

California Invasive Plant Council
2010 Symposium
Weeds & Wildlife:
Impacts and Interactions
Ventura Beach Crowne Plaza, Ventura, CA - October 13-16, 2010

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Treating Pampassgrass (*Cortaderia selloana*) in Majors Creek, Wilder Ranch State Park, Santa Cruz
Photo: Jacob Bentley, California State Parks

Welcome to the 19th Annual Cal-IPC Symposium!

For some of you, this will be your first introduction to Cal-IPC. For others, you may have attended more Symposia than you can count. All Symposium attendees receive a 2011 membership, joining fellow members throughout California and beyond! Membership includes our quarterly newsletter; updates and discounts on field courses, contact about advocacy events and next year's Symposium; and the right to vote for the Board of Directors.

Session Locations: Most paper sessions will take place in the Top of the Harbor (top floor), and San Miguel A & B of the Ventura Beach Crowne Plaza (1st floor). Posters are located in Bayview (top floor). Discussion groups will be held in Santa Rosa, Santa Cruz, Anacapa, and Buenaventura; see the Discussion Group descriptions and the agenda for specifics. Please see the convention center map on page 5.

Keynote Speaker: Please join us in welcoming Scott Morrison, Director of Conservation Science for the California Chapter of The Nature Conservancy, as our keynote speaker. He will be discussing weed and wildlife impacts and interactions during three decades of conservation management on Santa Cruz Island.

Discussion Groups: Once again, we are separating discussion groups into two sessions to allow attendees the option of attending two topics. These groups will run concurrent with paper sessions. Please see the Discussion Group listings on the last page of the program (behind the abstracts) for each group's description and room location.

Sponsors: Our sponsors help offset the cost of the Symposium while providing information and services to Cal-IPC members. Sponsor exhibits are located in Top of the Harbor. Please take time to visit with sponsor representatives at breaks or lunch.

Thursday Evening: After Thursday's session, join your fellow weed workers for the annual Social Hour and Raffle in San Miguel B and the hotel lobby, followed by the Awards Banquet and Auction in the Top of the Harbor. The raffle features books, wine, local contributions, and weed tools, while the auction will highlight several special contributions. See the flyer in the folder pocket for a partial list of items, tickets are \$1 each or 25 for \$20, and will be available either at the Sales table or at the Social Hour and Raffle. Remember to bring your complimentary drink ticket.

Friday Student Lunch: The Cal-IPC Student Chapter invites all students to join them at Anacapa Brewing Co., 472 E. Main St. between S. Oak St. and S. California St., to discuss ideas for student involvement in Cal-IPC. (Lunch is free for students.)

Saturday Field Trips: All field trip participants should meet at the front of the Ventura Beach Crowne Plaza at 7:45 am Saturday morning. Transportation will be provided for the Habitat Restoration: Southern Santa Barbara County. Participants in the Santa Clara River Watershed Tour trips will carpool (maps will be provided). Participants of the Santa Cruz Island field trip will drive ferry harbor. Lunch is provided for all full day trips. **Please bring water and sun protection.**

Photo Exhibit: Vote for your favorite photo; Cal-IPC members contributed their best shots to the Photo Exhibit which is located in the Lobby. Be sure to vote on Thursday before the Social Hour and Raffle; the winner will be announced at the banquet.

Sales: Need reference books on invasive plants? A t-shirt, hat, or bandana to look stylish in the field? A tote bag to carry your gear (or groceries)? A coffee mug to show your true colors at the office? Or preview a selection of raffle items and purchase raffle tickets in advance. Visit our sales table in the Top of the Harbor. We accept cash, checks, and credit cards.

Continuing Education Credits: Continuing Education hours are available from the California Department of Pesticide Regulation, including two hours of Laws and Regulations credit on Thursday. See the Continuing Education table near the entrance to the Top of Harbor for attendance sheets and scantron forms. Keep the codes and hours listed below for your records.

****PLEASE NOTE:** This year we need to check your ID and DPR card to confirm your identity and your DPR card. Please be prepared to show these forms of identification to the DPR table attendee.

Codes and hours:

Field Course	6.5 hrs. Other	Code A-1225-10
Thursday	Credits vary depending on whether you attend Laws and Regulations.	
	To receive credit for Laws and Regs, you must sign the separate attendance sheet at the beginning of the session and turn in a separate scantron at the end of the session. If not attending the Laws and Regulations, you may receive Other credit.	
	You must also fill out a scantron and sign the attendance sheet for the Other hours.	
	6.5 hrs. Other	Code A-1222-10
	2.0 hrs. Laws & Regulations	Code A-1228-10
Friday	6.5 hrs. Other	Code A-1227-10
Saturday Field Trips	4.0 hrs. Other	Code A-1223-10

Thank you to the organizations that support the Symposium through their sponsorship and to all the volunteers who contribute their time!

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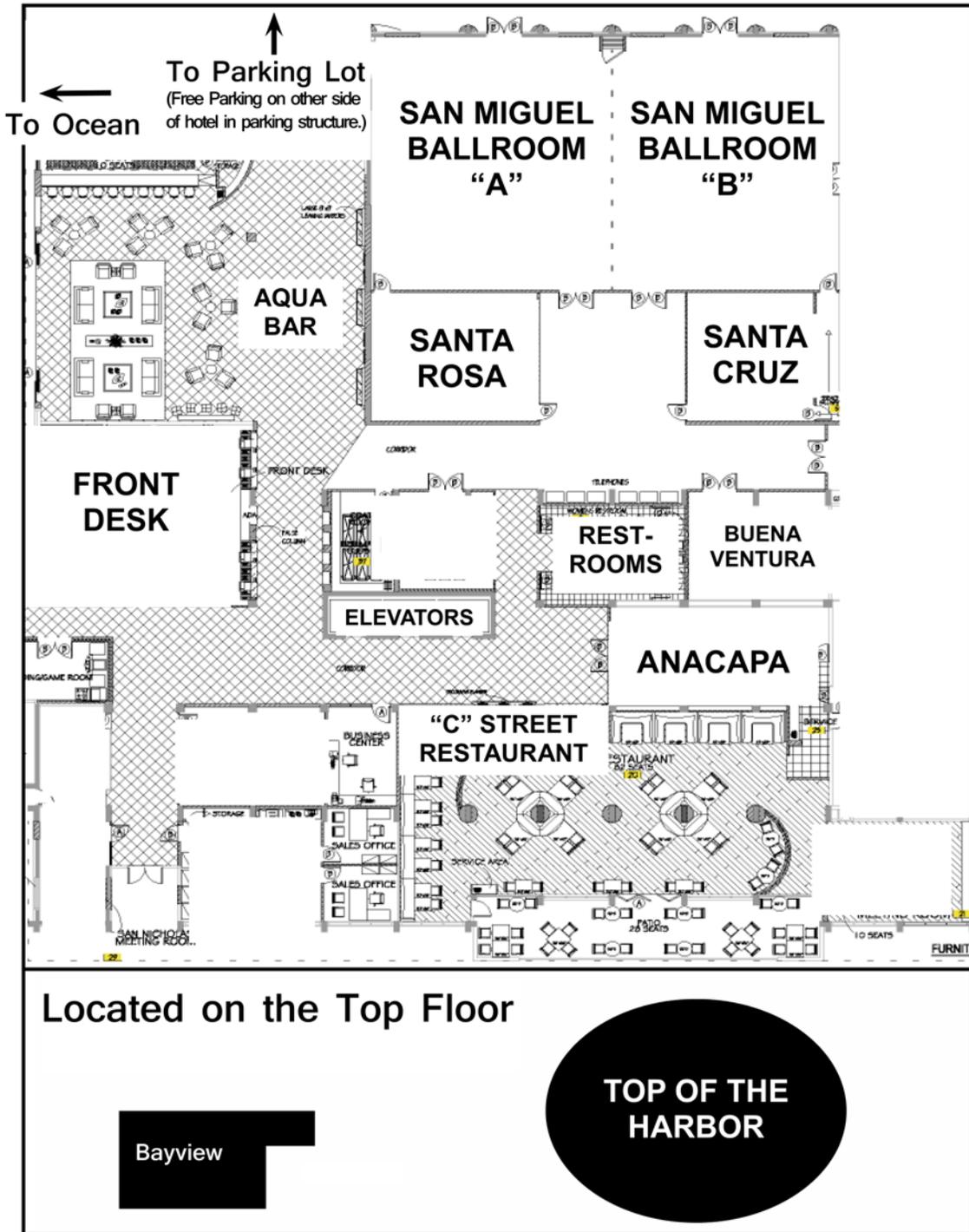
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Ventura Beach Crowne Plaza Map



California Invasive Plant Council 2010 Symposium

“Weeds and Wildlife: Impacts and Interactions”

