 Symposium

Bahia Resort Hotel, San Diego **September 20-22, 2007**

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Cal-IPC

Welcome to the 16th Annual Cal-IPC Symposium!

New to Cal-IPC? All Symposium attendees receive a 2008 membership as part of their registration fee. Pick up a copy of our latest newsletter and samples of "Don't Plant a Pest!" brochures near Registration. If you have questions about Cal-IPC, ask one of our Board or Staff members, identified by the blue (Board members) or bright pink (Staff) ribbons on their nametags.

Session Rooms: This year's plenary sessions and the Thursday evening banquet will be held in the Mission Bay Ballroom. Sponsor exhibits and posters are located in the Bayside Pavilion (large white tent), which will also hold the Thursday social hour and raffle. Friday morning working groups will use meeting rooms throughout the Bahia Hotel. Please refer to the hotel map on page five for the locations of all rooms.

Keynote Speaker: We welcome Dr. Jon Rebman of the San Diego Natural History Museum, to speak on "Creating the San Diego Plant Atlas: A Major Effort Using "Citizen Science." Dr. Rebman has been Curator of Botany at the SDNHM since 1996. He is the lead botanist in the San Diego Plant Atlas Project, a long-term project using volunteer plant collectors to document the floristic diversity of every region of San Diego County.

Invited Paper Sessions: Invasive plant work requires us to create innovative partnerships and communicate the importance of our work to diverse audiences. Two plenary sessions will feature invited speakers discussing "Building Lasting Coalitions" and "Designing Effective Communication Strategies." The Symposium will close with a plenary session addressing "Emerging Issues in Invasive Plant Management", including Dr. Joe DiTomaso's always-popular Weed Alerts.

Workshops and Discussion Groups: These breakout sessions on Friday morning allow Symposium attendees to discuss topics in small groups. Some offer trainings on particular topics; others are forums for discussion. See the flyer in the program folder for descriptions and room assignments.

Saturday Field Trips: All trips meet in the parking lot of the Bahia Hotel at 8am. Trips that do not provide lunch will return shortly after noon. Kendall-Frost Marsh participants will carpool; other trips will have transportation provided. We recommend that you bring sun protection and extra water on all trips.

Social Hour, Raffle, and Banquet: After Thursday's sessions, join fellow attendees in the Bayside Pavilion for a Social Hour (one free drink ticket is included with registration!) and bid on books, wine, tools and more in our annual raffle. At the end of the banquet, we will auction several extra-special items with the help of auctioneer Joe DiTomaso. The raffle flyer in your program packet gives a preview of the prizes. Tickets are $1 each (25 for $20) and will be available at the Sales table all day Thursday or from roving ticket sellers during the Social Hour. Place tickets in the bags next to the items you want. Pick up prizes in the foyer of the Mission Ballroom after the banquet. The annual Awards Banquet starts at 6:30pm in the Mission Ballroom and is free to all attendees. Come celebrate the accomplishments of this year's award winners, identifiable by the gold ribbons on their nametags.

Southern California Meeting: You are invited to attend a lunch meeting on Friday to discuss invasive plant issues pertinent to the Southern California Region (Santa Barbara and San Bernardino counties southward to the Mexican border). Southern California weed workers and researchers often have a difficult time collaborating and focusing regional efforts due to our distribution across a large landscape. This is a perfect opportunity to meet others in the region or catch up with old friends, and to prioritize issues on which to focus collaborative efforts. At this meeting, we will discuss regional priorities such as development of a Southern California Cal-IPC Invasive Plant Inventory focusing on problematic species in the region, regional advocacy, coordinating research and management, and mapping. Please take the time to attend this meeting,

and be prepared to share your vision for the region. (If you did not order a box lunch with your registration, please bring a lunch to the meeting.) The meeting will be held on the William D. Evans sternwheeler (see hotel map p. 5).

Sponsor Exhibits: We encourage you to visit our sponsors' exhibits in the Bayside Pavilion and talk to their representatives. Sponsors help support the Symposium and many provide products for invasive plant work. They will be available at lunch and during the poster sessions and Social Hour. Sponsor representatives wear light green ribbons on their nametags.

Photo Exhibit: Vote for your favorite photo of a weed or weed workers! Photos will be displayed in the Bayside Pavilion. Submit your vote on Thursday; winners will be announced at the banquet.

Sales: Visit the Sales table, located near Registration, to purchase reference materials, t-shirts, and NEW Cal-IPC tote bags.

Continuing Education Credits: Continuing Education hours are available from the California Department of Pesticide Regulation, including two hours of Laws and Regulations credit on Friday. See the Continuing Education table near Registration for attendance sheets and scantrons. Keep the codes and hours listed below for your records.

Codes and hours:

Mapping Field Course	6.0 hrs Other	code A-1116-07
Thursday	5.5 hrs Other	code A-1148-07
Friday	Credits vary depending on whether you attend Laws and Regulations. **To receive credit for Laws and Regs, you must sign the separate attendance sheet and turn in a separate scantron for that session.** If not attending the Laws and Regulations, you may receive 7.0 hrs Other credit.	
	5.0 hrs Other + 2.0 hrs Laws & Regs.	or 7.0 hrs Other code A-1149-07
Saturday Field Trips	4.0 hrs Other	code A-1150-07

Thank you to all of the organizations that supported this year's Symposium through their sponsorship and all the volunteers who contributed their time!

Cover photos: Mike Kelly and Tom Dudley

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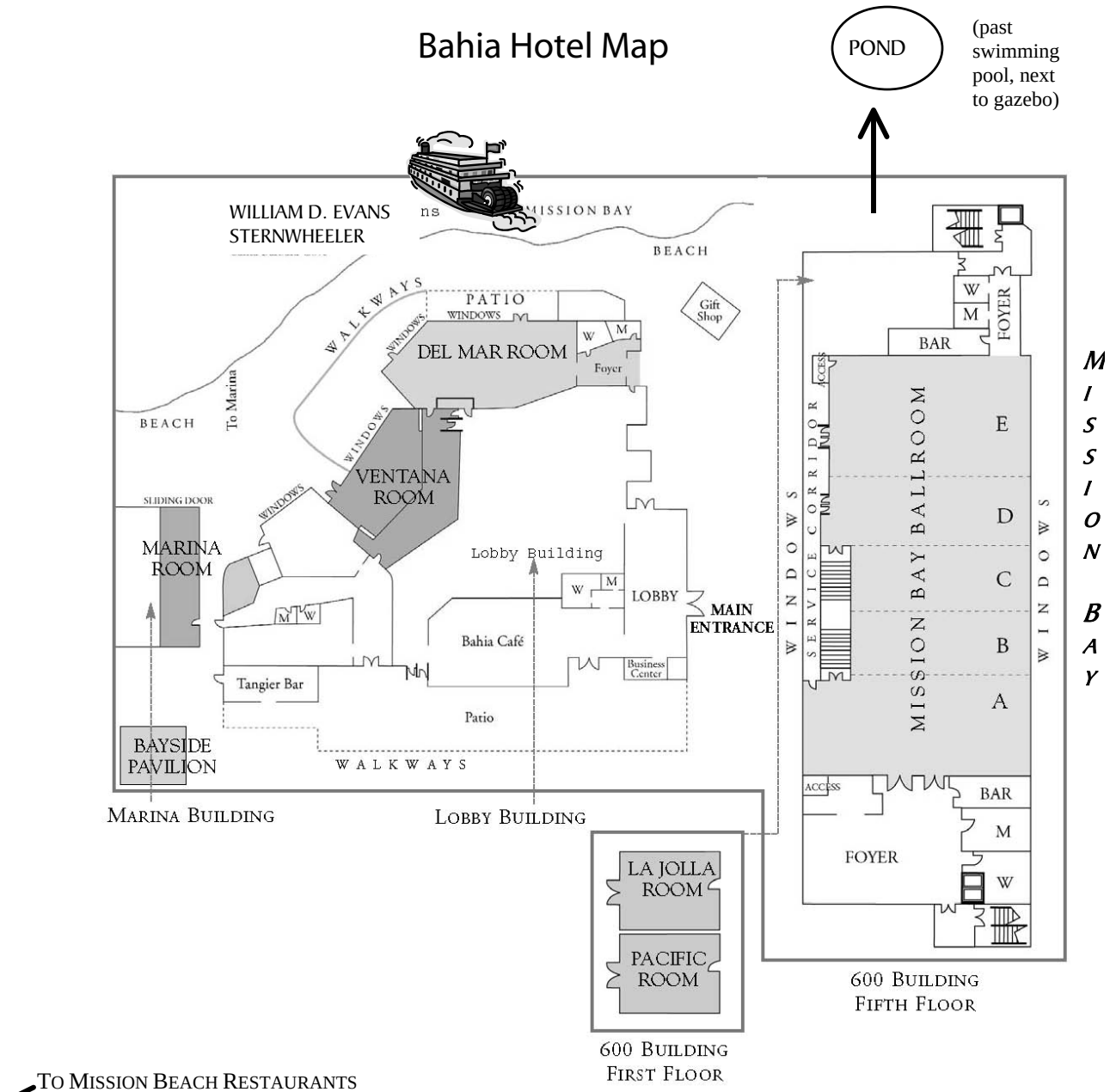
Bahia Hotel Map



Plenary and concurrent paper sessions, Thursday banquet: Mission Bay Ballroom

Sponsor exhibits, posters, Social Hour: Bayside Pavilion (large tent)

Working and discussion groups: Mission Bay Ballroom, La Jolla, Pacific, Marina, Ventana, William D. Evans sternwheeler

Thursday lunch: Pond

Friday Southern California lunch meeting: William D. Evans sternwheeler

Restaurants within Walking Distance of the Bahia Hotel
(Ordered by distance to hotel, closest first.)

1. Café Bahia
998 W Mission Bay Dr.
(858) 539-7635
The 2007 Cal-IPC Conference venue. Dining is available in the hotel's Cafe Bahia. $ - $½

2. Mizu
850 W Mission Bay Dr.
(858) 488-1700
Japanese restaurant, casual, family friendly $ - $½

3. Jack in the Box
3205 Mission Blvd.
(858) 488-2484
$

4. Roberto's Taco Shop
3202 Mission Blvd.
(858) 488-1610
Mexican fast food. $

5. Luigi's at the Beach
3210 Mission Blvd.
(858) 488-2818
10% off coupon in program packet
Italian restaurant, casual, family-friendly $ - $½

6. Mission Beach BBQ
756 Ventura Pl.
(858) 488-0298

7. Coaster Saloon
744 Ventura Pl.
(858) 488-4438
A Top 20 American Dive Bar! with burger, BBQ, appetizers, Mex food.

8. Fat Boyz Pizza
728 Ventura Pl.
(858) 488-2699
Pizzas, subs, calzones fast food style

9. Gaglione Brothers Famous Steaks & Subs
724 Ventura Pl.
(858) 488-1690
Sandwich shop, recognized for great subs, sandwiches, & Philly cheesesteaks $

10. Sandbar Sports Grill
718 Ventura Pl.
(858) 488-1274
Lively sportsbar with burgers, sandwiches, salads, appetizers, burritos, tacos & steaks. Upstairs deck. $ - $½

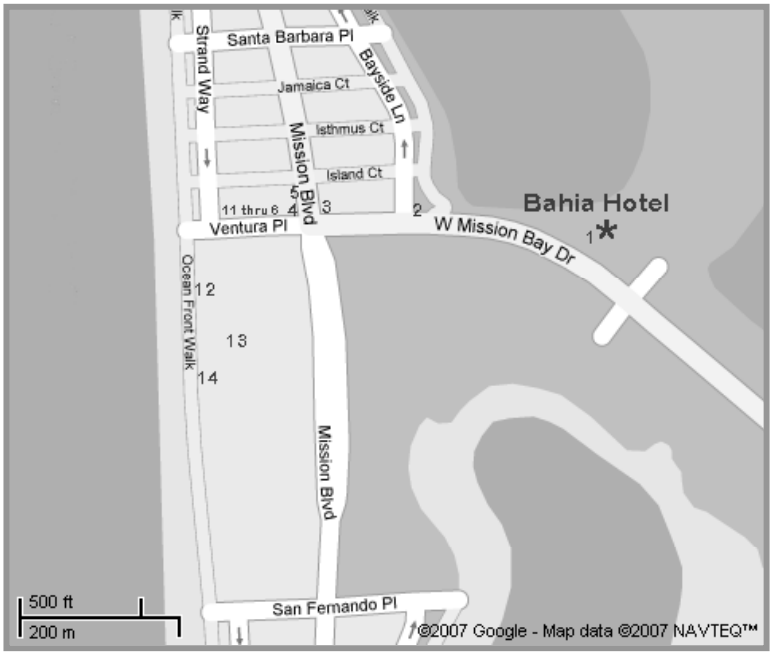
11. Kojack's Greek Food
714 Ventura Pl.
(858) 488-5647
Greek fast food

12. North Shore Café at the Wave House
3125 Ocean Front Walk
(858) 228-9283
Burgers, BBQ, salads, appetizers, etc. in a gnarly atmosphere. $ - $½

13. Five Star Grill
3136 Mission Blvd Ste I
(858) 539-1118
Asian - American fast food. $

14. Cane's Bar & Grill
3105 Ocean Front Walk
(858) 488-1780
10% off coupon in program packet
Ocean front restaurant, bar with roof top deck and entertainment. $ - $½

Zip code for the area is San Diego CA 92109



2007 Cal-IPC Symposium Program

Featuring Special Theme Sessions on
"Communication and Conservation: The Human Dimension in Invasive Plant Management"

Thursday, September 20

7:30 **Registration and Breakfast**
Mission Bay Ballroom foyer

Invited Theme Session I - Building Lasting Coalitions. Mission ABCD.
Chair: Sharon Farrell, Golden Gate Nat'l Parks Conservancy.