October 14-16, 2010, Crowne Plaza Ventura Beach, Ventura, CA



<p>~ THURSDAY, OCTOBER 14 ~ Please see abstracts for the complete list of authors on each presentation. Top of the Harbor and Bayview are on the top floor; all other rooms are on the 1st floor.</p>	
<p>7:30 REGISTRATION (<i>lobby</i>) & BREAKFAST (<i>Top of the Harbor</i>)</p>	
<p>TRENDS IN EARLY DETECTION MAPPING (<i>invited session, Top of the Harbor</i>) Moderator: Edie Allen, UC Riverside</p> <p>9:00 There's an app for that: Tracking weeds with mobile technology – <i>Christy Brigham, Santa Monica Mountains National Recreation Area.</i></p> <p>9:30 BAEDN, LAEDN, MAEDN, SAEDN, California EDN? Can we build a coordinated network of early detection networks to protect California from new invasions? – <i>Dan Gluesenkamp, Audubon Canyon Ranch & Bay Area Early Detection Network</i></p> <p>10:00 Map the Spread! Cal-IPC's statewide weed mapping for early detection and strategic management – <i>Dana Morawitz, Cal-IPC</i></p>	
<p>10:30 BREAK</p>	
<p>ANNUAL MEMBERSHIP MEETING (<i>Top of the Harbor</i>) Moderator: Doug Johnson, Cal-IPC</p> <p>11:00 Weed Alerts! – <i>Joseph DiTomaso, UC Davis</i></p> <p>11:15 Cal-IPC's Achievements 2009-10 – <i>Exec. Dir. Doug Johnson and Board Pres. Jason Giessow</i></p> <p>11:30 Keynote Address – Weeds and wildlife, impacts and interactions: A case study from Santa Cruz Island, California – <i>Scott Morrison, The Nature Conservancy</i></p>	
<p>12:00 LUNCH (provided - <i>Top of the Harbor</i>)</p>	
<p>DPR LAWS & REGULATIONS (<i>invited session, San Miguel A</i>) Moderator: David Chang, Santa Barbara, Ag. Commissioner's Office</p> <p>1:00 Risk management and liability insurance in habitat restoration and weed control – <i>Jeanette Heinrichs, Van Beurden Insurance</i></p> <p>1:30 Wildlife protection during habitat restoration and weed control – <i>Natasha Lohmus, California Dept. of Fish and Game</i></p> <p>1:50 The inspection process: What does the Agricultural Commissioner look for? – <i>Rudy Martel, Ventura Co. Agricultural Commissioner's Office</i></p> <p>2:10 Rules to follow for the use of aquatic herbicides in California. <i>Mike Blankinship, Blankinship & Assoc.</i></p> <p>2:30 Pesticide Safety "Jeopardy!" – <i>The Cal-IPC Players</i></p>	<p>STUDENT PAPER CONTEST (<i>San Miguel B</i>) Moderator: Katharine Suding, UC Berkeley</p> <p>1:00 Herbicide treatment of an invaded grassland following a prescribed fire – <i>Michael D. Bell, UC Riverside</i></p> <p>1:20 Resident community species diversity and invader genetic diversity do not affect the establishment of an annual exotic grass – <i>Heather McGray, UC Irvine</i></p> <p>1:40 The effects of climate change on the growth of barbed goatgrass (<i>Aegilops triuncialis</i>) in serpentine grasslands – <i>Elise Morrison, UC Davis</i></p> <p>2:00 Ecological correlates of fountain grass (<i>Pennisetum setaceum</i>) in California coastal sage scrub – <i>Lynn Sweet, UC Riverside</i></p> <p>2:20 Origins of invasive French broom – <i>Annabelle Kleist, UC Davis</i></p> <p>2:40 Exotic plant invasion interrupts chaparral ecosystem resistance, resilience and succession – <i>Sara Jo Dickens, UC Riverside</i></p>
<p>3:00 POSTERS & SPONSOR EXHIBITS (<i>Bayview & Top of the Harbor</i>)</p> <p>Posters listed on page 12. Please visit our sponsors.</p>	

<p>MANAGING INVASIVE PLANTS (<i>San Miguel A</i>) Moderator: Ann Dorsey, Santa Monica Mountains Nat'l Recreation Area</p> <p>4:00 Strategic planning for control of <i>Arundo donax</i> and restoration of riparian vegetation in semi-arid landscapes: A case study from the lower Santa Clara River, CA – <i>Bruce Orr, Stillwater Sciences</i></p> <p>4:20 <i>Euphorbia terracina</i>: Why worry? – <i>Ann Dorsey, Santa Monica Mtns Nat'l Rec Area</i></p> <p>4:40 Testing efficacy of control methods of the invasive shrub <i>Cytisus scoparius</i> in forest habitat of the Pacific Northwest – <i>Karen A. Haubensak, Northern Arizona University</i></p> <p>5:00 Solar tents demonstrated to be effective in several California climatic areas for inactivating plant propagative material – <i>James J. Stapleton, UC Kearney Agricultural Center</i></p>	<p>4:00 <u>DISCUSSION GROUPS</u></p> <p><i>All rooms are on the first floor. See end of program for descriptions.</i></p> <ol style="list-style-type: none"> 1. Mobile technologies for weed management (<i>Santa Rosa</i>) – <i>Christy Brigham, NPS; Dan Gluesenkamp, BAEDN</i> 2. A management decision tool for perennial pepperweed (<i>Santa Cruz</i>) – <i>Christine Whitcraft, CSU Long Beach, and Bill Winans, San Diego</i> 3. Weed-free sand and gravel (<i>Anacapa</i>) – <i>Martin Hutten, Yosemite NP, and Peter Beesley, PG&E</i> 4. Communicating your message (<i>Buenaventura</i>) – <i>Yvonne Menard, Channel Isl. NP</i>
<p>5:20 SOCIAL HOUR, RAFFLE, AND SILENT AUCTION (<i>San Miguel and lobby</i>)</p> <p>7:00 BANQUET (<i>included with registration, Top of the Harbor</i>)</p> <p>8:00 AWARDS PRESENTATION & LIVE AUCTION (<i>Top of the Harbor</i>)</p> <ul style="list-style-type: none"> • Jake Sigg Award for Service and Vision • Golden Weed Wrench (Land Manager of the Year) • Wildland Weed Organization of the Year • Ryan Jones Catalyst Award • Policy and Media Award • NPS "Weedzilla" • Student Paper and Poster • Photo Contest 	

<p>~ FRIDAY, OCTOBER 15 ~ Invited sessions on invasive plants and wildlife organized with the Western Section of The Wildlife Society.</p>	
<p>7:00 REGISTRATION (<i>lobby</i>) & BREAKFAST (<i>Top of the Harbor</i>)</p>	
<p>BALANCING MANAGEMENT FOR INVASIVE PLANTS & WILDLIFE (<i>invited session, Top of the Harbor</i>) Moderator: Rhys Evans, Western Section of The Wildlife Society</p> <p>8:00 How will tamarisk biocontrol affect wildlife? – <i>Tom Dudley, UC Santa Barbara</i></p> <p>8:30 Effects of Sahara mustard, <i>Brassica tournefortii</i>, on the biodiversity of a desert landscape – <i>Michelle Murphy, UC Riverside</i></p> <p>9:00 Impacts of California's invasive plant species on invertebrate fauna: A review – <i>Denise Knapp, UC Santa Barbara</i></p>	<p>INVASIVE PLANT IMPACTS TO WILDLIFE (<i>San Miguel</i>) Moderator: Brenda Grewell, USDA-ARS</p> <p>8:00 Effects of an exotic herbaceous perennial, <i>Cynara cardunculus</i>, on small mammals and songbirds – <i>Sandra A. DeSimone, Audubon's Starr Ranch Sanctuary</i></p> <p>8:20 Controlling the invasive offspring of historic olive trees on Santa Cruz Island, Channel Islands National Park – <i>Paula Power, Channel Isl. NP</i></p> <p>8:40 Biological traits and ecological dynamics of Uruguayan primrose-willow (<i>Ludwigia hexapetala</i>): Implications for management of invaded wetlands critical to fish and wildlife – <i>Brenda J. Grewell, USDA-ARS</i></p> <p>9:00 Simulating avian weed spread and control strategies: A simulation model of <i>Rhamnus alaternus</i> on Rangitoto Island, New Zealand – <i>David Moverley, Te Ngahere Native Forest Management</i></p>
<p>9:30 BREAK</p>	

<p>GRAZING, WEEDS, & WILDLIFE (<i>invited session, Top of the Harbor</i>) Moderator: Shea O'Keefe, USDA-NRCS</p> <p>10:00 Targeted grazing for weed and wildlife management – <i>Morgan Doran, UC Cooperative Extension</i></p> <p>10:30 Species composition changes, habitat effects and the role of livestock grazing in improving recovery potential for Ohlone Tiger Beetle in Santa Cruz County – <i>Jon Gustafson, USDA NRCS</i></p> <p>11:00 Influence of a large herbivore reintroduction on plant invasions and community composition in a California grassland – <i>Brent Johnson, Pinnacles Nat'l Monument</i></p>	<p>HABITAT RESTORATION (<i>San Miguel</i>) Moderator: Ingrid Hogle, San Francisco Estuary Invasive Spartina Project</p> <p>10:00 Patch-level treatment monitoring: An Invasive Spartina Project end-game strategy – <i>Ingrid Hogle, San Francisco Estuary Invasive Spartina Project</i></p> <p>10:20 Pacific Gas and Electric Company's use of Safe Harbor agreements to enhance habitat for endangered species in the San Francisco Bay Area – <i>Mark F. Dedon, Pacific Gas and Electric Company</i></p> <p>10:40 Avoiding inadvertent introductions of the invasive Argentine ants during native plant restoration projects – <i>Jessica Wade Shors, TRA Environmental Sciences</i></p> <p>11:00 Post-fire recovery plan for Solstice Canyon in Malibu, CA – <i>Erin Avina, Santa Monica Mtns Nat'l Rec Area</i></p> <p>11:20 The Matilija Dam Ecosystem Restoration Project – <i>Steven Reinoehl, Natures Image, Inc.</i></p>
<p>11:40 LUNCH (on your own)</p> <p>Student lunch (free to students) – Anacapa Brewing Co., 472 E. Main Street California Early Detection Network meeting – (<i>Santa Rosa</i>)</p>	
<p>MANAGING WEEDS & WILDLIFE ON THE CHANNEL ISLANDS (<i>invited session, Top of the Harbor</i>) Moderator: John Knapp, Native Range, Inc.</p> <p>1:30 The Anacapa Challenge – 'Iceplant Free by 2016!' – <i>Sarah Chaney, Channel Isl. NP</i></p> <p>2:00 Scorpion Rock seabird habitat restoration: Native plant community restoration and weed control techniques to enhance nesting habitat for Cassin's auklets (<i>Ptychoramphus aleuticus</i>)– <i>David Mazurkiewicz, Channel Isl. NP</i></p> <p>2:30 Herbicide treatment techniques of <i>Vinca major</i> growing with endangered <i>Galium buxifolium</i>, an island endemic – <i>Ken Owen, Channel Islands Restoration</i></p>	<p>1:30 DISCUSSION GROUPS <i>All rooms are on the first floor. See end of program for descriptions.</i></p> <ol style="list-style-type: none"> 1. Designing restoration projects to meet invasive plant and wildlife goals (<i>Santa Rosa</i>) – <i>Tom Dudley, UCSB</i> 2. Minimizing non-target effects of herbicide use (<i>Santa Cruz</i>) – <i>Susan Kegley, Pesticide Research Institute and Marc Lea, San Luis Obispo Co. Dept. of Agriculture</i> 3. Job skills for natural resource management and tailoring your resume to a job announcement (<i>Buenaventura</i>) – <i>Cal-IPC Student Chapter</i>
<p>3:00 BREAK</p>	
<p>BRINGING IT ALL TOGETHER (<i>invited session, Top of the Harbor</i>) Moderator: Valerie Eviner, UC Davis</p> <p>3:30 Desire, disappointment, surprises, and food webs: Melding conservation and ecological perspectives to better understand animal-invasive plant interactions. – <i>Rob Klinger, USGS-BRD</i></p> <p>4:00 Understanding research on herbicide impacts: Toxicology resources for today's habitat restoration worker – <i>Susan Kegley, Pesticide Research Institute</i></p> <p>4:30 Hey, what are they doing over there? What we can learn from animal and pathogen prevention & control projects – <i>John Randall, The Nature Conservancy</i></p>	
<p>5:00 ADJOURN</p>	

All participants meet at 7:45 am in front of the Crowne Plaza.

SANTA CRUZ ISLAND – Choose from two options!

Leaders: Sarah Chaney (NPS), Dr. Coleen Cory (TNC), Dr. Rob Klinger (ex-TNC), John Knapp (NRI), Dr. Lyndal Laughrin (U.C. Field Station), Dr. James Leary (Hawaii-HBT), Dr. John Randall (TNC), and Peter Schuyler (ex-TNC).

Invasive plants: fennel and many others!

Details: One-day or two-day option (see below). Transportation and meals provided. Boat returns to dock approximately 5:30-6pm.

Santa Cruz Island is the largest and most biologically diverse of the eight California Channel Islands, renowned as “California’s Galapagos”. The Nature Conservancy (TNC) owns and manages 76% of the island and the National Park Service (NPS) owns and manages the remainder.

The global significance of the island is underscored by its inclusion in:

- United Nations’ Man and the Biosphere Channel Islands Biosphere Reserve,
- State of California Area of Special Biological Significance,
- University of California’s Natural Reserve System,
- Channel Islands National Park, and
- Channel Islands National Marine Sanctuary.

The island is home to 12 single-island endemic species and 19 state and/or federally listed endangered, threatened, or species of special concern. Santa Cruz Island has a history of ecological disturbance resulting from the introduction of non-native ungulates and plants used for ranching and agriculture in the mid 1800s. TNC and NPS have worked cooperatively for nearly 30 years to change the trajectory of disturbance and impact towards one of recovery.

In 2007, after nearly 200 years of disturbance, the island was declared free of non-native ungulates with the eradication of feral pigs. The island is recovering but this process is threatened by non-native invasive plants and Argentine ants. Island managers have implemented a multi-faceted habitat restoration and enhancement program to address these threats.

Both field trips will include the following topics:

- Feral ungulate removal and vegetation response
- Island-wide invasive plant survey and mapping
- Early detection and rapid response
- Endangered Island Fox management
- Varied outcomes of prescribed burns to control fennel
- Management plan development and implementation
- Aerial support for conservation projects
- Herbicide Ballistic Technology (paint-ball gun applications)

All attendees will travel to the island via Island Packers catamaran power boat, which will offer chances for whale watching. Attendees will hike approximately 2.5 miles along a relatively flat primary dirt road.

One-Day Field Trip (including overnight participants): A mixed driving and hiking tour of the Isthmus, eastern Central Valley, and Canada del Puerto Canyon, with lunch provided at the historic Main Ranch complex. Returns to dock approximately 6pm.

Overnight (Two-Day) Field Trip: Overnight attendees will tour with one-day attendees on Saturday, and then depart on an extensive driving tour during the remainder of Saturday and Sunday. Housing will be provided in co-ed bunk rooms at the U.C. Field Station. All meals will be provided; attendees will assist with cooking the evening meal and accommodation clean-up.

Attendees will have the opportunity to see the southern and western portions of the island, with much more detailed discussion of multi-taxa eradications and management. Helicopter survey and applicator deployment will be demonstrated as well. Returns to dock approximately 6pm.

All participants meet at 7:45 am in front of the Crowne Plaza.

HABITAT RESTORATION: SOUTHERN SANTA BARBARA COUNTY

Leaders: Joddi Leipner (County of Santa Barbara), Karen Flagg (Growing Solutions), William Abbott (Land Trust for Santa Barbara County) Speaker TBD (Friends of the Ellwood Coast), Cris Sandoval (UCSB), Darlene Chirman (restoration consultant)

Invasive plants: tocalote, garland chrysanthemum, eucalyptus, tamarisk, myoporum, acacia, cape ivy, pampasgrass, smilgrass, fountaingrass, onionweed, fennel, Italian thistle, and castor bean.

Details: 8:00 am - 4:00 pm. Transportation and lunch provided.

Tour three distinct restoration/conservation projects. This field trip begins with a visit to the Foothill Open Space (part of the County of Santa Barbara's award-winning Integrated Waste Management Program) where a closed county landfill is being restored with native plants to improve wildlife habitat, enhance trails and provide passive community open space. Growing Solutions' native plant nursery is also on-site.

Then we will visit the Land Trust for Santa Barbara County's Coronado Butterfly Preserve and the neighboring City of Goleta's Ellwood Main Monarch Grove, one of the largest monarch over-wintering sites in California, where we hope to see a few early arriving monarchs on their way to clustering sites in the eucalyptus there. The Land Trust has been working for ten years to manage weeds and enhance the property with native plant communities and as monarch butterfly habitat.

Finally, we will visit the beautiful oceanfront Coal Oil Point Reserve. Restoration activities here are partly directed at protecting and increasing the population of the threatened snowy plover; plus restoring the slough margin with native plant communities to support birds and other wildlife.

SANTA CLARA RIVER WATERSHED TOUR

Leaders: Adam Lambert (UC Santa Barbara), Tom Dudley (UC Santa Barbara), Bruce Orr (Stillwater Sciences), Sophie Parker (TNC), Sandy Hedrick (Friends of the Santa Clara River, Hedrick Ranch Natural Area), Santa Clara Estuary Natural Preserve

Invasive plants: giant reed, Mediterranean mustard, black mustard, tocalote, yellow star thistle, chrySTALLINE iceplant, Russian thistle, fennel, tamarisk, smilgrass, castor bean

Details: Half-day, 8:00 am - 12:45 pm, lunch not provided

This half-day field trip will take attendees to view research, restoration, and conservation projects throughout the Santa Clara River Watershed. The Santa Clara River is one of the few major river systems in the State which retains much of its natural hydrology and is home to 17 endangered species. We will visit three sites within the watershed that have been impacted to varying degrees by invasive plants and discuss restoration initiatives associated with each site.

Our first stop will be at the Hedrick Ranch Natural Area, a 225 acre preserve along the Santa Clara River managed by Friends of the Santa Clara River. Volunteers are working to restore 45 acres of Arundo dominated riparian and wetland habitat and incorporate sustainable agriculture into the landscape.

We will then visit the Hanson-Villanueva property, a 1,000-acre property owned by TNC, which has extensive riparian and upland mixed habitats, and is a target site for large-scale invasive species management and restoration, and endangered species protection. This is also the future facilities site of the University of California, Santa Clara River Research Station and Preserve, which focuses on watershed-wide issues of human interaction with riparian systems.

Finally, we will visit the Santa Clara River estuary where tour leaders will discuss ongoing efforts to maintain and enhance habitat for native plants and wildlife.

STUDENT POSTER CONTEST

Contrasting effects of *Carpobrotus edulis* on arthropods in a coastal dune ecosystem - *Denise A. Knapp, UC Santa Barbara*

Using native shrubs to control re-establishment of giant reed (*Arundo donax*) - *Kai T. Palenscar, UC Riverside*

Effects of exotic mustard on native insect communities in California grassland - *Tadj K Schreck, UC Irvine*

CONTRIBUTED POSTERS

Control of barbed goatgrass in serpentine grasslands - *Paul A. Aigner UC Davis McLaughlin Reserve*

Effects of invasive *Limonium ramosissimum* on native salt marsh communities in a changing environment - *Autumn Cleave, San Francisco State University*

Eriogonum hybrid eradication program on Santa Cruz Island, California: Eliminating one island endemic to protect another - *Coleen Cory, The Nature Conservancy*

Use of non-native plants by island foxes: Conservation implications - *Brian Cypher, CSU Stanislaus*

Linking vegetation dynamics with physical processes to develop invasive plant control and riparian restoration strategies for a semi-arid river and its floodplain - *Zoey Diggory, Stillwater Sciences*

Preventing invasion through mineral materials inspections - *Martin Hutten, Yosemite National Park*

Trials of aminopyralid and a cut-and-dab method for Himalayan blackberry control - *Laura Jones, Yosemite National Park*

Herbicide control of velvet grass in Yosemite National Park - *Laura Jones, Yosemite National Park*

Adaptive integrated vegetation management of invasive *Spartina densiflora* in the San Francisco Estuary - *Drew Kerr, San Francisco Estuary Invasive Spartina Project*

Santa Clara River Research Station: Developing a preserve with a watershed focus - *Adam M. Lambert, UC Santa Barbara*

The spread and control of *Dittrichia graveolens* - *Meg Marriott, US Fish & Wildlife Service*

Avian response to *Arundo donax* invasion on the Lower Santa Clara River - *Devyn A. Orr, UC Santa Barbara*

Prioritizing invasive plant eradication in the San Francisco Bay Area - *Mike Perlmutter, Bay Area Early Detection Network*

Predicting the spread of invasive plants in the Sierra Nevada - *Cynthia Powell, Cal-IPC*

Successful tactics for controlling the invasive fennel (*Foeniculum vulgare*) on Santa Cruz Island, Channel Islands National Park - *Paula Power, Channel Islands National Park*

An evaluation of flooding risks associated with giant reed (*Arundo donax*) - *David F. Spencer, USDA ARS*

Developing time*temperature inactivation models for thermal death of black mustard (*Brassica nigra*) seeds - *James Stapleton, UC Kearney Agricultural Center*

Invasive pine tree impacts on coastal scrub vegetation in the Marin Headlands - *Robert Steers, National Park Service, Inventory and Monitoring Program*