9:00 Introduction. *Sharon Farrell.*

9:10 The California Rangeland Conservation Coalition. *Kim Delfino, Defenders of Wildlife.*

9:30 The California Horticultural Invasives Prevention (Cal-HIP) partnership and the PlantRight campaign. *Betsy Peterson, California State Floral Association.*

9:50 Cache Creek Conservancy: Building Tribal Partnerships. *Shannon Brawley, Cache Creek Conservancy.*

10:10 Discussion

10:30 **Break**

11:00 **Cal-IPC Annual Member Meeting**
Mission ABCD
Executive Director's report.
Doug Johnson. Cal-IPC
Board of Directors report.
Daniel Gluesenkamp, Audubon Canyon Ranch

11:30 **Keynote Address.** Mission ABCD
Dr. Jon Rebman, San Diego Natural History Museum: "Creating the San Diego Plant Atlas: A major effort using 'citizen science'"

12:00 **Lunch** (provided). Pond

1:00 **Posters and Exhibits Session I**
Bayside Pavilion. (Posters listed page 11.)

Contributed Session I - Mapping and Planning
(concurrent). Mission ABCD
Chair: Mandy Tu, The Nature Conservancy

2:00 Why walk when you can fly? Systematic aerial weed survey of Santa Cruz Island, California. *John Knapp*, Native Range Research and Management; Kelvin Walker, Prohunt; Rachel Wolstenholme and Coleen Cory, The Nature Conservancy.*

2:20 How to develop user-friendly riparian corridor invasive exotic species/habitat restoration master plans: Experiences on the San Diego and Otay Rivers. *Brad Burkhart*, BEC/ECORP Consulting; Mike Kelly, Kelly and Associates.*

2:40 Distributional patterns of perennial pepperweed (*Lepidium latifolium*) in the San Francisco Bay, a CalFed project. *Melanie Vanderhoof* and Chris Rogers, Environmental Science Associates.*

3:00 Developing early detection networks to abate the invasive species threat. *Tania Siemens and Mandy Tu*, The Nature Conservancy.*

Contributed Session II - Management
(concurrent). Mission E
Chair: Jennifer Erskine-Ogden, UC Davis

2:00 Managing herbaceous perennials in the Tahoe Basin. *Jennifer Erskine-Ogden*, UC Davis; Mark J. Renz, University of Wisconsin, Madison; Justin Norsworthy, New Mexico State University; Sue Donaldson, University of Nevada Cooperative Extension.*

2:20 The break-up and dispersal of *Arundo donax* by bulldozers. *John Boland, Tijuana River Valley Invasive Plant Control Program.*

2:40 Spraying over the top of *Ambrosia pumila*, a federally-listed species, to control invasive weeds. *Mike Kelly, Kelly and Associates.*

3:20 **Break**

Contributed Session III - Management
(concurrent). Mission ABCD
Chair: Sandra DeSimone, Audubon California

3:40 Evaluation of control efficacy and potential off-target effects resulting from herbicide treatment of invasive fig trees (*Ficus carica*). *Katherine A. Holmes* and Alison M. Berry, UC Davis.*

4:00 Non-chemical exotic control in coastal sage scrub restoration at an Audubon Preserve. *Sandra DeSimone, Audubon California's Starr Ranch Sanctuary.*

4:20 Artichoke thistle (*Cynara cardunculus*) control efforts and community recovery in historic southern California rangeland. *Margaret Royall*, Michelle Murdock and Katharine Suding, UC Irvine; Trish Smith, The Nature Conservancy.*

4:40 Assessing non-target vegetation response in the wake of perennial pepperweed (*Lepidium latifolium*) eradication at the Cosumnes River Preserve. *Rachel A. Hutchinson*, Joshua H. Viers and James F. Quinn, UC Davis.*

Contributed Session IV – Biological Control
(concurrent). Mission E.
Chair: Lincoln Smith, USDA-ARS.

3:40 Evaluation of the rosette weevil, *Ceratapion basicorne*, a new biological control agent of yellow starthistle. *Lincoln Smith*, USDA-ARS. Massimo Cristofaro ENEA C.R. Casaccia, Rome, Italy; Carlo Tronci Biotechnology and Biological Control Agency, Rome, Italy; Rustem Hayat, Ataturk University, Erzurum, Turkey.*

4:00 The effects of *Puccinia jaceae* on yellow starthistle competition and growth. *Jon O'Brien*, Joe DiTomaso, and Guy Kyser, UC Davis; Dale Woods, University of Wyoming.*

4:20 Regional testing of *Diorhabda 'elongata'* ecotypes for the biocontrol of saltcedar (*Tamarix* spp) in western US. *Peter Dalin, UC Santa Barbara.*

4:40 Gray leaf spot of kikuyugrass: An invasive pest of an invasive pest. *Frank P. Wong*, Karla A. de la Cerda, and Greg W. Douhan, UC Riverside.*

5:00 **Social Hour and Raffle.** Bayside Pavilion

6:30 **Banquet.** Mission Bay Ballroom

7:30 **Awards Presentation.** Mission Bay Ballroom

- Jake Sigg Award for Service and Vision
- Golden Weed Wrench Award for Land Manager of the Year
- Catalyst Award
- Policy Award

Friday, September 21

7:00 **Breakfast**. Mission ABCD.

Invited Session II - Designing Effective Communication Strategies. Mission ABCD
Chair: Pete Holloran, UC Santa Cruz

8:00 Introduction. *Pete Holloran.*

8:10 New ways to connect: Taking the pulse, eliminating the rumors. *Sharon Farrell, Golden Gate National Parks Conservancy.*

8:30 Strategic interactions across property boundaries in invasive plant control and implications for cooperation. *Mark Buckley, Environmental Incentives.*

8:50 Beyond the knowledge deficit model: Changing environmental behaviors. *Pete Holloran, UC Santa Cruz.*

9:30 **Poster and Exhibit Session II** Bayside Pavilion

10:30 **Workshops and Discussion Groups (concurrent).** Please refer to flyer in folder for rooms and a description of each group.

I) PlantRight bootcamp for effective outreach to nurseries. *Bethallyn Black, UC Cooperative Extension Master Gardener Program; Betsy Peterson, CA State Floral Association.*

2) Crafting better public outreach strategies and materials. *Asha Setty and Mary Petrilli, Golden Gate Nat'l Parks Conservancy.*

3) Developing a 'citizen science' program. *Mary Ann Hawke, San Diego Museum of Natural History.*

4) Preventing the risk of weed spread from ground-disturbing equipment. *Chris Christofferson, Plumas National Forest.*

5) Weed mapping developments. *Jason Giessow, Santa Margarita/San Luis Rey WMA.*

6) Weed control techniques Q&A. *Joe DiTomaso, UC Davis, and Mike Kelly, Kelly and Associates.*

7) Pest control applicator licensing and wildland weed control. *David Chang, Santa Barbara Co. Ag. Commissioner's office*

11:45 **Lunch in Mission Beach** (On your own.)

12:00 **Southern California Meeting**
William D. Evans sternwheeler (boat). Special meeting to discuss how Cal-IPC can address Southern California issues. Bring lunch if you did not purchase one with registration. *John Knapp, Catalina Island Conservancy.*

Contributed Session IV – Research (concurrent). Mission ABCD
Chair: Mona Robison, California Botany

1:30 Invasive plants for sale! A survey of nursery professionals. *Jennifer W. Burt*, Adrianna A. Muir, Jonah Piovia-Scott, Kari E. Veblen, Andy L. Chang, Judah D. Grossman, and Heidi W. Weiskel, UC Davis.*

1:50 Interloper's legacy: Invasive, hybrid-derived California wild radish (*Raphanus sativus*) evolves to outperform its immigrant parents. *Caroline E. Ridley* and Norman C. Ellstrand, UC Riverside.*

2:10 Toward understanding woody plant invasiveness: Phylogenetically independent contrasts of seedling growth traits and of performance under varying drought and nitrogen levels. *Eva Grotkopp*, Jennifer Erskine Ogden, and Marcel Rejmánek, UC Davis.*

2:30 Physiological and morphological responses of pampas grass (*Cortaderia selloana*) to variations in water table and soil nitrogen content. *Joanna L Kroon and George L Vourlitis*, CSU San Marcos.*

2:50 Measuring roots, *in situ*, of two late summer perennial plant species, *Elymus glaucus* and *Grindelia camporum*, and an invasive annual species, *Centaurea solstitialis. Steve Young* and Joe DiTomaso, UC Davis.*

3:10 Genetic relatedness can limit reproduction in a wind-pollinated grass weed via pollen limitation. *Jeffrey Firestone* and Marie Jasieniuk, UC Davis.*

Laws and Regulations (concurrent— provides L & R continuing education credit for state-licensed herbicide applicators). Mission E
Chair: Bob Case, Cal-IPC

1:30 Mock pesticide use monitoring inspection: An interactive skit with Q and A. *Bob Case, Cal-IPC; Chris Christofferson, Plumas National Forest; John Knapp, Catalina Island Conservancy.*

2:30 Invasive plant control and the California red-legged frog injunction. *David Chang, Santa Barbara County Agricultural Commissioner's Office.*

3:00 Use of herbicides near threatened and endangered species habitat. *Polo Moreno, CA Dept. of Pesticide Regulation.*

3:30 **Break**

Closing Session - Emerging Issues in Invasive Plant Management. Mission ABCD
Chair: Doug Johnson, Cal-IPC

4:00 Public policy and advocacy issues for the dedicated weed worker! *Mandy Tu[1] and Doug Johnson[2], The Nature Conservancy, [2]Cal-IPC*

4:20 Risky energy: Biofuels and invasive species. *Jacob Barney and Joe DiTomaso, UC Davis.*

4:40 Weed alerts and tools of the trade. *Joe DiTomaso, UC Davis.*

5:00 **Closing remarks**
Field trip logistics

5:10 **Adjourn**

Join us October 2-4, 2008, at California State University – Chico!

Saturday, September 22

Field Trips – All trips leave from the Bahia Hotel parking lot. Participants will meet at the Bahia at 8:00 am.

Torrey Pines State Reserve and Los Peñasquitos Canyon

Invasive plants/topics: *Ehrharta, mustard, Italian thistle, palms; herbicide use around sensitive species.*

Leaders: *Mike Kelly, Friends of Peñasquitos Canyon and Darren Smith, California State Parks.*

Full day*, transportation and lunch provided.*

We will make three stops to show a variety of control projects. First will be Torrey Pines State Reserve, located within San Diego city limits and yet one of the wildest stretches of land on our Southern California coast. Through the efforts and foresight of people in this area, 2,000 acres of land remain as they were before San Diego was developed—chaparral, the rare and elegant Torrey pines, miles of unspoiled beaches, and a lagoon that is vital to migrating seabirds. Invasive plant species such as *Ehrharta* and iceplant have begun to change this landscape. Successful programs control these species and monitor for new threats while avoiding herbicide impacts to sensitive species. Next we stop down the hill at Los Peñasquitos Lagoon where state ecologists are using successful volunteer programs to eliminate mustard and Italian thistle. The last stop will be up the watershed in the Los Peñasquitos Canyon Preserve to view an ongoing palm removal project examining different drilling methods and testing the amount of herbicide needed to effectively kill the plants.

San Luis Rey Watershed and Carlsbad Hydrologic Unit

Invasive plants: *Arundo, pampasgrass, perennial peppergrass, and eucalyptus.*

Leaders: *Jason Giessow, Santa Margarita and San Luis Rey Weed Management Area, and Doug Gibson, San Elijo Lagoon Conservancy.*

Full day*, transportation and lunch provided.*

This trip takes you through two large watershed-scale invasive species control programs that have been ongoing for the past six years. Stops include: San Elijo State Ecological Reserve to discuss *Lepidium* and ongoing restoration efforts; Elfin Forest Recreation Reserve along Escondido Creek to view large-scale eucalyptus and arundo removal; one of the largest pampasgrass removal sites in the state, three years after initial treatment and restoration; and San Luis Rey watershed to see sites that have been restored after arundo removal over a number of years. We will then work our way downstream to the newer sites that have been treated in the past few years, and finally to sites currently being treated, to show how sites look many years after initial treatment and biomass reduction has occurred.

Tijuana River National Estuarine Research Reserve

Invasive plants: *tamarisk hybrid and saltmarsh invaders.*

Leader: *Dr. Jeff Crooks, Tijuana River NERR.*

Half day*, transportation and lunch provided.*

The Tijuana River Reserve is located in a highly urbanized environment, encompassing beach, dune, mudflat, saltmarsh, riparian, coastal sage and upland habitats surrounded by the growing cities of Tijuana, Imperial Beach and San Diego. Three quarters of the reserve's watershed is in Mexico, and its management, education and research issues involve an international perspective. Critical issues confronted by the reserve include habitat restoration, endangered species management, management of the wastewater from Mexico, sediment management, and the integration of recreation. The reserve is home to eight threatened and endangered species, including the light-footed clapper rail, California least tern, least Bell's vireo, salt marsh bird's beak, cordgrass, white and brown pelicans, and numerous shorebirds. This tour will focus on a new tamarisk hybrid invading high saltmarsh zones, as well as other saltmarsh invaders and the programs used to control them and restore the area.