Prescribed burning controls barb goatgrass (*Aegilops triuncialis* L.) in Central Valley rangeland for up to five years - *Sara Sweet, The Nature Conservancy*

Effects of the invasive species *Arundo donax* on bank stability in the Santa Clara River, Ventura, CA - *Jiana ten Brinke, UC Santa Barbara*

Can carbon addition be used to reverse the effects of atmospheric nitrogen deposition? - *Don Thomas, San Francisco Public Utilities Commission*

Mapping flammable invasive weeds in the South Shore area of Lake Tahoe - *Ian Turner, Tahoe Resource Conservation District*

Oral Presentation Abstracts

Listed alphabetically by presenter

Post-fire Recovery Plan for Solstice Canyon in Malibu, CA. Avina, Erin*, Ann Dorsey, and Christy Brigham. Santa Monica Mountains National Recreation Area, Thousand Oaks, CA. *Erin_Avina@nps.gov

Post-fire establishment of native plant species is essential to the health of Southern California plant communities. To accomplish this, inhibiting the rapid spread of ecologically damaging invasive plant species post-fire is imperative. Following the 2007 Corral Fire in the Santa Monica Mountains National Recreation Area we drafted a work plan with the goal to restore 100 acres of burned area in Solstice Canyon (Malibu, California). This plan involved the rapid detection, control, and monitoring of twelve ecologically damaging non-native invasive plant species. The restoration strategy was as follows: 1) GPS mapping of invasive plants targeted for removal, 2) assessing infested areas for native and targeted plant percent cover, 3) prioritizing the timing of treatment of these areas based on plant species composition, 4) treating of these mapped infested areas, 5) surveying the areas post-treatment to determine the need for further treatment, and 6) post assessing all infested areas at the end of the treatment season to ascertain treatment effectiveness. A two year implementation of this plan resulted in an increase of native plant species by 32%, a decrease of 70% in non-native invasive plant species and a decrease of 2.7 % in overall work area.

Herbicide treatment of an invaded grassland following a prescribed fire. Bell, Michael D.*, Sara Jo Dickens, Heather Schneider, Kai Palenscar, and Lynn Sweet. California Invasive Plant Council: Student Chapter, Riverside, CA *michael.bell@email.ucr.edu

Over the past 200 years, California grasslands have become increasingly invaded by a suite of Mediterranean annual grasses and forbs. The invasion has reduced the richness of the native annual plant community and converted a perennial bunchgrass community into a non-native annual grassland. Prescribed fires are used by land managers on these converted landscapes as a method to control the density of invasive species. These prescribed fires target invasive grasses in order to reduce their dominance and facilitate re-establishment of native species, but often invasive forbs such as *Erodium cicutarium* and *E. botrys* emerge as the dominant species following the burn. Three treatments (Rodeo, Fusilade, and control) were applied to a native grassland in the winter following a prescribed burn and were followed with one of two seeding treatments (seeded and control). Fusilade is a grass specific herbicide that has been shown to reduce

E. cicutarium vitality in desert environments, while Rodeo is a non-selective herbicide with little preemergent effects. Both herbicide treatments resulted in a reduction of *E. cicutarium* cover, but also reduced the cover of the native bunch grass *Nassella pulchra*. The Fusilade treatments subsequently increased the cover of another invasive grass *Vulpia myuros*. The Rodeo treatments had less invasive cover and responded with increased native forb richness. The seeding treatments increased native forb richness and cover in the herbicide treatments. Our results suggest that cover and richness of invasive species can be reduced in grasslands through the combination of fire with chemical treatments.

Rules to follow for the use of aquatic herbicides in California. Blankinship, Michael. Blankinship and Associates. mike@h2osci.com

Do you apply herbicides to aquatic weeds? Recent court activity has clarified (or confounded) the requirement that herbicide applications to waters of the United States must be permitted. This presentation will define various components of the permit process, including what constitutes waters of the U.S.; the statewide general National Pollutant Discharge Elimination System (NPDES) permit for the Discharge of Aquatic Pesticides for Aquatic Weed Control in Waters of the US; and the ten herbicides approved for aquatic use. A permit can protect you from citizen lawsuits, the method of enforcement of the Clean Water Act. The USEPA just published a draft of their nationwide permit intended for use in states without an existing permit. However, California will not likely adopt the EPA permit, because California has an existing permit that is more stringent than the proposed EPA permit. Learn whether you will need coverage by this permit.

There's an app for that: Tracking weeds with mobile technology. Brigham, Christy¹*, Eric Graham², and Eric Yuen². ¹National Park Service – Santa Monica Mountains National Recreation Area, Thousand Oaks, CA. ²Center for Embedded Network Sensing, University of California, Los Angeles, Los Angeles, CA. *Christy_Brigham@nps.gov

Here we report on a new tool to map invasive species using a mobile phone application and web-interface to record and visualize invasive plant populations. The application called *What's Invasive!*, allows managers to upload photographs and other information about target invasive plants that is then used to generate a mobile phone application for use by the public. The

application is available in a variety of formats including a general format and a specific application for the iPhone. These applications are downloaded by a prospective user (e.g., hiker) from our internet site (www.whatsinvasive.com). Using the phone application, when a person finds one of the target species, they can compare it to the images and text, take a digital picture of the plant or population while the gps location is automatically recorded by the phone, and label the photograph with a plant name via a drop down menu. The application uploads the photographs, gps points, and data labels to the website where this information is translated into a map. We tested this application in the Santa Monica Mountains of Southern California with eight National Park Service staff over two weeks. Participants carried the phones during their regular work and recorded target species when they encountered them. Over the test period we collected over a thousand data points and field checked a subset of the data. In addition to this test-run, over 20 members of the public have downloaded the application and used it to map invasive plants within the Santa Monica Mountains. Eleven other parks have created their own *What's Invasive* applications. Our results suggest that this tool is a way to rapidly map invasive plants while engaging and educating the public.

The Anacapa Challenge – 'Iceplant Free by 2016!'.
Chaney, Sarah,^{1} Carolyn Greene², Ken Ower²*
¹Channel Islands National Park, CA, ²Channel Islands Restoration, *sarah_chaney@nps.gov

Islands are particularly vulnerable to the harmful effects of invasive species. Anacapa Island is home to many endemic plants and animals and provides critical nesting habitat for rare seabirds. Approximately 60% of East Anacapa Island's 112 acres is infested with red-flowered iceplant (*Malephora crocea*), which has expanded very rapidly, displacing native plants and animals, since its introduction in the 1950s. In 2008, the Park's Superintendent challenged staff to eliminate iceplant from Anacapa by 2016, the NPS Centennial. Anacapa's combination of terraces and cliffs, huge biomass of iceplant, presence of sensitive species and limited availability of restoration resources necessitates a multi-faceted approach to iceplant eradication. Vegetation recovery will be assisted by planting of native plants grown in an on-island nursery, focusing on areas where long domination by iceplant has reduced native plant diversity. This project will rely on assistance from cooperating organizations, community and business-sponsored volunteers and school and youth groups to accomplish results that NPS resources alone cannot achieve. Key project elements include establishment of a scientific monitoring program to track project results, dissemination of project information to all island visitors, and a comprehensive bi-lingual education program to create public awareness in coastal communities and throughout southern California about impacts of invasives in both island and mainland habitats. This presentation will detail project components and report on initial results.

Project staff have already recorded vigorous growth of natives where iceplant has been removed, improved habitat for rare island wildlife and significant community support in terms of funding and volunteer participation.

Pesticide Safety "Jeopardy!" *Chang, David*, County of Santa Barbara Agricultural Commissioner's Office, with audience participation, dchang@co.santa-barbara.ca.us

Watch Pesticide Safety "Jeopardy!" – America's Second Favorite Quiz Show. Watch three contestants vie for prizes as they demonstrate their knowledge of California's pesticide regulations, safety requirements, label statements, application guidelines, environmental stewardship, herbicide active ingredients, and invasive plant names. Pesticide Safety Jeopardy will be a rough facsimile of the television show, and a fun way to learn the details of California's pesticide safety rules.

Pacific Gas and Electric Company's use of Safe Harbor agreements to enhance habitat for endangered species in the San Francisco Bay Area.
Dedon, Mark F, Michael E. Fry and Peter M Beesley.*
Pacific Gas and Electric Company. Depts. of Land and Environmental Management, and Environmental Policy, San Francisco, CA. *mfd2@pge.com

Since 2008 Pacific Gas and Electric Company (PG&E) has implemented two Safe Harbor agreements with the US Fish and Wildlife Service (USFWS) to cover activities at two San Francisco Bay Area locations. Safe Harbor agreements are intended to contribute to species protection and habitat enhancement while at the same time balancing certain land use activities, such as ranching, mining, timber harvesting, or in this case operations at critical utility facilities. A Safe Harbor agreement is between the landowner and typically the USFWS which assures the landowner that no added restrictions will be imposed as a result of carrying out activities expected to benefit an endangered species. In Contra Costa County, PG&E is partnering with the Antioch Dunes National Wildlife Refuge to protect and enhance the quality of critical habitat for three endangered species: Lange's metalmark butterfly, Antioch Dunes evening primrose, and Contra Costa wallflower. Under a Safe Harbor agreement, PG&E received authorization from the USFWS to use herbicides and equipment to reduce populations of invasive non-native plants (tree-of-heaven, yellow starthistle, vetch and ripgut brome) growing on PG&E property where two electric transmission towers are maintained adjacent to the refuge. PG&E is also partnering with the USFWS and the Silicon Valley Land Conservancy to protect and enhance habitat for the threatened bay checkerspot butterfly on Tulare Hill in Santa Clara County where PG&E maintains five transmission lines on a 45-acre parcel. PG&E completed a safe harbor agreement that incorporates cattle grazing as a management strategy to reduce the vegetative cover of invasive grasses that compete with the endemic serpentine plants that provide nectar for the butterfly.

Effects of an exotic herbaceous perennial, *Cynara cardunculus*, on small mammals and songbirds.

DeSimone, Sandra A. and Scott E. Gibson.* Audubon's Starr Ranch Sanctuary, Trabuco Canyon, CA.
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Artichoke thistle, *Cynara cardunculus*, has invaded 283 ha at 1583 ha Starr Ranch. Experiments indicated a non-chemical control method that reduces thistle cover by 95% after one season. To understand how thistle control and subsequent coastal sage scrub (CSS) restoration affect wildlife populations, we monitor small mammals and songbirds throughout the process. In 2004 we selected an artichoke thistle-dominated site and a matched pristine CSS site (for size, elevation, aspect, and slope). During the wet and dry season annually since 2004 and ongoing, we trap small mammals over three consecutive nights and do songbird point counts in each site. We also spot-mapped songbirds in 2006 over a restoration chronosequence from baseline artichoke thistle-dominated through sixth season of restoration. In 2010, we trapped small mammals in four sites of increasing restoration age. Results indicate that artichoke thistle-dominated sites are relatively poor habitats for wildlife. In point count results, the pristine CSS site had 55% higher songbird species richness than the matched thistle-dominated site. Spot mapping data indicated an increasing trend in songbird species richness over the chronosequence from baseline through year six of restoration. Small mammal species richness was 83% lower in the artichoke-thistle dominated site compared to the matched pristine CSS site. In small mammal chronosequence sampling, artichoke thistle-dominated sites had the lowest richness (two species) and numbers of captures (one) compared to four sites of increasing restoration stage (2 – 24 species; 3 – 19 captures). Our results support implementation of restoration soon after exotic control for native wildlife recovery.

Exotic plant invasion interrupts chaparral ecosystem resistance, resilience and succession.

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Fire, at an invasion front, offers a unique opportunity to study exotic plant effects on resistance, resilience and succession of chaparral above and belowground following wildfire. Above ground plant community resistance and resilience to exotic plant invasion is well studied, however, the ability of soils in the same systems to resist and recover from invasion are less understood. In chaparral ecosystems of southern California, exotic annual species invasion is limited in mature communities, but following fire, may dominate a site and alter natural post fire soil inputs. We examined chaparral system resistance and resilience to exotic plant invasion above and below ground in intact, mature chaparral and post fire chaparral succession process. Hypotheses were: (1) Presence of exotic plant

species in the chaparral changes biological and chemical characteristics of soils by altering soil inputs. (2) Presence of exotic plants slows succession of chaparral above and below ground. (3) If exotics are controlled and native chaparral species restored, soil biological and chemical characteristics return to pre-invaded conditions because native soil inputs are restored. Intact, mature chaparral above ground plant communities were resistant to invasion; however, the very low levels of invasion that did occur lead to alterations of the soil chemical and microbial characteristics of the soils. Post fire succession was slowed both above and below ground by the presence of exotic plant species indicating that post fire chaparral is not resistant to invasion or the impacts of invasion. Removal of exotic plants and seeding of natives post fire facilitated rates of succession similar to uninvaded chaparral.

Targeted grazing for weed control and wildlife management. *Doran, Morgan, P.* University of California Cooperative Extension, 501 Texas Street, Fairfield, CA. (707) 784-1326, mpdor@ucdavis.edu

Livestock grazing can provide many services beyond the production of food and fiber when grazing is managed to achieve specific vegetation or ecological objectives. Targeted grazing is a term used to describe highly managed grazing regimes that are strategically applied to produce specific impacts on vegetation and consequently other ecosystem components. Such grazing regimes are used to manage weed populations, fire fuels, plant community composition, water quality and wildlife habitat. Desired grazing impacts are accomplished by manipulating several grazing parameters that describe and define the type of grazing system applied. These grazing parameters are generally well understood by targeted grazing practitioners, but it is important for people making rangeland management decisions to understand these parameters in order to plan effectively and communicate grazing management decisions to others. The primary grazing parameters that are manipulated to achieve desired results are livestock density, grazing duration, timing of grazing and the type of animal. Livestock density, expressed as the number of animal units (AU) per acre, can be changed to influence grazing selectivity. The duration of grazing will vary according the livestock density, the amount of vegetation and the desired amount of vegetation utilization. Timing of grazing may be planned for specific seasonal conditions or for a plant's phenological stage. The type of livestock is chosen based on the type of vegetation that needs to be manipulated or, as is often the case, what is available. These grazing parameters are used in conjunction with ecological parameters to determine appropriate and targeted grazing applications.

***Euphorbia terracina*: Why worry?** Dorsey, Ann*, Erin Avina, and Christy Brigham. Santa Monica Mountains National Recreation Area, Thousand Oaks, CA.

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Understanding the mechanisms that promote the invasiveness of newly introduced non-native species is imperative to control the spread of ecologically damaging plants. *Euphorbia terracina*, a new invader to California's Santa Monica Mountains, has dramatically increased its distribution over the last five years. With numerous scattered isolated populations now found throughout Ventura and Los Angeles counties, including large populations within the Santa Monica Mountains National Recreation Area (NPS), it is proving to be a threat to our wild land communities. Careful monitoring of populations on National Park Service land has highlighted multiple characters that lend to its invasive potential. Tracking its phenology, we have found that it is productive ten months out of the year and rapidly moves through life stages. It has a vegetative and flowering stage of one month and a fruiting stage of three weeks. Its indeterminate mode of reproduction allows it to be a prolific seeder. Germinating early in the growing season enables it to readily exploit available niches under deciduous trees where native plants are not found. Another trait we feel lends to its invasiveness is its ability to tolerate herbicide application. Presently we are examining the best treatment methods for this species by looking at the effect of pre-emergent (chlorsulfuron) and post-emergent (glyphosate) herbicides and hand pulling. The pre-emergent herbicide was the most effective treatment (63% cover decrease) followed by pre-emergent coupled with hand pulling (52% cover decrease). Hand pulling leaving *E. terracina* around natives was ineffective (30% cover increase).

How will tamarisk biocontrol affect wildlife?

Dudley, Tom¹, Mike Kuehn¹, Steven Ostojic², Heather Bateman³, & Matthew Brooks². ¹University of California, Santa Barbara; ²TU.S Geological Survey, Western Ecological Research Center; ³Arizona State University, Mesa, AZ

The program to develop biological control of *Tamarix* spp. using the specialist saltcedar leaf beetle, *Diorhabda elongata* sensu lato, has produced some spectacular results (and more failures), but also some exceptional political conflicts, primarily over perceived threats to endangered southwestern willow flycatchers (SWFL) nesting in tamarisk. Numerous species of birds, reptiles and small mammals occupy tamarisk habitat in western riparian areas, although in general tamarisk provides somewhat poorer quality habitat than the native species it has replaced. The introduction of biocontrol will affect tamarisk habitat by changing the physical structure (temporary loss of canopy shading, gradual dieback of stems) and presenting a new food resource for insectivores. We focus here on two basic questions: 1) will biocontrol alter the relationship between tamarisk and wildlife negatively or positively? and 2) is restoration of native vegetation a feasible

option following biocontrol? We are addressing these and other questions at the Virgin River, which flows through SW Utah, NW Arizona and southern Nevada to join the Colorado at Lake Mead. The Virgin watershed is the first ecosystem where *Diorhabda* and SWFL co-occur, and in 2010 we anticipate that several thousand acres of tamarisk-dominated vegetation could be newly defoliated. We hypothesize that short-term structural change may reduce habitat quality in some locations during the breeding season (with real threats to some individual birds but not other vertebrates), while this new food resource will sustain or improve conditions for wildlife species in general. Subsequently, because sufficient propagules of native riparian plants are still present in the Virgin River, recovery should follow the gradual decline of *Tamarix* biomass...and by the time of this presentation, we may even have some results to begin to answer these questions. The implications for T&E species, and for other western rivers, will be addressed along with a novel strategy to facilitate riparian restoration on river segments lacking adequate native propagule sources.

The conflict between the Fish & Wildlife Service and the Department of Agriculture over potential threats to nesting SWFL is the basis for a lawsuit against USDA that has halted the *Tamarix* biocontrol program, and could have significance beyond this system because it has led to further restrictions on the use of biocontrol as a tool for managing invasive species in wildland environments. In this political environment in which the opposing federal agencies are unwilling to support comprehensive monitoring of the ecosystem responses to biocontrol, we run the risk that long-term data will not be available that could provide resolution to these conflicts.

BAEDN, LAEDN, MAEDN, SAEDN, California EDN?

Can we build a coordinated network of early detection networks to protect California from new invasions? Gluesenkamp, Daniel,*¹ Andrea Williams.²

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In 2006 we began building the Bay Area Early Detection Network (BAEDN), an initiative which coordinates and organizes Early Detection and Rapid Response to plant invasions across the nine counties which contact the San Francisco Bay. BAEDN partners developed an operating framework, obtained grant support, and pulled together critical EDRR infrastructure. BAEDN staff predict which species will be most harmful, coordinate detection of infestations, and prioritize the most harmful outbreaks for eradication. BAEDN then works with agencies and citizens to proactively deal with the highest priority outbreaks before they grow into large and costly threats. This "stitch-in-time" approach minimizes the environmental and economic damage caused by these invaders; educates citizens; and dramatically reduces the need for planning and resources required to control large, established invasive plant populations.

In this talk we discuss lessons learned from building the BAEDN and present the infrastructure and systems now available to others building multi-county regional early detection networks. Finally, we will talk about efforts underway to build similar multi-county networks, and outline the vision for California EDN: a coordinated network of networks protecting California from new invasions.

Biological traits and ecological dynamics of Uruguayan primrose-willow (*Ludwigia hexapetala*): implications for management of invaded wetlands critical to fish and wildlife.

Grewell, Brenda J. and Caryn J. Futrell.* USDA-ARS Exotic & Invasive Weeds Research Unit, Davis, CA. *bjgrewell@ucdavis.edu

The invasion of Uruguayan primrose-willow (*Ludwigia hexapetala*) has impacted a wide range of wetlands that provide critical wildlife habitat. To address knowledge gaps and support the development of ecologically-based weed management strategies, we partnered with wildlife refuge managers and conducted experimental research. We evaluated the growth, nutrient allocation and cycling dynamics of *L. hexapetala* to identify weak points in the weed's life cycle for targeted management, and tested integrated methods for primrose-willow control in refuge water supply canals. We compared invaded and non-invaded wetlands, and conducted seedling emergence assays to inform restoration planning. Biological traits of primrose-willow promote its invasive ability to compete in a wide range of wetland environments, including areas subjected to seasonal drying. Hydrochorous dispersal of buoyant shoot fragments and seed capsules emphasize the need to prioritize control of upstream invasion sites. Primrose-willow forms dense floating mats which reduce subsurface light penetration, preempt submersed vegetation, and reduce native macrophyte abundance and diversity. Primrose-willow growth is limited by water depth and nutrient loads, yet the weed successfully invades both high and low resource environments. Seedling emergence assays confirm viable primrose-willow seed banks. Seed bank recruitment is enhanced under drawdown conditions, and following disturbance. Preliminary results of canal experiments suggest manipulation of hydrology coupled with mechanical removal prior to herbicide applications can increase efficacy and reduce herbicide use. Non-chemical control strategies should target pre-reproductive growth before plants produce viable seed, and also because biomass accumulation and carbohydrate storage reserves of the plant are lowest during this life stage.