Kendall-Frost Marsh, Mission Bay

Invasive plants: *mangroves.*

Leaders: *Isabelle Kay, UC Natural Reserves and Chris Redfern, San Diego Audubon.*

Half day*, transportation on your own (carpools), lunch on your own (returns to the Bahia by noon).*

Mission Bay was once part of a thriving wetlands complex encompassing thousands of acres of wildlife

habitat. As it was developed for recreational use in the 1940s and 50s, extensive salt marshes that once dominated the bay were reduced to a 30-acre patch along the northern edge of the bay. This remaining coastal salt marsh comprises the Kendall-Frost Mission Bay Reserve owned by the UC Natural Reserve System and the adjacent Northern Wildlife Preserve owned by the City of San Diego. An area of the preserve has been infested with invasive grey mangrove (*Avicennia marina*). This salt marsh habitat is the site of a newly approved removal project with assistance from the Southern California Wetlands Recovery Project Small Grant Program.

Posters

Alphabetical by first author (* = presenter).

The Salmon River experience: Tools of the trade. Petey Brucker and Shannon Flarity*, *Salmon River Restoration Council*

Trials on chemical control of periwinkle (*Vinca major*) and Cape ivy (*Delairea odorata*). *Casey Burns[1] and Stevie Adams[2] ;* [1]USDA Natural Resources Conservation Service (NRCS), Somis, CA; [2]Ojai Valley Land Conservancy, Ojai, CA; *Presented by Shea O'Keefe, NRCS, Escondido, CA

Wildly successful restoration & mitigation: A contractor's perspective. John Caruana, Lisa LaMond*, Michelle Caruana. *Nature's Image*

Native plant restoration along highway rights-of-way in California. *Vic Claassen* and Steve Young, UC Davis*

Coyote Creek floodplain reclamation project – Re-establishing native plant habitat. *Jennifer Codianne*, and Leo Dumont,* Santa Clara Valley Water District

Managing coastal sand dunes on Camp Pendleton. *Meghan Dinkins* and Benjamin Lardiere,* MCB Camp Pendleton

GeoWeed: A new weed data management tool. *Deanne DiPietro* and Zhahai Stewart,* Sonoma Ecology Center

A look at California Department of Food and Agriculture's pest exclusion branch noxious weed policies. *Katie Filippini,* California Department of Food and Agriculture

Tributaries to the Upper Santa Clara River, Los Angeles
Elihu Gevirtz, Jennifer Jackson, and *Nadine Martins.* Condor Environmental Planning Services, Inc.

Biological soil crusts and the effects of their disturbance on the germination of exotic vascular plants in coastal sage scrub. *Rebecca R. Hernandez* and Darren Sanduist,* CSU Fullerton

Controlling giant reed (*Arundo donax*) within the Tijuana River Valley. *Robert W. Hobbs[1]*, Julie Simonsen-Marchant[1], Tito Marchant[1], and John Boland[2],* [1]EcoSystems Restoration Associates, [2]Southwest Wetlands Interpretative Association

Restoring San Francisco's Tidal Marshes: The Demise of Invasive *Spartina*. *Ingrid B. Hogle*, Peggy Olofson, Erik Grijalva and Drew Kerr*, San Francisco Estuary Invasive Spartina Project

Applied ecology of Eurasian watermilfoil (*Myriophyllum spicatum* L.) in Fall River. *Thaddeus Hunt[1]*, Joseph M. DiTomaso[1], and David F. Spencer[2],* UC Davis.

Thread-leaved *Brodiaea* weed control for habitat restoration: Implementation, maintenance and monitoring. *Shirley Innecken*, Robert MacAller, Mark Dodero* RECON Environmental

Noxious weed display of Gila County Arizona. *Christopher Jones[1]* and Karrol Braddock[2]*[1]University of Arizona Gila County Cooperative Extension, [2]Master Watershed Stewards Program

Drilling and injecting two invasive palm species.

Mike Kelly[1], Bonnie Peterson[2], and Stephanie Bracci[3].* [1]Kelly & Assoc., [2]Merkle & Assoc., [3]City of Metropolitan Wastewater Dept.

The efficacy of alternative herbicides on non-native invasive woody broadleaf perennials. *Janet Klein and Cerissa Hoglander*,* Marin Municipal Water District

Eradicating 25 species- Challenges and successes of switching from population to seed bank management on Catalina Island, California *John Knapp[1]*, Sarah Ratay[1],* and *Jon Hall* (formerly with the Catalina Island Conservancy), [1]Catalina Island Conservancy, Avalon, CA.

Plant community and ecosystem effects of *Arundo donax* invasion. *Adam Lambert[1,2] and Tom Dudley*[2]* [1]Eastern Connecticut State University, [2] UC Santa Barbara

Ecology and future biocontrol of cape ivy in Southern California. *Nicole Molinari[1*], K. Seward[2], F. Burton[3], Y. Tamagawa[2], T. Dudley[4], C.D'Antonio[3,1], D. Chang[5] & J. Balciunas[6],* [1]Ecology, Evolution & Marine Biology, [2]College of Creative Studies, [3]Envir. Studies, [4]Marine Science Inst., UC Santa Barbara; [5]Santa Barbara County Agriculture Commissioner's Office; [6]USDA Agricultural Research Service

Milestone™ (aminopyralid): New research results of efficacy on noxious and invasive weeds. *Vanelle Peterson[1], Bruce Kidd*[1], Joe DiTomaso[2], Carl Bell[2], Celestine Duncan[3], Bob Wilson[4], Joe Yenish[5], Mike Moechnig[6], Mary B. Halstvedt[1], and Randy L. Smith,* [1]Dow AgroSciences, [2]UC Davis, [3]Weed Management Services, [4]University of Nebraska, [5]Washington State University, [6]South Dakota State University

Figs and bridal creeper: Two stubborn weeds that require ingenuity. *Sarah Ratay* and John Knapp,* Catalina Island Conservancy

Invasive species research at the National Park Service Pacific Coast Science and Learning Center. *Jane Rodgers[1], Tiffany Knight[2] and Caroline E. Ridley*[3],* [1]Point Reyes National Seashore, [2]Washington University, [3]UC Riverside

Effects of non-native aphids (*Hyalopterus pruni)* on competition between native and non-native *Phragmites australis*. *Yoshi Tamagawa*, Adam M. Lambert,* UC Santa Barbara

TNC's Weed Information Management System (WIMS) – An application tool for invasive species management. *Mandy Tu*,* The Nature Conservancy's Global Invasive Species Initiative, Portland, OR

Speaker Abstracts

Alphabetical by first author (* = presenter).
Poster abstracts follow in a separate section.

Risky energy: Biofuels and invasive species.

*Jacob Barney** and *Joseph DiTomaso*, Department of Plant Sciences, University of California, Davis, CA 95616. jbarney@ucdavis.edu

In an effort to reduce greenhouse gas emissions, expand domestic energy production, and maintain economic growth, public and private investments are being used to pursue dedicated feedstock crops for biofuel production. The leading candidates for lignocellulose-based energy are primarily rhizomatous grasses, most of which are not native to the region for which production is proposed. From an agronomic perspective, the life history characteristics, rapid growth rates, and tonnage of biomass produced by these non-native grasses make them ideal feedstock crops.

Unfortunately, several of these candidate feedstock species being considered for commercial production in the United States are invasive pests in other regions where they have been introduced. Their invasiveness is mainly a result of their life history characteristics and rapid growth rates. The combination of being non-native and possessing weedy characteristics, along with their potential scale of cultivation, presents a significant risk that biofuel crops could escape cultivation and potentially damage surrounding ecosystems. Biofuel crops will likely be cultivated on lands surrounded by sensitive forest, prairie, desert, and riparian areas, as well as rangelands and agricultural commodities. The potential societal benefits of a biologically-based energy supply are great, but the introduction and development of biofuel crops should be conducted to minimize the risk of these proposed feedstock species escaping cultivation and causing economic and environmental damage.

We have proposed a series of ecological analyses that when combined with risk assessment and computer modeling can quantify the risk of each proposed biofuel feedstock escaping cultivation and invading natural and managed ecosystems.

The break-up and dispersal of *Arundo donax* by bulldozers.

John Boland, Tijuana River Valley Invasive Plant Control Program, Imperial Beach, CA. JohnBoland@sbcglobal.net (619) 296-5061

I studied reproduction by fragmentation in *A. donax* (giant reed). I found that most new recruits growing from fragments were growing from rhizome fragments. The conventional wisdom regarding the break-up of *A. donax* clumps emphasizes the role of natural flooding events. But I examined clumps before, during and after the severe floods of 2004-05 and found that flooding events rarely break up *A. donax* rootstock and rarely produce new recruits. This is partly because rhizomes are very strongly attached to clumps. It appears that flooding alone cannot account for the spread of *A. donax*.

During the study, I observed bulldozers conducting channel maintenance and saw that they easily cut and moved large sections of *A. donax* rootstock. I hypothesized that bulldozers and other heavy equipment are important in the break-up and dispersal of *A. donax*. I tested this bulldozer hypothesis and found strong support. First, after bulldozers were used in one of the tributaries leading into the Tijuana River Valley, new *A. donax* recruits downstream were 61 times more abundant than in the valley at large. Second, *A. donax* was significantly more abundant than expected at seven San Diego County sites where bulldozers are frequently used. The results suggest that bulldozers and other heavy equipment play an important, and overlooked, role in the break-up and dispersal of *A. donax*. I urge regulatory agencies to require appropriate Best Management Practices when permitting bulldozer use in *A. donax* areas.

Cache Creek Conservancy: Building tribal partnerships.

Shannon Brawley, Cache Creek Conservancy, www.cachecreekconservancy.org, P.O. Box 8249 Woodland, CA 95776-8249, 530-661-1070

The Cache Creek Conservancy (CCC) is a 501 3 (c) whose mission is to preserve, restore, enhance and promote the stream environment along Cache Creek from the Capay Dam to the Settling Basin. Currently, representatives from the aggregate mining companies, governmental agencies, local landowners, Native American groups, and other community members work together to bring the CCC to the forefront of innovative projects such as non-native invasive plant species control. This presentation will focus on the CCC's partnership with the Native American Community and how we have dealt with weed eradication, restoration and cultural preservation issues.

Strategic interactions across property boundaries in invasive plant control and implications for cooperation

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Invasive species managers face a combination of biological and social factors that influence project success. Invasive species population dynamics are driven by management across the entire landscape, not just in conservation and restoration areas. A socially aware and strategic management approach can improve landscape-scale success by creating opportunities for cooperation. When invasive species managers recognize and address the priorities, beliefs, and expectations of other landowners, they are much more likely to succeed, especially if there are fundamental disagreements among stakeholders. When the expectations of others have not been adequately addressed, as in the case with some large-scale restoration efforts in the Sacramento River valley, projects can be stalled and forced to revise their goals. Game theory and behavioral economics provide insights for improving outcomes under such scenarios. These insights are illustrated using empirical data from the upper Sacramento River valley.

How to develop user friendly riparian corridor invasive exotic species/habitat restoration master plans - experiences on the San Diego and Otay Rivers. *Brad Burkhart**, BEC/ECORP Consulting, *Mike Kelly*, Kelly & Associates San Diego, CA *bburkhart@ecorpconsulting.com* 619-282-4040

An overview of the development of two master plans to restore riparian habitat along 12-13 mile segments of two major river corridors in San Diego County. Projects included mapping of major invasive exotic species on urban portions of the San Diego and Otay Rivers combined with design of restoration master plans designed to eradicate exotics and restore riparian habitat after invasive eradication. Projects included innovative lowlevel aerial polygon mapping methodologies that allowed for easy translation of weed eradication areas to a range of publicly and privately funded restoration efforts that would be used to fund the plans. Both master plans included calculations of percent cover of each exotic species mapped throughout these typical southern California riparian systems, including giant reed (Arundo donax), pampas grass (*Cortaderia selloana*), palms (*Washingtonia* spp. & *Phoenix canariensis*), broadleaf exotic trees, tamarisk (*Tamarix ramosissima*), lugwigia (*Ludwigia peploides*), and castor bean (*Ricinis communis*). Finally, the San Diego River Project included implementation of a pilot project that allowed for comparison between master plan mapped areas of exotics with actual acreages of exotic eradication found during eradication implementation.

Invasive plants for sale! A survey of nursery professionals. *Jennifer W. Burt*[1]*, *Adrianna A. Muir*[2], *Jonah Piovia-Scott*[2], *Kari E. Veblen*[1], *Andy L. Chang*[3], *Judah D. Grossman*[1], and *Heidi W. Weiskel*[1]. [1]Department of Plant Sciences, University of California, Davis, One Shields Avenue, Davis, CA 95818, [2]Section of Evolution and Ecology, UC Davis, [3]Department of Environmental Science and Policy, UC Davis. * jwburt@ucdavis.edu *(530) 752-1701.*

Many invasive plants in California wildlands originally were introduced for gardening, landscaping, and erosion control. Yet invasive plants continue to be actively imported for these uses. With very little government regulation of horticultural imports of invasive plants, efforts have turned toward voluntary initiatives to encourage self-regulation by the horticulture trade. We conducted a survey of nursery professionals in the S.F. Bay Area to gauge their perceptions of invasive species, the role of the horticulture trade in invasive plant introductions, and their participation—potential and actual—in preventive measures outlined in the St Louis Voluntary Codes of Conduct for nursery professionals. We found nursery professionals to be highly aware of invasive plants and to accept responsibility as a trade for horticultural introductions. Although very few had heard of the St Louis Voluntary Codes of Conduct, the majority reported having participated in at least two of seven preventive measures, and most reported willingness to engage in the majority of preventive measures, including discontinuing sales of known invasive plants. The results of this survey reveal a major obstacle to participation in voluntary initiatives: general and scientific knowledge is not being sufficiently translated from scientists and practitioners to nursery professionals. We provide specific recommendations for improving voluntary prevention efforts in the horticulture trade.