Species composition changes, habitat effects and the role of livestock grazing in improving recovery potential for Ohlone tiger beetle in Santa Cruz County, California.

Gustafson, Jon and Dr. Grey Hayes².* ¹USDA, Natural Resources Conservation Service, Davis, CA; ²Elkhorn Slough National Estuarine Research Reserve, Watsonville, CA.

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Invasive plants have long been recognized as contributing to habitat quality decline for wildlife species. In spite of this, few studies have focused on management regimes applicable at large scale that can ameliorate invasive species impacts on specific wildlife species. The *federally endangered Cicindela ohlone* (Ohlone tiger beetle (OTB)) is threatened by introduced grasses and forbs within the narrow range of its distribution, in California coastal prairie. Whereas many despair about controlling invasive grasses and forbs in grasslands, managers responsible for this and perhaps many other sensitive grassland species are adapting practices to address these species. In these cases, it is often more important to moderate impacts of invasive species rather than remove species altogether or reduce their frequency or abundance. Unfortunately, due to its cryptic nature, low population numbers and limited distribution, little is known about the OTB. However, it is understood that livestock may be important for maintaining habitat necessary for restoring OTB habitat where prescribed fire, chemicals and mechanical treatments have limited applicability. Properly managed livestock grazing can modify OTB habitat by reducing exotic grass and forb cover in localized areas within grasslands, establishing suitable bare ground and maintaining desirable habitat structure. The livestock impacts necessary for creating this habitat likely require frequent and intense grazing during the growing season. Such management regimes are often avoided by conservation lands managers concerned with other objectives. However, these regimes may be necessary to effectively reduce the impacts of exotic invasive species on this and other grassland wildlife species.

Testing efficacy of control methods of the invasive shrub *Cytisus scoparius* in forest habitat of the Pacific Northwest.

Haubensak, Karen A.¹, Ingrid M. Parker², Sara Grove², Stephanie Kimitsuka², Jeffrey R. Foster³, and Nancy F. Benson³. ¹Northern Arizona University School of Forestry, Flagstaff, AZ; ²University of California-Santa Cruz Dept of Ecology and Evolutionary Biology, Santa Cruz, CA; ³Fort Lewis Department of Forestry, Yelm, WA.

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The exotic shrub Scotch broom (*Cytisus scoparius*) has been implicated in failed reforestation efforts in the Pacific Northwest. We present the results of an ongoing experiment at Fort Lewis, Washington, testing the efficacy of broom control methods in the context of Doug-fir reforestation. Following initial clearing of mature broom at five sites, we implemented two broom control methods in a replicated, controlled design: 1) soil scarification at different times of year and different intervals; and 2) herbicide application at three different times of year. We measured resprouting rates of the initial cleared individuals, germination of broom from the seedbank, and broom cover for three years following initial clearing. We found that resprouting of broom stumps did not depend on stump diameter or height. While germination rates declined dramatically across all treatments over three years, removal of

competing vegetation with herbicide tended to increase broom germination compared to controls. However, soil scarification increased germination rates still further. Broom cover was lower in all treatments compared to control plots, with similar responses to scarification and herbicide. We observed high mortality rates of Doug-fir seedlings in our experiment which was likely due to lack of rainfall. However, our previous work suggests that broom may alter soils so as to inhibit growth of certain species in broom-invaded sites. A subsequent greenhouse bioassay confirmed that Doug-fir seedling growth was substantially impaired in long-invaded broom soils compared to uninvaded forest soils, which suggests a long-term legacy of broom on both managed and wild lands.

Risk management and liability insurance in habitat restoration and weed control. *Heinrichs, Jeanette, Van Beurden Insurance.* jheinric@vanbeurden.com

Anyone who advertises, solicits, or operates as a pest control business must obtain a Pest Control Business License. (There are some exemptions.) Each pest control business must have a qualified applicator licensee, or a certificate holder for a maintenance gardener, responsible for the pest control operations of the business.

In addition, you must provide proof of financial responsibility for potential damages resulting from your pest control work, by submitting evidence of either liability insurance; a surety bond; or a certificate of deposit in the DPR Director's name. For instance, the minimum coverage for an agricultural pest control business making applications by ground is \$100,000 bodily injury per person; \$300,000 bodily injury per occurrence and \$50,000 for property damage or a surety bond of \$75,000.

How do you manage risk, especially if you're in a public agency or you are a private applicator and not covered by liability insurance? Of course, follow the regulations and apply herbicides in good faith. Attend this presentation to discuss the options.

Patch-level treatment monitoring: An Invasive Spartina Project end-game strategy. *Hogle, Ingrid.* San Francisco Estuary Invasive Spartina Project, Berkeley, CA. ibhogle@spartina.org

Regional control coordinated by the San Francisco Estuary Invasive Spartina Project (ISP) has reduced the cover of invasive Spartina populations in the Bay Area by 85% since the height of the infestation in 2005. As control progresses and native plants revegetate, locating and identifying the last remaining patches of invasive Spartina becomes much more difficult, even for treatment crews and monitoring staff with years of experience. Beginning last summer, ISP field biologists began working with treatment crews in the field, using GPS units to relocate and record the treatment of each individual remaining Spartina patch in a few select sites. This trial was so successful that the ISP doubled its field staff in 2010 so as to scale-up patch-level treatment monitoring to many more sites. In this

presentation I will review how we achieved an 85% reduction in invasive Spartina cover in four years, and how we are using patch-level treatment surveys to help us reach our goal of invasive Spartina eradication.

Variable responses of a California grassland to the reintroduction of tule elk. *Johnson, Brent* Pinnacles National Monument Brent_Johnson@nps.gov

Although large mammalian herbivores are known to have had large effects on the ecology and evolution of terrestrial plant communities, many of these populations have been dramatically reduced or extirpated from their pre-historic ranges due to hunting and other human-caused alterations to the landscape. Over the last century, there have been many successful reintroductions of mammalian herbivores throughout the world. However, these herbivores are often returned to sites that are no longer pristine, having been grazed by cattle and invaded by exotic plants. One such herbivore is tule elk (*Cervus elaphus nannodes*), which was on the brink of extinction 150 years ago, but now has several stable populations throughout California due to successful conservation and reintroduction efforts. Here, we summarize results from a five-year enclosure experiment that explores the effects of reintroduced tule elk populations on a northern California coastal grassland community. Our results indicate that the reintroduction of elk increased plant species richness and abundance, with these effects due primarily to the responses of both native and exotic annual species, rather than perennials. Elk did not significantly alter shrub cover, although this may have been due to the slow response time of woody species and the duration of this experiment. However, we found that elk promoted the successful establishment of *Lupinus arboreus* seedlings, a native shrub that is known to have large effects on soil nitrogen availability and community composition. We also found that the exotic grass, *Holcus lanatus*, experienced reduced levels of elk herbivory when associated with the native shrub, *Baccharis pilularis*. In summary, our work shows that while tule elk have positive effects on the native species composition, this comes at the cost of increasing the richness and abundance of the exotic taxa in the community.

Understanding research on herbicide impacts: Toxicology resources for today's habitat restoration worker. *Kegley, Susan E.* Tom Greer², Chuck Benbrook³, Karen Benbrook³, Paul Jepsen⁴, Michael Guzy⁴, and Pierre Mineau⁵.* ¹Pesticide Research Institute, 2768 Shasta Road, Berkeley, CA 94708; ²IPM Institute of North America, 4510 Regent St., Madison WI 53705; ³BCS Ecologic, 90063 Troy Road, Enterprise OR 97828; ⁴Integrated Plant Protection Center, Oregon State University, Corvallis, OR 97331; ⁵National Wildlife Research Centre, Environment Canada, 100 Gamelin Blvd., Hull, Que., Canada K1A 0H3. *skegley@pesticideresearch.com

Weed management with herbicides has the potential to impact wildlife and humans; however, different locations frequently have different at-risk populations

because of geography, species distributions or proximity of water or sensitive sites to treatment areas. This presentation will highlight the Pesticide Risk Mitigation Engine (PRiME), a new web-based tool that provides an estimate of site-specific pesticide risks for birds, small mammals, earthworms, pollinators, aquatic invertebrates, and fish. For humans, inhalation and dermal risk indices have been developed. All indices are based on field data and provide the probability of an undesirable impact occurring as a result of a pesticide application. Mitigation measures (such as a buffer strip to reduce runoff into waterways) that reduce exposure potential are incorporated into the tool, and serve to highlight measures applicators can take to reduce risk. PRiME provides a means to compare different pesticide products, weigh impacts of application methods, account for site-specific conditions, access information on mitigation options for specific product/application selections, and evaluate an index “score” and ranking for each application and specific endpoints of concern. The tool includes a novel user interface, including GIS mapping of treatment area boundaries and sensitive sites, as well as automated retrieval of Natural Resource Conservation Service soils data.

Origins of invasive French broom. *Kleist, Annabelle C* and Marie Jasieniuk.* University of California-Davis Dept. of Plant Sciences, Davis, CA. *ackleist@ucdavis.edu

Evidence of hybridization among ornamental cultivars and species, and naturalized populations is important because it can increase invasiveness and make management, particularly biological control, difficult. French broom, believed to be *Genista monspessulana*, was introduced into California by the horticultural industry and has caused serious environmental damage throughout the state. It is no longer available commercially, but its close relative, sweet broom, is a popular ornamental and may be contributing to invasive populations. The goals of this research are to: i) identify the cultivated sources of invasive broom populations in California, and ii) determine whether hybridization between ornamental plants and naturalized populations has occurred. To address these objectives, we collected samples from invasive French broom populations throughout California, landscape plantings, horticultural outlets, and botanical gardens and arboreta from its native range. These samples were used to reconstruct a phylogeny of brooms using two chloroplast and two nuclear DNA regions. We also cloned nuclear ITS sequences to confirm parentage and assess hybrid origin. ITS sequences are non-coding DNA regions that occur several hundred times throughout the genome. The copies are usually homogenized so that only a single sequence is found within an individual. However, this homogenization process may not be complete in recent hybrids. Thus, analyzing multiple copies of ITS from suspected hybrids can give information about parentage and hybrid origin.

Phylogenetic analyses revealed a well-supported group containing *G. monspessulana* samples from its native

range and the majority of invasive French broom samples from California. ITS phylogenetic analysis with these additional sequences revealed an ornamental sweet broom group containing sequences from a small number of invasive French broom individuals. Our results suggest that the majority of invasive French broom in California originated from *G. monspessulana* but that ornamental sweet broom can contribute to invasive populations via hybridization.

Desire, disappointment, surprises, and food webs: melding conservation and ecological perspectives to better understand animal-invasive plant interactions. *Rob Klinger.* USGS-BRD, Yosemite Field Station-Bishop Office, 568 Central Avenue, Bishop, CA 93514. rcklinger@usgs.gov (760) 873-5125

Because plants and animals often exert strong mutual influences on each other, fundamental plant-animal interactions such as pollination, herbivory, granivory, and seed dispersal are likely to have different effects on each group in different phases of the invasion process. Within a given phase of invasion, these effects will be determined primarily by: (1) the direction and strength of interactions between animal and invasive plant species; and, (2) stochastic or deterministic environmental events that alter interaction strengths. A number of examples from island and mainland systems provide evidence of the complex relationships between animals and invasive plants, especially when plants are released from long periods of intense herbivory. Unanticipated outcomes have resulted from these interactions, some of which have not been desirable from a conservation perspective. From an ecological perspective though, these outcomes are not particularly surprising. These points are illustrated with data from a series of studies conducted on Santa Cruz Island, California, from 1991 to 1998. The goal of these studies was to evaluate the effects of the spread of a highly invasive perennial forb, fennel (*Foeniculum vulgare*), following removal of grazing mammals (cattle and feral sheep) in the 1980's. Although fennel was introduced to Santa Cruz in the 19th century it occurred in only a few localized populations throughout most of the 20th century. Following removal of the cattle and, to a lesser extent, the feral sheep in the 1980's, the distribution of fennel increased 50% and mean cover 11% to 51%. Although fennel had largely negative effects on native plants, this was not necessarily so for animals. Conversion of grasslands to fennel stands resulted in a change in bird species composition, however diversity was as high or higher in fennel stands as in other vegetation types. Similarly, density of small mammals, including an endemic deer mouse (*Peromyscus maniculatus santacruzae*), was 2x-7x higher in fennel stands as in other vegetation types, primarily because of greater rates of survival. Effects on birds and rodents were not simply an outcome of altered vegetation structure; seed removal trials showed that fennel seeds were consumed by rodents and granivorous birds. In essence, two highly undesirable grazing mammals had, for over a century, limited the spread of what became a highly

undesirable and surprising plant invasion. In ecological terms, the removal of the grazers resulted in a change in interaction strengths, allowing fennel to rapidly spread and establish an alternative vegetation state. Native plant species tended to have negative relationships with fennel, but native animals tended to have positive ones. The case study from Santa Cruz demonstrates that evaluating outcomes of plant invasions and setting realistic management goals will, in many cases, be best done in the context of food webs and multi-trophic interactions. Moreover, it will be essential to acknowledge that management of invasive plant species can send systems on unpredictable trajectories leading to various states and transitions, sometimes with contrasting patterns between plant and animal communities.

Impacts of California's invasive plant species on invertebrate fauna: A review. *Knapp, Denise A.**. University of California-Santa Barbara Dept. of Ecology, Evolution, and Marine Biology, Santa Barbara, CA. *dknapp@lifesci.ucsb.edu

In order to effectively manage invasive plants in California, it is essential to understand each species' ecosystem-level impacts. An important component of those impacts is effects on higher trophic levels, including invertebrates. Acting as pollinators, decomposers, herbivores, predators, and prey, invertebrates are critical to ecosystem function. In order to investigate the effects of California plant invaders on invertebrates, all available CallIPC Plant Assessment Forms were reviewed (197 species); this information was supplemented with additional published and unpublished studies when available. Only 25% of these California invasives had any invertebrate information available. Of those 49 species, observed impacts appear to be negative for 57%, positive for 18%, and both negative and positive for 20%, while there was no apparent impact for 4%. The source of these assessments varied widely, however, from general observations that the species attracts pollinators or is toxic to most organisms, to more comparative or experimental studies. Fifty-four percent of these determinations were from "other published material," while 31% were from reviewed, scientific publications, and 15% were from unpublished observations. When results are restricted to scientific publications, 13 of 15 species (87%) showed negative impacts, versus one positive and one no impact. Examples and recommendations will be given.

Wildlife protection during habitat restoration and weed control. *Lohmus, Natasha**. California Dept of Fish and Game. (805) 684-6281

The Department of Fish and Game (DFG) is responsible for conserving, protecting, and managing California's fish, wildlife, and native plant resources. To meet this responsibility, the Fish and Game Code (Section 1602) requires an entity to notify DFG of any proposed activity that may substantially modify a river, stream, or lake. Notification is required by any person, business, state or local government agency, or public utility that

proposes an activity that will: substantially divert or obstruct the natural flow of any river, stream or lake; substantially change or use any material from the bed, channel, or bank of, any river, stream, or lake; or deposit or dispose of debris, waste, or other material containing crumbled, flaked, or ground pavement where it may pass into any river, stream, or lake.

The notification requirement applies to any work undertaken in or near a river, stream, or lake that flows at least intermittently through a bed or channel. This includes ephemeral streams, desert washes, and watercourses with a subsurface flow. It may also apply to work undertaken within the flood plain of a body of water.

If you are planning an activity that requires DFG notification, you will need to provide your regional DFG office with a completed notification form and the corresponding fee.

If DFG determines that the activity may substantially adversely affect fish and wildlife resources, a Lake or Streambed Alteration Agreement will be prepared. The Agreement includes reasonable conditions necessary to protect those resources and must comply with the California Environmental Quality Act (CEQA). The entity may proceed with the activity in accordance with the final Agreement.

Learn how to apply for a LSAA and about the conditions that are applied to riparian weed projects and how these projects can affect wildlife.

The inspection process: What does the Agricultural Commissioner look for? *Martel, Rudy* Ventura Co. Agricultural Commissioner's Office, rudy.martel@ventura.org

The Agricultural Commissioner's Office plays a key role in regulating pesticides in California. The size and diversity of California agriculture, and the State's increasing urbanization, require a more complex partnership between state and local pesticide regulatory authorities than anywhere else in the nation.

The Department of Pesticides Regulation works closely with the County Agricultural Commissioner's Office who is the primary local enforcement agents for pesticide laws and regulations. The Agricultural Commissioner's Office regulates pesticide use to prevent misapplications or drift, and possible contamination of people or the environment. A main component of the Agricultural Commissioner's Office enforcement is through pesticide application and pesticide mix/load inspections.

The Agricultural Commissioner's inspection focuses on the safety of the pesticide user. We verify compliance of the employer with the pesticide label, personal protective equipment, pesticide handler training and the safe use of the pesticides by the handlers.

Scorpion Rock seabird habitat restoration: Native plant community restoration and weed control techniques to enhance nesting habitat for Cassin's auklets (*Ptychoramphus aleuticus*). Mazurkiewicz, David¹, Josh Adams² and, A. Laurie Harvey¹ ¹Channel Islands National Park-Montrose Settlements Restoration Program, 1901 Spinnaker Drive, Ventura, CA 93001 USA ²U.S. Geological Survey and Moss Landing Marine Laboratories, 8272 Moss Landing Road, Moss Landing, CA 95039 USA.
*david_mazurkiewicz@nps.gov

Introduced non-native plant species within the Channel Islands can greatly affect the quality of nesting habitat for seabird species. Scorpion Rock located off the north-east end of Santa Cruz Island is an important seabird nesting location, with five species of seabirds using this offshore rock as a nesting location. The establishment of invasive non-native plants on Scorpion Rock has led to a decrease in the abundance and quality of nesting habitat for burrow nesters such as Cassin's Auklets (*Ptychoramphus aleuticus*) as well as other seabirds. The plant community structure pre-restoration effort was approximately 90% exotic, annual plant species primarily crystalline ice plant (*Mesembryanthemum crystallinum*), cheeseweed (*Malva parviflora*) and nettle-leaved goosefoot (*Chenopodium murale*). Removal of non-native, invasive vegetation and the restoration of a native perennial coastal sage scrub community on Scorpion Rock is helping to provide better soil structure, nesting conditions and cover for seabirds utilizing this location. The outplanting and maintenance of over 5000 plants on Scorpion Rock from 2008 to present has resulted in the reestablishment of a native plant community and an appropriate trajectory to increase the quality of nesting habitat and structure. Examination and testing of control methods for the invasive species present on Scorpion Rock as well as the development of remote site restoration techniques has been helpful for other habitat restoration projects within the Channel Islands.

Resident community species diversity and invader genetic diversity do not affect the establishment of an annual exotic grass. McGray, Heather G.* and Katharine N. Suding. University of California-Irvine Dept. of Ecology and Evolutionary Biology, Irvine, CA.
*hmcgray@uci.edu

At a local scale, increasing the species diversity of a native plant community has been shown to increase the resistance of the community to invasion. Alternately, it has been shown that increasing the genetic diversity of an invasive species population can increase invasive success. The objective of our study was to examine the relative importance of these two types of biodiversity (species diversity and genetic diversity) to the establishment of invasive species populations. We directly manipulated the species diversity of native California grassland communities and the genetic diversity of populations of an annual invasive grass (*Avena barbata*) to test the following hypotheses: 1) Increasing species diversity of a resident plant

community will increase the resistance of that community to species invasion and 2) Increasing the genetic diversity of the invasive species population will increase invasion success. We established communities that ranged in diversity from 1-16 native California grassland species. We invaded these communities with populations of *Avena*, which varied in genetic diversity from 1-8 distinct genotypes. We measured invasion success by measuring the percent of *Avena* individuals that survived to reproductive adulthood. We found no effect of either community species diversity or *Avena* genetic diversity on *Avena* survival. *Avena* survival was on average 80% across all treatments, indicating that these two forms of biodiversity have little impact on the establishment of *Avena* in a single generation. However, both forms of biodiversity may have larger impacts on other measures of invasive success including total biomass production and reproductive output.