Mock pesticide use monitoring inspection: An interactive skit with Q and A.

Bob Case, Cal-IPC; Chris Christofferson, Plumas National Forest; and *John Knapp, Catalina Island Conservancy*. bobcase@astound.net.

A mock "Pesticide Use Monitoring Inspection", featuring herbicide application errors and appropriate procedures will be presented in the form of a skit. The script of the presentation follows the standard DPR Pesticide Use Monitoring Inspection form. The cast will include a newly licensed rookie applicator, a

seasoned, knowledgeable, diligent applicator and an agricultural biologist from the local Agricultural Commissioner's office (we will use a recently retired Deputy Ag Commissioner for this part). A representative from the San Diego Department of Agriculture will also be present to provide input.

The agricultural biologist/inspector will use form PR-ENF-I04 to perform two simultaneous inspections. The rookie applicator will perform a mock mix/load and a mock application, complete with props. The rookie will make "mistakes" during the entire process. These "mistakes" will be non-compliances and violations noted in DPR's list of violations and other common errors observed by agricultural commissioners' staff throughout the years. The audience will be provided with a copy of the standard form PR-ENF-I04 and will be able to track and respond to questions about the committed errors.

Simultaneously the biologist will be monitoring a mock mix and load and application by the diligent applicator. The diligent applicator will have all the right answers and techniques to do a perfect mix/load and application. The biologist and diligent applicator will interact with the audience and the rookie to improve the rookie's knowledge and technique, leading to a fully compliant and sound application.

Invasive plant control and the California red-legged frog injunction. *David Chang*, Santa Barbara County Agricultural Commissioner's Office. dchang@santa-barbara.co.ca.us

The injunction ordered by the US District Court (Northern District of California) on October 20, 2006 requires the US EPA complete, within 3 years, formal consultations with US FWS on the impacts of 66 pesticides on California red-legged frogs (CRLF); prohibits the interim use of 66 specific pesticides within and adjacent to red-legged frog habitats, specifically designated critical habitat areas, aquatic features and upland habitats occupied by the frog; mandates pesticide-free buffer zones adjoining frog habitats (200 feet for aerial pesticide applications to prevent drift and 60 feet for ground applications to prevent runoff); allows exemptions for public health vector control programs, invasive species and noxious weed programs, and other specific applications that pose little or no risk to frogs; and requires US EPA to distribute an educational brochure for pesticide applicators and county agricultural commissions regarding the red-legged frog, impacts of pesticides and contaminants on frogs generally, and describing the interim restrictions on pesticide use in the settlement.

Regional testing of *Diorhabda 'elongata'* ecotypes for the biocontrol of saltcedar (*Tamarix* spp.) in western US.

Peter Dalin[1]*, *T. Dudley*[1], *D. Thompson*[2], *D. Bean*[3], *B. Cashore*[4], *D. Eberts*[5], *M. Foristet*[6], *D. Kazmer*[7], *J. Michels*[8], *J. Milan*[9] & *C.J. DeLoach*[10]

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The Eurasian saltcedar leaf beetle *Diorhabda elongata* (*sensu lato*) has been introduced into several western states for the biocontrol of saltcedar (*Tamarix* spp.). Establishment was successful at some sites, with heavy defoliation and subsequent mortality of plants observed at sites in northern Nevada. However, at sites south of 37-38° N in latitude, the original form of *D. elongata* (collected in Fukang, China 44.1° N) failed to establish. Incubator studies indicated that failure was because these Fukang beetles responds to declining daylength by entering reproductive diapause too early in the season to successfully overwinter.
The purpose of the present study is to test different ecotypes of *D. elongata*, currently held under quarantine in the US (Fukang, China 44.1° N, Turpan, China 43.5° N, Uzbekistan 38.1° N and Crete, Greece 35.1° N), inside double secure cages in the field at sites in nine states ranging from 35-48° N in latitude; seven of these sites are within California. Our predictions are: I.) The time period when beetles are reproductively active will match the time period when foliage is available at those latitudes that match the beetles latitudes of origin, and 2.) Beetle will have the highest over-wintering survival at matching latitudes. The experiment, which is currently being conducted in 2007, will provide crucial knowledge about how to promote biocontrol of tamarisk over the widespread range of infestations in western US.

The California Rangeland Conservation Coalition.
Kim Delfino, Defenders of Wildlife, Sacramento, CA. kdelfino@defenders.org, 916-313-5800

Building and maintaining winning coalitions is not easy—it is an art and a science. There are key components that must be present for any coalition to be successful over time. This presentation will focus on how to build and maintain coalitions, drawing upon past examples from experiences at the national and state level, and highlight one particular example from California. In 2006, Defenders of Wildlife, along with the California Cattlemen's Association, worked with California ranchers, environmentalists, and agencies to create the California Rangeland Conservation Coalition. This is an unprecedented effort to bring together disparate parties to conserve and enhance private working landscapes and wildlife habitat within the Central Valley, surrounding foothills, and interior coast range. Members of the Coalition mutually recognize the benefit of our unique partnership and the potential to work together to preserve the environment and the ranching.

Non-chemical exotic control in coastal sage scrub restoration at an Audubon preserve. *Sandra DeSimone* *, Audubon California's Starr Ranch Sanctuary, Trabuco Canyon, CA, sdesimone@audubon.org 949-858-0309

Restoration of rare coastal sage scrub habitat at Audubon California's Starr Ranch Sanctuary in southern California commences the second year of non-chemical control of the exotic herbaceous perennial, artichoke thistle (*Cynara cardunculus)*, which has invaded 700 acres of native and degraded grassland stands at the 4000-acre preserve. An effective treatment for artichoke thistle, repeated removal of leafy rosettes, was derived from a series of experiments. After 1 – 2 years per stand, we have reduced artichoke thistle to < 5 percent cover on 365 acres. The second year of thistle control we restore to either needlegrass grassland or coastal sage scrub. Analyses of aerial photoseries taken over 48 years revealed gradual coastal sage scrub colonization of some grassland stands. Thus, we decided to actively restore 250 acres of artichoke thistle-infested sites in which shrub species have begun colonization to scrub. Exotic annual plant species require control during the restoration process. An experiment that investigated non-chemical techniques suggested that flaming and early brush cutting could control exotic annuals while natives established in early stages of restoration. Monitoring of active and passive restoration processes over three years showed 50-60 percent native shrub cover in treatment areas with baseline 0-5 percent native cover and a baseline thistle cover of 40 to 90 percent.

Managing herbaceous perennials in the Tahoe Basin.
Jennifer Erskine-Ogden,* University of California, Davis, Section of Evolution and Ecology, Davis, CA, 95616, jaerskine@ucdavis.edu*, Mark J. Renz,* University of Wisconsin, Madison*, Justin Norsworthy,* New Mexico State University, and Sue Donaldson, University of Nevada Cooperative Extension. jaerskine@ucdavis.edu

Several weedy herbaceous perennial species have recently established within the Tahoe Basin and surrounding areas. While control methods exist for these species, they cannot be implemented in sensitive areas. We compared a new herbicide delivery method that deposits herbicide on the lower side of a stem's cut surface with cutting only and spot spraying. In greenhouse studies we evaluated the effectiveness of several herbicides applied in two different growth stages of perennial pepperweed (PPW) (*Lepidium latifolium*), at the flowerbud and flowering stages. Results showed that applications made to PPW reduced belowground biomass by 79, 82 or 42 % if plants were treated with glyphosate (50 % solution of Roundup[1]), chlorsulfuron (0.282 oz Telar[1]/gallon water) or cut only respectively 45 days after treatment compared to untreated controls. No differences were found between herbicides used, method of application, or phenology of plants. Field studies were also initiated to evaluate the effectiveness of this method on PPW, diffuse knapweed (DKW) (*Centaurea diffusa*) and dalmation toadflax (DT) (*Linaria genistifolia* ssp. *dalmatica*). Excessive rainfall occurred in the winter/spring of 2005 reducing densities 29, 37 and 27 % in untreated treatments for PPW, DKW and DT respectively compared to the previous year. Cover of plants treated with this new method was reduced 76-81, 90-99, and 63-81 % for PPW, DKW and DT respectively. This new method provides land managers with an effective management option for the eradication of establishing infestations of herbaceous perennial weeds in/near sensitive areas.

For more information on this method, please see our University of Nevada Cooperative Extension Special Publication 06-09 at: www.unce.unr.edu/publications/SP06/SP0609.pdf

[1]Brand names are provided for example purposes only. Other brands may also be licensed for use in your area. Information herein is offered with no discrimination. Labels should be adhered to for all herbicides for appropriate use.

New ways to connect: Taking the pulse, eliminating the rumors.

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Public outcry, lawsuits, and project delays have motivated project managers to develop innovative public involvement strategies to build support for resource management efforts. Staff working within the Golden Gate National Recreation Area (GGNRA) have been focused on increasing public engagement for more than a decade, but in the last two years, with the formal integration of Project Information Coordinators (PICs) into large-scale invasive plant control projects, those efforts have become increasingly effective. The use of PICs was tested at six different project sites within the GGNRA. PICs developed messages relevant to particular communities, engaged a broader and more diverse public, and created a mechanism for responding rapidly to community concerns. Over the last two years PICs interacted with more than 6,000 park visitors. Data from those interactions and visitor logs reveal some key lessons and upend hoary planning myths. What did not happen was as important as what did happen. Unlike other resource management projects, projects using PICs generated no negative calls to upper-level park management, the press, or elected officials; public conflict never halted project activities. The subsequent use of PICs in other settings has confirmed the efficacy of active public engagement activities.

Genetic relatedness can limit reproduction in a wind-pollinated grass weed via pollen limitation.

Jeffrey Firestone[1]*, *Marie Jasieniuk*[1]Graduate Group in Ecology & Dept. of Plant Sciences, UC Davis. Firestone@ucdavis.edu (530) 752-8284

Whether during colonization or spread, or following management failure, invasive species may have to survive as small populations on the way to becoming large ones. Conservation biology teaches about processes, such as pollen limitation and inbreeding, that limit reproduction in small populations, but not whether they apply to invasive species. To test whether small population sizes can depress reproduction in invasive weeds through pollen limitation and/or inbreeding, we created 50 independent, small populations of the invasive grass *Lolium multiflorum* from four wild California seed sources.

Our results indicated that populations with more plant biomass (and therefore, pollen) had greater *absolute* seed production, of course, but also greater seed production *per floret*. No effect of increased relatedness on seed production (e.g. classical inbreeding depression) was detected. Interaction between relatedness and population size, however, was significant. The correlation of population size to percent (per floret) seed production was greatest in populations that were most closely related, intermediate with intermediate relatedness, and not significant for those that were nearly unrelated (most diverse). Thus, it appears that the reduced reproduction of individuals in smaller populations is caused by a genetic limitation acting via the pollen limitation. This suggests that introducing new genotypes into a region or population might increase the likelihood of invasion success.

Toward understanding woody plant invasiveness: Phylogenetically independent contrasts of seedling growth traits and of performance under varying drought and nitrogen levels.

Eva Grotkopp, *Jennifer Erskine-Ogden*,* and *Marcel Rejmánek*, University of California, Section of Evolution and Ecology, 1 Shields Avenue, Davis, CA 95616. jaerskine@ucdavis.edu 530-752-1092

Understanding causal factors of invasiveness of some exotic species is important for managers. Previous studies have shown that invasive species have higher seedling relative growth rates (RGR), leaf area ratios (LAR), and specific leaf areas (SLA) than much less-invasive species. We compared the seedling growth traits of invasive exotic woody species with those of phylogenetically related less-invasive exotic woody species commonly cultivated in California (40 species in 13 sets of contrasts). Both LAR and SLA were significantly positively associated with woody plant invasiveness. High seedling RGR, in contrast to previous studies, was only marginally significant. Invasive species are also often thought to opportunistically use available resources and/or to exhibit more uniform performance across different environments. In many places, atmospheric nitrogen deposition adds an important resource to the environment. With climate change, many regions expect increasing drought. Again, using commonly planted exotic horticultural woody angiosperms (19 species forming 8 contrasts), we examined the growth trait responses of invasive species and their related much less-invasive counterparts to two nitrogen levels (low typical California wildland level and high) and to three levels of drought (none, intermediate, and high). Plants were grown from seed at the two nitrogen levels under well-watered conditions for two months and then subjected to the drought treatments for one month. We found that for most traits, invasive species had different responses –behaving opportunistically in some contrasts, while maintaining trait levels across

treatments in others, both, or in some cases, neither strategy.

Beyond the knowledge deficit model: Changing environmental behaviors

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There is ample evidence that certain human behaviors increase the damage caused by invasive plants (gardening with invasive plants) while other behaviors ameliorate it (controlling outlying infestations early). What will lead to changes in human behavior such that there is less of the former and more of the latter? Social science researchers, particularly those working in the fields of public health and cognitive psychology, have learned hard-won lessons about what works and what doesn't. Addressing knowledge deficits—informing people that some garden plants can become invasive in wildland situations—is seldom enough. (Just ask any smoker.) So what works? A combination of factors, often involving effective communication, appropriate incentives, and efforts to shift social norms. This presentation reviews findings relevant to invasive plant managers from widely dispersed literatures in conservation psychology, community-based social marketing, environmental education, public health, behavioral economics, and other social science disciplines.

Evaluation of control efficacy and potential off-target effects resulting from herbicide treatment of invasive fig trees (*Ficus carica*).

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The aggressive spread of invasive plants into wildlands has caused triclopyr to become one of the most commonly used herbicides in natural areas. Restoration activities often utilize basal bark applications of triclopyr, since this method allows treatment of individual invasive plants within a community of natives. Although triclopyrs use as a foliar-spray in coniferous forests has been studied extensively, very little research has been done on basal bark applications. Basal bark treatments require the use of concentrated herbicide solutions and, when applied to invasives with high stem densities, may result in the application of large quantities of herbicide for a given area. We treated groves of invasive fig trees (*Ficus carica*) with a basal bark application of 25% triclopyr (Garlon® 4) and 75% carrier oil (Hasten®). We compared this standard application with limited basal bark triclopyr treatments (less than 40% stems treated) as well as foliar-sprays of triclopyr and glyphosate, but only the standard basal bark treatments successfully controlled figs. We then analyzed triclopyr soil residues in fig groves treated with standard basal bark applications and monitored for off-target effects on native plants transplanted into these groves. Although the high stem densities typical of invasive figs created herbicide application rates that were up to ten times higher than typical foliar-spray rates, we found very low triclopyr soil residues in treated groves and mortality of native transplants was nonsignificant. We conclude that, when applied carefully, basal bark treatments of triclopyr can effectively control invasive fig trees with minimal off-target effects.

Assessing non-target vegetation response in the wake of perennial pepperweed (*Lepidium latifolium*) eradication at the Cosumnes River Preserve.

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Perennial pepperweed (*Lepidium latifolium*) is identified as one of the major threats to successful restoration of riparian and grassland habitats at the Cosumnes River Preserve. In order to effectively manage pepperweed and associated habitats, we eradicated pepperweed in three meter by three meter plots. We then assessed the response of non-target vegetation prior to treatment and for two years post-treatment. Following treatment by mowing, plots were treated with either Telar® or Rodeo® herbicides at four sites to assess which herbicide had the smallest impact on plant communities in restored riparian and grassland communities. Initial analyses show that both herbicide treatments were successful at eradicating pepperweed, but that plots treated with Rodeo® were more diverse and contained more native species than plots treated with Telar®. Plots in riparian plant communities surveyed one year post-treatment are more diverse and contain a higher composition of native species. Data collected from seed bank trials indicate soil collected from riparian communities at the Cosumnes River Preserve include more species in the seed bank and a higher proportion of natives than soil collected from grasslands. These results will enable managers at the Cosumnes River Preserve to make informed decisions about future eradication efforts.

Spraying over the top of *Ambrosia pumila*, a federally listed species, to control invasive weeds.
Mike Kelly[1]*, *Cindy Burrascano*[2], and *Melanie Johnson Rocks*[3], [1]Kelly & Assoc., San Diego, CA, [2]San Diego, CA, [3]City of San Diego Multiple Species Conservation Program, San Diego, CA, mkellysd@aol.com 858-342-8856

Kelly & Associates, with the City of San Diego's Multiple Species Conservation Program, tested a grass specific herbicide, Fusilade II *(fluazifop-P-butyl)*, over the top of San Diego Ambrosia *(Ambrosia pumila),* a federally listed species in the ragweed family. Is it possible to control invasive grasses that threaten this rare species without harming the rare plant itself. The experiment was done in three phases. Phase I was a backyard test with 35 potted *Ambrosias*. Fusilade II was tested at three strength levels, all with and without surfactant, with an untreated control population, for a total of 35 plants. The spray-to-wet experiment appeared to have no negative impact on the sprayed plants. Phase II involved field spraying Fusilade II on several native cohort species that might occur with the *Ambrosia*, including *Nassella pulcra*, a perennial bunch grass. Phase III involved spraying Fusilade II on 5 plots of a natural population in Mission Trails Region Park; all five were paired with a control plot that received no spraying. Prior to spraying a stem count was done for the Ambrosia in all plots. Fusilade II was sprayed to wet over 100% of each treatment plot, including the *Ambrosia*, several invasive grasses, and *Erodium*. Monitoring results showed no apparent negative impact to the *Ambrosia*, with plants appearing robust in treated and untreated plots, and stem counts up in both. All but one invasive grass species was killed in treatment plots, while flourishing in untreated plots. *Erodium* spp., a broadleaf invasive, was killed in treatment plots, an unexpected "bonus." Fusilade II can now be added to the "tool box" of methods for controlling weeds threatening this rare plant.

Why walk when you can fly: Systematic aerial weed survey of Santa Cruz Island, California.
John Knapp[1]*, *Kelvin Walker*[2], *Rachel Wolstenholme*[3], *and Coleen Cory*[3]. [1]Native Range Research and Management, [2]Prohunt, and [3]The Nature Conservancy, *Avalon, CA. bearflagnative@hotmail.com (310) 510-2821

Land managers are often faced with making critical weed management decisions based on limited knowledge of weed distribution and abundance. As a result, limited resources may be directed towards low priority weed control activities. A comprehensive weed map is essential for prioritizing work. Weed mapping via remote sensing and aerial photograph interpretation are expensive and do not allow for detection of incipient or small-scale populations, while ground mapping is time-intensive and impractical in extremely rugged terrain. In 2007, The Nature Conservancy (TNC) contracted Prohunt Incorporated to complete an island-wide survey of 55 weed species on Santa Cruz Island, a 96 mi^2 island jointly owned and managed by TNC and the National Park Service. This survey differed from other weed surveys in that the entire landscape was scanned in person and mapped with a hand-held global positioning system, yet was completed in only 41 days. Approximately 88% was conducted from a two-person helicopter, traveling at an altitude of 5-30 feet above the ground. The remaining 12% was conducted on the ground by two or more mappers walking parallel to each other along drainages and valley floors to ensure maximum species detection. Aerial surveys used in concert with ground surveys can be a fast and accurate way to effectively map multiple species over entire landscapes while minimizing weed dispersal and damage to native vegetation. Aerial surveys have been developed into an effective tool for early detection, and have great potential for rapid response.

Physiological and morphological responses of pampas grass (*Cortaderia selloana*) to variations in water table and soil nitrogen content.
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Cortaderia selloana, or pampas grass, is a common ornamental throughout California that has escaped and has become invasive in coastal shrubland and riparian ecosystems. The purpose of this study was to determine how the growth and physiology of *C. selloana* respond to various combinations of soil nitrogen and water table depth. Growth factors examined included biomass production and shrub (height and width) and leaf morphology (specific leaf area, SLA). Physiological factors examined included water use, photosynthesis, and tissue nitrogen and phosphorous contents. These response variables were examined in a manipulative experiment using a 2 x 3 random factoral design with two water table and three nitrogen levels. Water, nitrogen and the interaction between the two were found to have a significant influence on many of the growth and physiological factors of *C. selloana*. Specifically, added nitrogen caused significant increases in biomass and tiller production, plant height and width, and water use. By examining which plant response factors are enhanced by the various combinations of water and nitrogen treatments, we hope to gain insight into the invasive

nature and success of *C. selloana* in coastal shrubland and riparian systems.

Use of herbicides near threatened and endangered species' habitats.

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California is second to Hawaii as the state with the highest number of threatened and endangered species. The Department of Pesticide Regulation (DPR) helps to protect those listed species by working with stakeholders (county agricultural commissioners, farmers, commercial applicators, wildlife agencies, and others) in the development and implementation of pesticide use limitations that take into consideration both the needs of the species and pesticide applicators. DPR's pesticide use limitations are methods of application, restrictions, or prohibitions that apply to any given active ingredient being considered for use in proximity to endangered species' habitat. Most use limitations are avoidance measures to keep active ingredients out of the species habitat. In order to assist pesticide applicators with the identification of endangered species and their habitats, as well as any applicable pesticide use limitations, DPR has developed an online database program called PRESCRIBE that tells pest control professionals where endangered species occur, what pesticides pose risks to listed species and how to avoid those risks.

The effects of *Puccinia jaceae* on yellow starthistle competition and growth.

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A new bio-control rust, *Puccinia jaceae* var. *solstitialis,* was introduced to control yellow starthistle (*Centaurea solstitialis*) in 2003. To test the effects of the rust on the weed under field conditions, we are performing two experiments. The objective of the first experiment is to examine the effects of the pathogen on the above ground biomass production of yellow starthistle (YST). As part of this experiment, we are also evaluating the effect of the rust on the competitive ability of YST with the common rangeland annual grass wild oat (*Avena fatua*). The objective of the second experiment is to test the interaction of the rust with two common insect bio-control agents (*Eustenopus villosus* and *Chaetorellia succinea*). In both experiments, infection rates were monitored and recorded over the field season, and chlorophyll rates, seedhead production, and vegetative biomass were measured. Insect attack rates are also being determined on a subset of seedheads. Unexpectedly, we found the rust spread rapidly in the first season after inoculation. Initial regression analyses suggest that the rust may not have an effect on the overall biomass or seedhead production of YST under optimal conditions. There is potentially a negative correlation between increased rust infection, and total leaf chlorophyll levels. Initial relative crowding coefficient values indicated that the rust decreased the competitive ability of yellow starthistle with wild oat by about 60%. We are currently repeating the experiment in a second field season and will report on our findings at the conference.

The California Horticultural Invasives Prevention (Cal-HIP) partnership and the PlantRight campaign.

*Betsy Peterson**, California Seed Association, and *Terri Kempton*, Sustainable Conservation. tkempton@suscon.org.

Many government and environmental groups have made headway removing invasive plants once they've taken root, but what if we could prevent invasions before they start? The horticultural industry is starting to answer that very question. The California Horticultural Invasives Prevention (Cal-HIP) partnership is a collaborative effort to prevent garden and landscaping plants from invading California's natural wildlands. Nurseries, landscapers, wholesalers, retailers, scientists, environmental groups and governmental agencies have joined forces to find voluntary solutions to the invasive plant problem – solutions that can protect the environment and strengthen the gardening community. Cal-HIP is creating tailor-made solutions through a transparent, participatory process.

By working together, the project partners are finding practical ways that gardeners and the industry can make the transition from invasive plants to non-invasive alternatives. The first step was to identify when and where certain nursery and landscaping plants cause environmental problems, basing our assessments on the Cal-IPC Inventory process. The group has developed a powerful outreach campaign called PlantRight to educate professionals about the problem of invasive plants and the non-invasive plants they can feature in their place. In early 2008, the PlantRight campaign will open up to the public so that home gardeners can participate in protecting California wildlands from horticultural invasive plants.

Betsy Peterson, a Cal-HIP Steering Committee member and representative from the California Seed

Association, will give an update on the progress of this powerful collaboration and share ways that the Cal-IPC community can play an important role in the project. She will also introduce the breakout session "Bootcamp for working with nurseries" that will provide hands-on training for interacting with horticultural businesses in a positive, effective way. For more information on Cal-HIP, please visit the Sustainable Conservation website at www.suscon.org/invasives/index.asp.

Interloper's legacy: Invasive, hybrid-derived California wild radish (*Raphanus sativus*) evolves to outperform its immigrant parents. *Caroline E. Ridley*[1]* and *Norman C. Ellstrand*[1,2], [1]Department of Botany and Plant Sciences, University of California, Riverside, CA, [2]Center for Conservation Biology, University of California, Riverside, CA. caroline.ridley@email.ucr.edu 951-827-5009

Hybridization between species and subspecies may lead to the evolution of invasive weeds by enhancing survival and reproduction in hybrid-derived lineages. California wild radish (*Raphanus sativus* × *Raphanus raphanistrum*) is a hybrid-derived species that has spread prolifically within the last 150 years, replacing all pure parental populations throughout California. Though highly plausible, a link between hybridization and invasiveness in California wild radish has never been empirically tested. In field experiments, we compared the survival and reproduction of several populations of California wild radish with that of populations of its pure parents in multiple years and varied environments. California wild radish has high survivorship and generally produces more pods per plant, more seeds per pod and more seeds per plant than either of its progenitors. In year one in Riverside, CA, it produced 3-times more seeds per plant than *R. raphanistrum* and *R. sativus*. In Irvine, CA, reproduction was higher overall and California wild radish produced 2-times and 20-times more seeds per plant than *R. raphanistrum* and *R. sativus*, respectively. Individual populations of California wild radish also display a strong genotype-by-environment interaction, indicating genetic diversity may be partly responsible for the weed's ability to invade California's vast and varied landscape. Our results demonstrate that by limiting the introduction and subsequent hybridization of congeners, we may be able to prevent the evolution of new invasive lineages.

Artichoke thistle (*Cynara cardunculus*) control efforts and community recovery in historic southern California rangeland. *Margaret Royall*[1]*, *Michelle Murdock*[1], *Trish Smith*[2], *and Katharine Suding*[1], [1]Department of Ecology and Evolutionary Biology, University of California at Irvine, Irvine, CA. [2]The Nature Conservancy, Newport Beach, CA. *ksuding@uci.edu (949)824-7495.

Artichoke Thistle (*Cynara cardunculus*; CYCA), a deep-rooted perennial thistle, is an extremely problematic invader of disturbed grasslands in southern California. It has invaded large areas (over 4,000 acres) of the Nature Reserve of Orange County (NROC). The NROC, working with The Nature Conservancy (TNC), instated control program for CYCA involving direct application of herbicide to individual plants. Thousands of acres have been treated annually since 1994. We resurveyed 102 areas initially surveyed in 1998, to ask whether CYCA has declined due to these control efforts, and if so, what is replacing CYCA. Specifically, we were interested in whether passive restoration of native perennial grasses (e.g., *Nassella pulchra*, NAPU) was occurring or if other problematic exotics (such as *Brassica nigra*, BRNI) were replacing CYCA. Since 1988, CYCA cover has decreased from a mean cover of over 50% to cover less that 5%. CYCA cover remained highest on sites high in clay content. Over this period, BRNI cover moderately increased (8%), but mostly in sites where CYCA cover remains high, and does not appear to replacing CYCA removed by the control effort. Natives, and particularly NAPU, did not appear to be affected, either positively or negatively, by the cover of CYCA. These results inform the future control program and restoration decision-making, suggesting that sites high in clay with few established natives may require more active restoration efforts.

Evaluation of the rosette weevil, *Ceratapion basicorne*, a new biological control agent of yellow starthistle. *Lincoln Smith*[1]*, *Massimo Cristofaro*[2], *Carlo Tronci*[3] and *Rustem Hayat*[4], [1]USDA-ARS, Albany, CA 94710, [2]ENEA C.R. Casaccia, Rome, Italy, [3]Biotechnology and Biological Control Agency, Rome, Italy, [4]Ataturk University, Erzurum, Turkey. lsmith@pw.usda.gov 510-559-6185.

Ceratapion basicorne (Coleoptera: Apionidae) is a weevil native to Eurasia whose larvae develop in root-crowns of yellow starthistle. This insect was "rejected" as a prospective biological control agent about 15 years ago after preliminary evaluation of its host plant specificity showed that it could develop on safflower. However, the insect is known to attack very few plant species

in the field and has never been reported from safflower. We conducted a series of no-choice, choice and field experiments to measure the risk that this insect would pose to nontarget plants. Larval development occurred on nine plant species, including safflower and bachelor's button (*Centaurea cyanus*). All these host plants are within a small monophyletic clade within the subtribe Centaureinae. Three years of field studies conducted in eastern Turkey, at three sites with natural populations of the insect, demonstrated that the weevil does not damage safflower plants despite attack rates of 48-98% on yellow starthistle. The insect does not attack any native North American plants. We have requested permission to release this insect as a biological control agent of yellow starthistle.

Developing early detection networks to abate the invasive species threat.

Tania Siemens[1] and *Mandy Tu*[2]*, [1]The Nature Conservancy in Oregon, Portland, OR, [2]The Nature Conservancy's Global Invasive Species Initiative, Portland, OR. imtu@tnc.org 503-802-8150

Prevention and EDRR (early detection & rapid response) practices are the most effective strategies for managing the invasive species threat over the long-term and at large-scales. When new invasive species are immediately detected and identified, and rapid responses are taken to contain and eradicate those new infestations, environmental and economic damages and subsequent impacts can be significantly mitigated. In this presentation, two different models of an EDRR program will be presented, demonstrating how an EDRR program can be constructed and implemented at both the site and at larger state/regional scales. We then detail how we have created several local site-based EDRR networks with local CWMA partners in Oregon using volunteers, citizen scientists and staff. The goal of this presentation is to enable and to motivate practitioners to create and implement their own EDRR program.

Public policy and advocacy issues for the dedicated weed worker!

Mandy Tu[1] *and Doug Johnson*[2], [1]The Nature Conservancy, [2]Cal-IPC. imtu@tnc.org 503-802-8150

Doug Johnson (Cal-IPC) and Mandy Tu (TNC) will give a brief overview of how public policy may ultimately affect your work on the prevention and management of weeds, why you should be interested in what is happening at the state and national scales, what Cal-IPC is doing, and what you can do to advocate for better funding and integrated management plans!

Distributional patterns of perennial pepperweed (*Lepidium latifolium*) in the San Francisco Bay, a CalFed project.

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Perennial pepperweed (*Lepidium latifolium*), is an aggressive invasive plant species in the San Francisco Bay Delta. Under the CALFED Ecosystem Restoration Program, Environmental Science Associates (ESA) addressed two questions: what is the extent of the perennial pepperweed invasion within the San Francisco Bay? Can its distribution be explained and predicted using environmental variables? Perennial pepperweed was mapped along the shoreline of the San Francisco Bay using GPS. Spatial relationships between its distribution and environmental variables were tested using binomial logistic regression. Habitat, tidal regime, elevation, distance to water, distance to roads, distance to levees and distance to agriculture were all considered in the analysis. Resulting predictive models were mapped using GIS and high risk areas in the San Francisco Bay were identified. Perennial pepperweed was found to occur within marsh habitats, with full tidal action, near open water. This study demonstrated that habitat variables from widely available GIS layers can be used to predict distribution patterns for perennial pepperweed. Distribution maps created in the study will serve as a baseline for future monitoring and control efforts, and will be publicly available on CDFG's BIOS Project. Prediction maps outside of mapped areas will assist in identifying high risk wetland habitat areas and increase the efficiency of management efforts.

Gray leaf spot of kikuyugrass: An invasive pest of an invasive pest.

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Pyricularia grisea is a fungal pathogen that affects a diverse range of graminaceous hosts, causing gray leaf spot of turf and blast of rice. It was recently discovered in California in 2001 on perennial ryegrass and 1997 on rice, causing significant economic damage on both crops. Kikyuygrass (*Pennisetum clandestinum*) is a noxious weed that was introduced into California in 1918 and is widespread in the southern and central coast of the state and is often managed as the primary turf species in landscapes, parks, sports fields and golf courses. In 2003, *P. grisea* was found to be causing a

new disease of kikuyugrass in multiple locations throughout California. Genetic analyses indicated that these populations are different from those that infect perennial ryegrass or rice. Both mating type idiomorphs, lacking in U.S. rice and ryegrass populations were also found, suggesting that kikuyugrass populations are capable of sexual reproduction. These results indicate that this is a novel population of *P. grisea* in the U.S. of unknown origin. The management of this pathogen is complicated by the emergence of fungicide-resistant populations and the lack of commercially available disease-resistant kikuyugrass varieties. Best management practices for the sustainable control of this pathogen in turfgrass are being developed and the utility of *P. grisea* as a biocontrol of kikuyugrass is unknown at this time.

Measuring roots, in situ, of two late summer perennial plant species, *Elymus glaucus* and *Grindelia camporum*, and an invasive annual species, *Centaurea solstitialis*.

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Roots of late summer plant species penetrate deep into the soil for acquisition of available resources. Root growth may allow *Elymus glaucus* and another native perennial, *Grindelia camporum*, to inhibit *Centaurea solstitialis* establishment in restored native communities. In 2006, field studies were conducted near Davis, California to determine root growth, activity and soil moisture use of *E. glaucus*, *G. camporum* and *C. solstitialis*. For *E. glaucus* and *C. solstitialis*, a maximum of 0.88 and 0.75 roots/cm^2 occurred at 30 cm on April 19 and 27, respectively, while the maximum number of roots (0.60 roots/cm^2) for *G. camporum* occurred on June 21 at 120 cm. After flowering of *C. solstitialis*, total roots declined to less than 0.16 roots/cm^2. During the same period, maximum *E. glaucus* roots at 180 cm reached 0.40 roots/cm^2 and the number of roots for *G. camporum* was 0.30 roots/cm^2. Soil moisture for all species was 100% of bare ground control on April 27. By July 5 or flowering for *C. solstitialis*, soil moisture was $\leq$ 50% of bare ground control for *C. solstitialis* and *G. camporum*, but $\geq$ 50% for *E. glaucus*. By October 31, soil water content at 180 cm for *C. solstitialis*, *G. camporum* and *E. glaucus* was 42, 48 and 74%, respectively, of the bare ground control. Growth and moisture use of *C. solstitialis* and *G. camporum* roots during late spring was similar, while *E. glaucus* roots were less active at depths $\geq$ 120 cm.

Poster Abstracts

Alphabetical by first author (* = presenter).

The Salmon River experience: Tools of the trade

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Over the last 12 years the Salmon River Restoration Council (SRRC) and its partners have developed an unusually effective model using a well-stocked Tool Kit for controlling several priority invasive plant species at a watershed scale in the Salmon River (approximately ½ million acres). Through its Salmon River Cooperative Noxious Weed Program (CNWP), the SRRC has developed an adaptive approach that includes some basic guiding principles and 13 Steps to attain effectiveness. The guiding principles that our community and partners have rallied around include: Early Detection, Rapid Response, Thorough and Persistent Management, and the Use of the Appropriate Tools. We are currently controlling 12 targeted species of noxious weeds and are having a high level of effectiveness with our signature species being Spotted Knapweed which we have reduced by over 98% at more than 250 sites throughout the Salmon River wildland watershed. The SRRC has found that there are certain tools that are most appropriate to effectively manage different species in varying habitats. The SRRC tools are used for digging, mulching, burning, cutting, pulling, bagging and mashing the targeted plants. Members of our local community have been fabricating a line of tools, including the "Super L" digging bar, that are used by the SRRC paid and volunteer crews, Drivers That Care, and Adopt An Area programs.

Trials on chemical control of periwinkle (*Vinca major*) and Cape ivy (*Delairea odorata*)

Casey Burns[1] and Stevie Adams[2] ; [1] USDA Natural Resources Conservation Service (NRCS), Somis, CA; [2]Ojai Valley Land Conservancy, Ojai, CA; *Presented by Shea O'Keefe, NRCS, Escondido, CA (Authors not present). Shea.okeefe@ca.usda.gov (760) 745-2061 x104

There is little quantitative research data, especially within native vegetation communities, on the effectiveness of different herbicides on invasive periwinkle (vinca) (Vinca major) and cape ivy (Delairea odorata) when applied to large infested areas. The most frequently used method for vinca removal has anecdotally been reported as foliar herbicide treatment of resprouts following mowing/mastication typically with weed wackers or weed whips, and for cape ivy as foliar herbicide application to intact biomass. The goals of this study were to determine the most effective method for concurrent removal of both invasive species, 1) from large areas (> 5 acres) where methods used for removal of smaller patches may not be effective or possible, and 2) with limited impact to surrounding native vegetation. The study took place on 14 acres of rare riparian/floodplain forest on the lower Ventura River in Ventura County, California. Dense growth of vinca may be preventing recruitment of native tree and shrub species.

Treatment plots were configured with three replicates of five different herbicide treatments to create a total of 15 plots. Each plot was 30 x 30 feet in size, but only a concentric interior plot of 20 x 20 feet was sampled. This established a five-foot buffer on all sides from adjacent treatment areas. Vegetation within each plot was surveyed using the line-intercept method. Within each replicate, herbicide treatments were randomly assigned to a plot using glyphosate, triclopyr, glyphosate and triclopyr, imazapyr, and control (no herbicide). Initial biomass removal was accomplished by mowing 11 acres of riparian forest understory using a fixed tooth mower. Efforts were made to avoid native plant species and minimize soil disturbance. Plots were sampled eight weeks after mowing then treated with the assigned herbicide at application concentrations determined by a Pest Control Advisor (PCA). Only the targeted invasive species were treated. Plots were surveyed again three and nine weeks after the initial herbicide application. This poster will summarize preliminary analyses of the effects of different treatments to vinca, cape ivy, and other vegetation.

Wildly successful restoration & mitigation: A contractors perspective

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Natures Image specializes and focuses its work on restoring native habitats throughout the West. During the past 10 years the company has evolved to be a leading contractor and chosen partner for both public and private entities for their habitat restoration and mitigation needs. Given our breadth and depth of experience, what we would like to highlight here are three factors critical to wildly successful habitat restoration and mitigation. When these tools are used with discipline they have resulted in all stakeholders meeting and in some cases exceeding their restoration goals. The first factor, an in-depth understanding of all of the stakeholders, is pivotal and assists the contractor

in defining the best installation approach. A second critical factor is having a voice during the planning process. We propose bringing in Natures Image during the initial planning process. Our expertise assists both the owner and biologists in reaching the best possible outcome. Third, communication during all phases of the project ensures that all parties are reaching milestones that are agreed upon and outlined at the outset. Last, we will profile two case studies that demonstrate the results of utilizing these important tools. One highlights an installation of 120 acres of coastal sage shrub that has resulted in documentation of the California gnatcatcher within one year. The other highlights removal of several acres of dense *Arundo donax* in difficult terrain.

Native plant restoration along highway rights-of-way in California

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The establishment of native perennial grasses along highway rights-of-way provides benefits of reduced weed infestations and herbicide use and increased sediment control and plant species diversity. Cultural and chemical management techniques are necessary to improve establishment success of native perennial grasses in the first two to five years after planting. Field studies were conducted along two roadway environments in northern California to determine the effect of 1) burning, spraying, cultivating and species selection on the establishment of native perennial grasses and persistence of non-native annual vegetation and 2) mowing, burning or spraying alone and in combination on an existing stand of native perennial grasses with dense populations of non-native annual species, particularly yellow starthistle. In the Interstate 5 highway median, burning and spraying had the most significant effect on native grass establishment and reducing non-native vegetation persistence. Cultivation and species selection (wet or dry site seed mix) had no significant effect on native perennial grass establishment or annual weed persistence at this site. Along State Route 20 in Colusa County, native perennial grass stands that were overrun with non-native annual species, particularly yellow starthistle, were effectively treated with a combination of well-timed vegetation control techniques.

Coyote Creek floodplain reclamation project: Re-establishing native plant habitat

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The Santa Clara Valley Water District's (SCVWD) Vegetation Management Unit is conducting a three-year project to remove non-native invasive vegetation throughout Coyote Creek Floodplain located in Milpitas, CA. The floodplain consists of 6 acres located along Coyote Creek. As of 2003 95% was infested with non-native invasive vegetation, mainly *Lepidium latifolium*, *Conium maculatum*, and *Brassica nigra*. During Year 1 (2004) all non-native invasive vegetation was mechanically and chemically controlled. Approximately .185 acres was planted with native herbaceous vegetation. During Year 2 (2005) an additional .122 acres were planted for a total of .307 acres. Plantings were installed in polygon clusters, mulched with compost, and watered by hand on a monthly basis for 2 years throughout the growing season. In Year 3 (2006) it was found that approximately 3.615 acres were vegetated with native plants equaling a 1000% increase in native vegetation and 60% native cover. The increase in native cover has led to a decrease in maintenance and herbicide costs. Costs in Year 1 totaled $83,572.47. Year 2 costs totaled $46,682.36. In Year 3, costs dropped to $41,852.63. This year, (Year 4) costs dropped significantly to $28,540.50. This is a savings of $55,031.97 in costs since the beginning of our project. Although we faced many challenges in establishing Coyote Floodplain with native vegetation our project proved successful by creating native plant habitat and allowing us to conserve resources that we can now use toward other projects.

Managing coastal sand dunes on Camp Pendleton

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Camp Pendleton has approximately 17 miles of relatively undeveloped coastline, including rare Southern California coastal dune habitat. To help counter-act non-native invasive plant species (NIS) spread, Marine Corps Base Camp Pendleton began management practices in 1994 designed to improve nesting habitat for California Least Tern (*Sterna antillarum brownii*) and improve the dune system. NIS control and native vegetation surveys have been implemented. A vegetation monitoring protocol was started to gauge vegetation changes during the ongoing

management period. Here vegetation management methods and monitoring results are summarized.

GeoWeed: A new weed data management tool

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GeoWeed is a data collection and management tool for the invasive plant project manager. The system provides for recording location and status data for plant populations, monitoring the populations over time, and tracking treatments and management activities. GeoWeed consists of a desktop MicroSoft Access database coupled with a customized ArcPad application for field use with a handheld computer and GPS. Data attributes are linked with geographic point and polygon data and photographs. The application is based on the features of other mapping programs combined with many new innovations, including:

- Enhanced data integrity and safety
- Clarified, refined, and new data elements
- Intuitive user interface with many new features
- Web-based reports
- Basic data aggregation
- Data quality checks and diagnostics

GeoWeed has been developed by Sonoma Ecology Center with funding, input, and help from California Bay Delta Authority, The Nature Conservancy, U.C. Davis Information Center for the Environment, and the Golden Gate National Parks Conservancy, and is currently in use by Team Arundo del Norte partners and the Golden Gate National Parks Conservancy. Future plans for the project include instant on-board maps, photo management utilities, and enhanced data aggregation facilities. GeoWeed is free software shared under the GNU General Public License. http://GeoWeed.org.

A look at California Department of Food and Agriculture's pest exclusion branch noxious weed policies

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The mission of the California Department of Food and Agriculture's Pest Exclusion Branch is to keep exotic environmental pests out of the state and to prevent or limit the spread of newly discovered pest within the state. Working under the Action-Oriented Pest Rating System the California Department of Food and Agriculture provides guidance to county and state agricultural inspectors on regulatory actions to take when a plant pest is detected. Under the system, plant pests are assigned a rating (A, B, C, D, or Q). The rating designates the recommended regulatory action, ranging from eradication and containment to release at the discretion of the county agricultural commissioner. Noxious weeds and weed seeds can be found contaminating shipments such as containerized nursery stock, aquatic plants, baled hay, and seeds for propagation. California Department of Food and Agriculture biologists and county inspectors work together within California's Pest Prevention System to enforce laws and regulations that are intended to exclude destroy, treat or otherwise mitigate the pest risk associated with noxious weeds.

Tributaries to the Upper Santa Clara River, Los Angeles

Elihu Gevirtz, Jennifer Jackson, and *Nadine Martins*. Condor Environmental Planning Services, Inc. Prepared For Amec Earth and Environmental, Inc., and The Ventura County Resource Conservation District. Elihu@condorenvironmental.com, 805-898-2000.

Condor Environmental Planning Services, Inc. (Condor) mapped the vegetation and the locations of Arundo (*Arundo donax*) and Tamarisk (*Tamarix ramosissima*) within the 500-year floodplains of the tributaries to the upper Santa Clara River. The surveyed area encompasses more than 10,600 acres within the area stretching 32 miles from west to east, roughly from west of Interstate 5 to Highway 14. The work was conducted for the Ventura County Resource Conservation District and Amec Earth and Environmental. The District is leading a joint-agency effort titled "The Santa Clara Arundo and Tamarisk Removal Project". The objective of the project was to map Arundo and Tamarisk and the vegetation in the Santa Clara River and its tributaries in northern Los Angeles County and northeastern Ventura County. This information will help the agencies plan the weed eradication efforts.

Condor identified and recorded the types of vegetation to the series and (in some cases) association levels within the floodplains of the tributaries, recorded the locations of *Arundo* and Tamarisk infestations in the GIS, and prepared detailed maps and a Geographic Information System (GIS).

Condor surveyed and collected data in 68 drainages (14 principal tributaries to the Santa Clara River, 35 secondary tributaries, and 19 tertiary tributaries), having a combined total linear distance of approximately 181 miles. A total of 148 data collection points were established and 24 vegetation series were observed. Arundo and/or Tamarisk were found in 10 of

the 14 principal tributaries. A total of 43 vegetation maps were created to illustrate the results of the surveys. The report includes species lists for each of the drainages.
These maps will guide the agencies charged with removal of these infestations toward Arundo and Tamarisk locations, and to the locations of sensitive habitat, and sensitive species. Having these locations recorded in the GIS will allow future researchers to return to these exact locations to monitor success of the weed removal efforts.

Biological soil crusts and the effects of their disturbance on the germination of exotic vascular plants in coastal sage scrub

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Invasion by nonnative species is shifting the composition of coastal sage scrub (CSS) plant communities in southern California from native perennial shrubland to exotic annual grassland. Disturbance of the soil, and especially, biological soil crusts (BSCs), is known to increase germination of exotic plants. These crusts, which are a fragile aggregation of cyanobacteria, fungi, green algae, lichen and moss, occupy the soil surface, and perform primary and secondary ecosystem functions in all high and low abiotic stress systems, respectively. Using field and greenhouse experiments, I will test the hypothesis that disturbance of BSCs increases the germination of exotic plants in CSS. In the field, paired plots were disturbed and mean germination of native and exotic plants were compared to control plots containing intact BSC (n =21). In the greenhouse experiment, BSC cores will be extracted from the field, potted, and treated (disturbed or intact). Seeds of native and exotic plants will be disseminated over the BSC cores and watered to determine time to germination and percent germination (n=10). In the field, results to date show that disturbance of BSCs alters CSS community composition by increasing exotic plant members. In the greenhouse, I expect exotic species to show higher percent germination in disturbed BSC cores than in intact BSC cores. Additionally, I expect native species to have lower percent germination in disturbed BSC cores. Results will assist land managers to better manage and preserve CSS communities by including BSC as an ecological factor of exotic plant invasions and a component of overall ecosystem health.

Controlling giant reed (*Arundo donax*) within the Tijuana River Valley

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EcoSystems Restoration Associates (ERA), in cooperation with Southwest Wetlands Interpretive Association (SWIA), has been conducting chemical and physical control of giant reed (*Arundo donax*) as well as habitat restoration throughout the Tijuana River Valley Regional Complex for the last three years. In the Tijuana River Valley, giant reed occurs in a patchy distribution in comparison to the large, dense stands that are more typical in San Diego County. Since the habitat surrounding infestation areas was primarily composed of riparian woodland, riparian scrub, and open water, project specifications required that ERA avoid substantial impacts to sensitive biological resources such as the federally listed least Bell's vireo, while cost-effectively controlling this highly invasive species. This created a challenging situation to systematically eradicate the giant reed. The control techniques utilized included foliar treatment on intact and trampled stands of giant reed, as well as cut-stump treatment. The foliar herbicide treatments included the application of 4%, 6%, and 7.5% glyphosate over a three-year period. The most effective means of control was achieved thorough foliar application of 7.5% glyphosate, which resulted in complete eradication within four weeks. The 4% and 6% glyphosate application rates resulted in approximately 60-80% suppression of the stands. The cut-stump treatment was overall unsuccessful with nearly 100% re-growth, although these results varied by year. From a cost perspective, using a 7.5% treatment was equivalent to using the cut-stump method. The results ran contrary to original beliefs, but confirmation from the third year of experimentation showed that the cost benefit and effective means were maintained by the using 7.5% application rates. To date, ERA has sprayed invasive giant reed from approximately 900-acres of riparian habitat within the Tijuana River Valley.

Restoring San Francisco's tidal marshes: The demise of invasive *Spartina*

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Eradication of invasive *Spartina* from the San Francisco Estuary is well underway following up to four years of treatment coordinated by the San Francisco Estuary Invasive Spartina Project. The ISP Monitoring Program has been documenting the extent of invasive Spartina throughout the estuary since 2001, using GPS, aerial photo interpretation, and photo point monitoring. We are finding that at most sites, two years of treatment using the herbicide imazapyr results in a very significant reduction of *Spartina* stands, leaving only sparse patches requiring follow-up treatment. Dominant marsh vegetation, including pickleweed, appears to recover quickly. Here we present successes and challenges evidenced by recent monitoring results at selected sites being treated by the ISP Control Program.

Applied ecology of Eurasian watermilfoil (*Myriophyllum spicatum* L.) in Fall River.

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The Fall River in Shasta County, CA is a host to the exotic weed Eurasian watermilfoil (*Myriophyllum spicatum*). In 2003, the aquatic weed infestation resulted in decreased flow rates leading to a broken levee and the flooding of 3000 acres of grazing land. $200,000 was spent on plant harvesting downstream to restore flow to the river. In addition, the species is a hindrance for the local trout fishery and downstream power generation. We are mapping its distribution in the river and comparing sediment and plant characteristics between invaded and uninvaded locations in order to determine potential limitations for its spread. We are also monitoring nonstructural carbohydrates stored in root tissues to identify periods when reserves are lowest so that control operations may be optimally timed. Currently, nutrient addition experiments measuring biomass return and Rapid Light Curves (RLCs) indicate possible Nitrogen or Phosphorous limitation at two of 6 sites sampled for comparison of sediment characteristics between invaded and uninvaded sites. Also, root stored nonstructural carbohydrate lows appear to coincide with spring regrowth and flower development in midsummer.

Thread-leaved brodiaea weed control for habitat restoration: Implementation, maintenance and monitoring

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RECON Environmental, Inc. (dba RECON) is contracted to design and implement guidelines, maintenance tasks, and monitoring methods through which thread-leaved brodiaea (*Brodiaea filifolia*) populations and habitat can be restored as mitigation for impacts on a development site in Carlsbad, California.

The development of this property resulted in the loss of sensitive habitats for the thread-leaved brodiaea. These impacts are considered significant and require mitigation through habitat restoration. RECON prepared the Final Habitat Restoration and Mitigation Plan in November of 2005. The plan is currently in its second year of implementation.

Thread-leaved brodiaea is a federal threatened, state endangered, California Native Plant Society List 1B.1 species. Approximately 95% of the population was preserved; the remaining 4.9% of the population was translocated using the soil transfer method into degraded valley needlegrass grassland.

Weed eradication within the grassland has been intensive and includes dethatching using weed whips, repeat, weed-specific herbicide application, and hand-pulling. Primary invasives include fennel (*Foeniculum vulgare*), Italian ryegrass (*Lolium multiflorum*), ripgut brome (*Bromus diandrus*), wild oats *(Avena* spp.), and black mustard (*Brassica nigra*). Native species within the grassland are limited and include thread-leaved brodiaea, purple needlegrass (*Nasella pulchra*), blue-eyed grass (*Sisyrinchium bellum)*, and small-flowered morning glory (*Convolvulus simulans*). Weed eradication and habitat restoration are intended to result in reduced competition by invasives and an increase in native pollinator populations. Restoration methods include thread-leaved brodiaea seed collection and propagation, planting of container plants, and direct seeding of annuals.

Noxious weed display of Gila County Arizona

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Accurate plant identification is a basic skill required for all noxious weed control efforts. However, collections to practice identification are not readily available. To address this deficiency, Master Watershed Steward (MWS) Volunteers Karrol Braddock and Til Zimmerman teamed up with USDA Tonto National Forest's Noxious Weed Program Manager Patti Fenner to collect 23 specimens of noxious weeds found in central Arizona's Gila County. Each specimen is prepared at a level of herbarium quality and displayed in a tabletop poster rack. Included are exotic knapweeds, starthistles, toadflax, annual grasses, salt cedar and others. The display rack and poster are used at trainings, workshops and other events for volunteers and personnel to examine physical weed specimens for identification purposes. Preserved field specimens are an exact, visual sample of species seen in the field, and they allow for quicker, more effective learning than using field guides. This collection benefits both Cooperative Extension and state agencies; it provides MWS participants with an improved training tool that better prepares them for volunteer work. The display rack also serves as a resource to compare weed specimens when delivered to the office for identification.

The Master Watershed Steward Program is a partnership of the University of Arizona Cooperative Extension and the Arizona Department of Environmental Quality, developed to educate and train citizens across Arizona to serve as volunteers to maintain healthy watersheds.

Drilling and injecting two invasive palm species

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Canary Island date palms (*Phoenix canariensis*) and Mexican fan palms (*Washingtonia robusta*) are two palm species common in Southern California riparian areas that were added to Cal-IPC's invasives list in 2006. Cutting down these palms is time consuming, dangerous, and expensive. Landfills refuse to accept palm fronds for recycling. An alternative method of killing these palms was described in a Cal-IPC poster by this principal author. This method involved drilling holes into the center of these palms and injecting glyphosate herbicide into the holes. This author arbitrarily chose to drill 3 holes at different angles into the trees. The amount of herbicide and the number of holes were arbitrary. Killing certain invasive trees and leaving them standing has been approved by the resource agencies under certain conditions. The opportunity arose in 2006 under an invasive tree contract won by Kelly & Assoc. from the Metropolitan Wastewater Dept. of the City of San Diego to experiment with drilling methods, herbicide types, and herbicide dosages on both these palm species. Hundreds of palm trees 6 foot and taller were experimented on. Trees were divided into different size categories of 6-12', 12-18', 18-24', 24' and up. Two herbicides were tested, glyphosate (Glyphosate Pro II) and triclopyr (Garlon 4) at three different dosages: ¼ oz., ½ oz. and 1 oz. The number of holes varied from one to three. Monitoring of the numbered and tagged trees occurred on a quarterly basis. Clear results have emerged with the data on the fan palms, but not yet with the date palms. The next monitoring, July 2007, is expected to provide sufficient data on the latter to draw conclusions.

The efficacy of alternative herbicides on non-native invasive woody broadleaf perennials

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The widespread distribution of non-native invasive woody broadleaf perennials such as *Genista monspessulana* (French Broom) on watershed lands compromises fuel break systems and threatens native biodiversity. On Marin Municipal Water District lands, current practices for weed containment are restricted to manual and mechanical methods as well as prescribed burning and propane flaming. However, the extent of the threat exceeds current capabilities and dictates the need for alternative means of control.

In the spring and summer of 2007, the efficacy of "alternative" herbicides will be tested on several age classes of *G. monspessulana*. Commercially available alternative herbicides, typically comprised of plant-based essential oils, fall under three active ingredient categories: eugenol-based, surfactant-based, and citrus-based. MMWD will test one product from each of these categories. All are contact herbicides, are known to damage herbaceous tissue, and are at least partially effective at defeating select annual weed species. All are publicly perceived as being more desirable than traditional products such as Roundup or Garlon.

The trial will consist of both a single and a repeat application of each product to three age classes of *G. monspessulana*. There will be four replicates of each treatment as well as four controls at two different

locations. The efficacy of the first and second applications will be quantified by live stem counts and by conducting visual assessments of plant damage relative to the control plots. These preliminary experimental results will provide additional information for the ongoing debate regarding conventional and alternative weed control options on watershed lands.

Eradicating 25 species- Challenges and successes of switching from population to seed bank management on Catalina Island, California

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In 2003 an extensive island-wide invasive plant mapping survey was conducted on Catalina Island; 76 species were prioritized for management action. Total area infested, number of populations, and median population size were recorded, and the data was used to develop a ranking matrix to identify species for eradication. A two-year funding campaign secured the initial support for eradication of 25 species including: *Arundo donax*, *Centaurea solstitalis*, *Delairea odorata*, and *Tamarix ramosissima*. Physical removal and a variety of chemical application techniques were used to remove all living plants of species targeted for eradication over a three-year period. The program is now transitioning from treating live populations to managing seed-banks; this switch in management objectives has affected all aspects of the program from invasive plant awareness, program support, staffing, species detection, equipment needs, and funding acquisition. The program is now dependent on employing extremely detail-oriented field crews to conduct more precise surveys of small populations and seedlings, limiting our ability to use volunteers. Monitoring and control of these persistent seed-banks poses funding challenges. Educating funding agencies and decision makers about the process of invasion, seed bank dynamics and the importance of consistent population treatment is vital to promote effective weed management programs.

Plant community and ecosystem effects of *Arundo donax* invasion

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Giant reed (*Arundo donax* L.) is a notorious invader of riparian communities in California, but its impacts on ecosystems has not been documented. We examined plant diversity and several biotic and abiotic processes in *A. donax* infested and uninfested areas of the active river channel and adjacent terrace. Plant diversity and percent cover, soil moisture, and light availability were measured in permanent plots in May, August, and November. Decomposition rates and C:N dynamics of native litter and *A. donax* litter were measured over the same period. Species richness and cover were significantly lower in *A. donax* infested areas; these effects were strongest on the terrace where *A. donax* stands were long established. During the peak growing season in May, soil moisture was 32% lower in *A. donax* infested areas, but was not significantly different in the dry season. Light levels at the soil surface were 65% lower with *A. donax* present, a trend that continued throughout the year. As *A. donax* percent cover increased, native percent cover, soil moisture, and light availability decreased ($r^2 = 0.537$, $p < 0.001$). Native litter decomposed at 3.5 times the rate of *A. donax* litter and had significantly more nitrogen and a lower C:N than *A. donax* litter. These results show that *A. donax* invasion substantially alters both biotic and abiotic processes in native riparian systems, with impacts most likely increasing over time. The low quality of *A. donax* litter may substantially alter nutrient cycling and limit nutrient availability for other plants and higher trophic levels in riparian systems. The slow decomposition of *A. donax* litter may 'clog' invaded systems with poor quality tissue high in lignin and lead to dry litter build-up enhancing fire risk.

Ecology and future biocontrol of cape ivy in southern California

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The increasing presence of the invasive vine, Cape ivy (*Delairea odorata*), poses a threat to riparian ecosystems and biodiversity in coastal southern California where it forms dense understory mats and arboreal tangles. It is listed by Cal-IPC as a high impact invader only in the central part of the state, owing to a general lack of information on its ecology and life history, competitive ability, and mechanisms of invasion and negative impact in the southern portions of its invasive range. Our work addresses these mechanisms by coupling observational field studies with experimental garden experiments. In infested areas Cape ivy reduces open substrate 8-fold, light by 50%

and understory species diversity by ca. 35%, many of which are also non-indigenous. Species level impacts are assessed using physiological measures (photosynthetic and growth rates, water use, light availability) of native species with and without Cape ivy. We also compare phenological and physiological traits of Cape ivy with native vines to evaluate how it invades and why its detrimental influence on native ecosystems may be related to life-form differences. Baseline information is also being developed in order to test effectiveness of candidate agents (stem-boring moth, *Digitivalvia delaireae*, and a gall-forming fly, *Parafreutreta regalis*) as part of a proposed statewide biocontrol program.

Milestone™ (aminopyralid): New research results of efficacy on noxious and invasive weeds

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Milestone™ (aminopyralid) is a new herbicide developed by Dow AgroSciences for managing noxious and invasive plant in range and pasture, rights-of-way, and other non-cropland sites that controls over 50 susceptible herbaceous broadleaf plants including yellow starthistle (*Centaurea solstitialis*), Canada thistle (*Cirsium arvense*), and spotted knapweed (*Centaurea maculosa*). Research trials in California, Idaho, Montana, Nebraska, Oregon, and Washington were initiated in 2005 and 2006 to assess the efficacy of Milestone on weeds not previously tested. Experiments were conducted to assess efficacy of Milestone at 3, 5, and 7 fl oz product/A applied with CO2-pressurized backpack sprayers in spray volumes of 15 to 20 GPA. Percent visual control was taken at 73 to 378 days after application. Common mullein (*Verbascum thapsus*), Scotch thistle (*Onopordum acanthium*), purple starthistle (*Centaurea calcitrapa*), rush skeletonweed (*Chondrilla juncea*), St. Johnswort (*Hypericum perforatum*), meadow knapweed (*Centaurea jacea*), tall buttercup (*Ranunculus acris*), and Italian (*Caduus pycnocephalus*), woolly distaff (*Carthamus lanatus*), and artichoke thistle (*Cynara cardunculus*) response to aminopyralid were assessed in the experiments. Milestone at 1.25 and 1.75 oz/A provided excellent control of woolly distaff thistle (92/100%), rush skeletonweed (92/95%), St. Johnswort (87/99%), and tall buttercup (100%) about 1 year application. Milestone at 1.75 oz/A provided excellent control of meadow knapweed (99%), artichoke thistle (90%), and Italian thistle (88%) 1 year after application. Seasonal data showed excellent control of purple starthistle (98/100%) at 0.75, 1.25, and 1.75 oz/A and mullein (85/96%) at 1.0 and 1.75 oz/A, respectively. Based on the efficacy data these weeds were added to the Milestone label.

Figs and bridal creeper: Two stubborn weeds that require ingenuity

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Twenty-five invasive plant species are targeted for eradication on Catalina Island, following a systematic prioritization based on their limited abundance and invasiveness. No treatment recommendations were available for two of the species, fig (*Ficus carica*) and bridal creeper (*Asparagus asparagoides*), and effective control methods were difficult to perfect. The most successful treatments are presented here. Figs were first treated with 100% Habitat® (Imazapyr) herbicide using the hack-and-squirt method during the summer and fall months that resulted in 0% control, but slowed leafing out of the trees in the spring. Basal bark application of Pathfinder II™ (Triclopyr) herbicide was then used throughout the year and resulted in effective control. This allowed for a follow-up treatment within the same season of small branches or seedlings that were hard to find or access during the original treatment. Several other challenges were encountered while controlling figs, including access to remote populations and the resulting skin reaction of the applicators to the tree sap. Bridal creeper was first treated unsuccessfully with Glyphosate Pro II (Glyphosate) herbicide at a variety of rates as foliar or wick applications. Treated bridal creeper appears to die back to the dense fleshy tubers that are part of its rhizomatous root system, then quickly re-sprouts from another tuber during the same season. Manually removing the rhizomes from the ground and solarizing them has proven to be a successful control method for this species and its bio-waste.

Invasive species research at the National Park Service Pacific Coast Science and Learning Center

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The NPS has a research mandate to provide management with the highest quality science and information available. Now, more than ever, parks recognize that timely and reliable scientific information is essential for sound decisions. Located at Point Reyes National Seashore, the Pacific Coast Science and Learning Center provides a hub for researchers working in San Francisco Bay Area national park units. These parks include: Point Reyes National Seashore, Golden Gate National Recreation Area, Muir Woods National Monument, Pinnacles National Monument, and John Muir National Historic Site. Out of 122 active research permits, the Center is currently involved in 22 invasive species projects, examining both plants and fungi (17) and animals (5) in marine (5) and terrestrial (17) environments. Included is a study by the University of Washington examining the relationship between European beachgrass and endangered plant populations; research examining the minimum stem diameter to produce roots of Cape-ivy; and a reciprocal transplant experiment to determine the role of rapid adaptive evolution in the spread of California wild radish.

Effects of non-native aphids (*Hyalopterus pruni)* on competition between native and non-native *Phragmites australis*

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Common reed, *Phragmites australis*, is a common plant in wetlands across North America. A non-native *Phragmites* haplotype has been rapidly invading wetland communities and displacing native haplotypes. In the California desert, a haplotype whose native status has not yet been determined (Gulf Coast haplotype) is colonizing wetlands and oases. Studies have shown that native *Phragmites* haplotypes are more susceptible to non-native aphids (*Hyalopterus pruni*) than either the exotic or Gulf Coast haplotypes. Aphid feeding damages and kills native *Phragmites* and may be indirectly responsible for their decline. We are conducting a common garden experiment to determine if differential *H. pruni* herbivory mediates competition between native and non-native *Phragmites* haplotypes using five native haplotypes (two from CA), the non-native haplotype, and the Gulf Coast haplotype. Native haplotypes were paired with either the non-native haplotype or the gulf coast in pots and are being grown either with or without aphids. After two months of growth, plants will be harvested and above- and belowground biomass will be measured to compare growth differences among treatments. Our predictions are that both above- and belowground growth will be lower for native haplotypes in the aphid treatment compared to native plants without aphids. We expect that the non-native and Gulf Coast haplotypes will be relatively unaffected by aphids and will have similar growth in all treatments. Studies of invasive plants often focus on direct interactions among an invasive plant and the native plant community, but multitrophic level and positive interactions among exotic species may enhance a plant's invasiveness.

TNC's Weed Information Management System (WIMS) – An application tool for invasive species management

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TNC's Weed Information Management System (WIMS) is a Microsoft Access-based relational database application that is designed to assist natural resource managers in managing their local weed data. WIMS keeps track of three types of data records: weed occurrences (GPS point locations), assessments (size and status of the weed infestation to facilitate monitoring over time), and management treatments applied to those weed infestations. Once data have been entered into the database, data can be easily exchanged between multiple users in a variety of formats, exported in NAWMA (North American Weed Management Association) standards, written to shapefiles for mapping in any standard GIS program, and a variety of reports can be instantly generated. Additionally, WIMS can be used on a handheld computer with a GPS unit to facilitate weed mapping and data capture in the field. This enables the site manager to export data from the Access database onto a handheld unit, bring those data into the field, see imagery directly on the screen, map and collect field data, then immediately upload those new data into the Access database. We believe that WIMS is one good option for land managers to keep track of weed-related data.

Notes