Map the Spread! Cal-IPC's statewide weed mapping for early detection and strategic management. Morawitz, Dana. California Invasive Plant Council, Berkeley, CA 94709. dfmorawitz@cal-ipc.org

Maps of weed occurrence are essential for planning effective management and early detection/rapid response programs. Information about where a given plant is not found is fundamentally important, but not easily captured with field mapping over large area. In collaboration with the state's Weed Management Areas (WMAs) over the last three years, Cal-IPC has created statewide distribution maps for over thirty weeds. Now, thanks to federal stimulus funding through ARRA, Cal-IPC is mapping more species, increasing the resolution of our mapping, and developing an online portal to share the information. This information will support strategic planning at all levels: by individual landowners, WMAs, regional early detection networks, state agencies such as the California Department of Food and Agriculture, the Invasive Species Council of California, and developing national early detection networks. Cal-IPC's risk assessment project in 2006-08 began this effort by collecting information from Weed Management Areas and other experts to develop maps based on counties and Jepson floristic regions. We are now improving the resolution of these maps by collecting existing datasets from land management entities, attending WMA meetings, and interviewing experts in each county to create statewide maps with presence data at the scale of USGS quadrangles. This project will add critical distribution data needed for implementing CDFA's strategic prioritization model to determine the most effective populations to target for treatment. We will also develop an online portal where data can be entered and viewed by the state's natural resource managers. We are coordinating with the Bay Area Detection Network and Calflora to explore the most effective way to develop an online system that will be useful and user-friendly. Local land managers play a key role in building this data system, and we need your help for this effort! Cal-IPC members

represent a wealth of knowledge about invasive plant distribution and can collectively build a system that will make us all more strategically effective in the future.

The effects of climate change on the growth of Barbed Goatgrass (*Aegilops triuncialis*) in serpentine grasslands. Morrison, Elise,* Amy Battaglia and Barbara Going. University of California – Davis Dept. of Environmental Science and Policy, Davis, CA. *esmorrison@ucdavis.edu

The invasion of California grasslands by European annual grasses has resulted in widespread changes in the productivity and composition of native plant communities. The few remaining intact grasslands are generally found in harsh, unproductive habitats, such as serpentine soils. Although dominated by native forbs and relatively resistant to invasion by many non-native annual grasses, serpentine grasslands are at risk of invasion by a particularly aggressive grass, Barbed Goatgrass (*Aegilops triuncialis*). Climate change could potentially alter the resistance of serpentine grasslands to invasion by influencing the success of non-native species. Since serpentine grasslands are often water-limited habitats, changes in precipitation as a result of climate change may alter the competitive balance between native and exotic plants. We studied how variations in spring precipitation and competition affect the growth and seed production of Barbed Goatgrass. Spring precipitation was supplemented (50% over ambient), reduced via rainout shelters (50% below ambient), or left unmanipulated in a serpentine grassland at McLaughlin Reserve (UC Davis). Goatgrass growth was monitored over the course of the growing season. Goatgrass growth was significantly affected by competition and precipitation treatments. Tiller number was reduced in the presence of the native community in all precipitation treatments, but increased when spring rain was supplemented. Seed production is currently being measured but preliminary results suggest that increases in rainfall could promote the growth of Barbed Goatgrass on serpentine. However, the growth of Barbed Goatgrass on serpentine may be limited if management focuses on maintaining an intact native community.

Weeds and Wildlife, Impacts and Interactions: A Case Study from Santa Cruz Island, California. Morrison, Scott A., PhD The Nature Conservancy, 201 Mission Street, 4th Fl., San Francisco, CA 94105 smorrison@tnc.org

Interactions between wildlife and invasive plants can be complex, and can complicate management and the attainment of conservation goals. Examples abound across California of ways in which pest plants, and their management, directly and or indirectly affect the conservation management of native (and nonnative) wildlife – and of the ways in which wildlife can affect the management of weeds. I illustrate such relationships by providing an overview of three decades of conservation management of Santa Cruz Island, California. Management programs on the island have ranged from the eradication of feral vertebrates and

invertebrates to the control of pest plant infestations; from the recovery of imperiled endemic species to the design and implementation of biosecurity measures to prevent future threats. Recognizing that on islands some of the challenges of and opportunities for managing invasive species are unique, I discuss how lessons from the conservation management experience on Santa Cruz Island may find application to mainland California issues and systems. Especially in an era of intense global change, natural resource protection in California requires goals be clear and priorities shared across scales relevant to the problem; strategies be explicitly focused on seizing management efficiencies and economies of scale; and support of the necessarily adaptive implementation of those strategies be enduring and programmatic.

Simulating avian weed spread and control strategies: a simulation model of *Rhamnus alaternus* on Rangitoto Island, New Zealand. Moverley, David Te Ngahere Native Forest Management, P.O. Box 71109, Rosebank Post Centre, Auckland 1348, New Zealand. dave@te-ngahere.co.nz

Large complex invasions are often both difficult to understand and quantify. Surveying such invasions, if possible, can be costly and may not necessarily provide the information required to successfully and efficiently manage them. Variables that affect both invasive spread and management when viewed or analyzed across landscape structure can greatly improve the understanding and management of such invasions. A simple, individual based, bottom-up, mechanistic, simulation model based on discrete time and space was built using cellular automata theory. It was used to characterize the avian spread of the invasive plant *Rhamnus alaternus* and evaluate the effectiveness and efficiency of different control scenarios across the contextually rich, ecologically important Rangitoto Island in the Hauraki Gulf, Auckland, New Zealand.

As the person responsible for managing the control of the invasion, earlier authors' research on modeling invasive spread has been applied to this complex problem. The parameterization of local variables from previous research, spatial applications utilizing a rich data set, and ground operational experience has provided a model that simulates the spread of *Rhamnus* through time, classifies spatial components of the invasion, and evaluates management scenarios using different levels of control effort as a measure of efficiency. The model has captured the flexible environmental patterns that influence both the spread and management of this invasion and has led to the adoption of the best strategy for implementation of the program. The model is an example of the application and assessment of modeling and invasive spread research, to practical management and implementation of a complex invasive issue, within a complex natural environment.

Effects of Sahara Mustard, *Brassica tournefortii*, on the biodiversity of a desert landscape. Barrows, Cameron W. and Michelle Murphy*, University of California at Riverside's Center for Conservation Biology. * mmurp003@student.ucr.edu

Given the abundance of non-native species invading wildland habitats, managers need to employ informed triage to focus control efforts on weeds with the greatest potential for negative impacts. Our objective here was to determine the threat Sahara mustard, *Brassica tournefortii*, represents to meeting regional goals for protecting biodiversity. Sahara mustard has spread throughout much of the Mojave and Sonoran Deserts. It has occurred in southern California's Coachella Valley for 80 years. In years when the mustard occurs at high densities it has clear negative impacts on the native flora. We identified reductions in native plant reproduction, shifting composition increasingly toward Sahara mustard while decreasing the fraction of native species. We also examined the impact of Sahara mustard on wildlife species, including the threatened Coachella Valley fringe-toed lizard, *Uma inornata*. The mustard invasion appears to result in complex responses to the lizards' prey and habitat quality. Without control measures the long-term impacts to desert biodiversity will be an increasing decline in native annual plants, arthropod species richness, and dune stabilization with broad regional trophic impacts and reductions in potential habitat for a host of dune narrow-endemic species.

Strategic planning for control of *Arundo donax* and restoration of riparian vegetation in semi-arid landscapes: a case study from the lower Santa Clara River, CA. Orr, Bruce K^{*}, Zoey Diggory¹, and Tom Dudley². ¹Stillwater Sciences, Berkeley, CA, ²University of California, Santa Barbara, CA.
*bruce@stillwatersci.com

Conservation and restoration of California's semi-arid river corridors is a daunting challenge, particularly in light of increasing demands for water and land coupled with invasive species and global climate change. The lower Santa Clara River (Ventura County, California) has been significantly altered by levees, water diversions, agriculture, and urbanization that have altered natural geomorphic and hydrologic processes, causing riparian habitat loss or degradation and facilitating invasion by *Arundo donax*. The California Coastal Conservancy's Santa Clara River Parkway project seeks to ameliorate these impacts and conserve existing riparian habitats by acquiring and restoring a 25 mile-long floodplain corridor. We coupled vegetation sampling and mapping with studies of the hydrogeomorphic processes that shape these systems, including large El Nino flood events, to improve our understanding of the key drivers affecting riparian vegetation dynamics. These findings, coupled with recent research by others on *Arundo* ecology and invasive grass-fire cycles, are being used to develop strategic plans and priorities for *Arundo* control and riparian restoration in the Santa Clara River watershed.

Various strategic actions to control *Arundo* are being considered, such as focusing initially on higher terraces that are less likely to be reinvaded from upstream sources during the next big flood and that are adjacent to fire-prone shrub lands, areas in and adjacent to high quality riparian habitat, river reaches with lower levels of nutrient loading where native vegetation can better compete with *Arundo*, preparing contingency plans to remove new propagules immediately following major floods, and to the extent feasible removing sources in an upstream to downstream direction.

Herbicide treatment techniques of *Vinca major* growing with endangered *Galium buxifolium*, an island endemic. McEachern, Dr. Kathryn¹ and Ken Ower² ¹USGS-BRD-WERC, Channel Islands Field Station, Santa Cruz Island, CA. and, ²Channel Islands Restoration, Santa Barbara, CA.
kathryn_mceachern@usgs.gov

This project highlights challenges involved in herbicide treatment of invasive *Vinca major* L. [Apocynaceae] (greater periwinkle) within the boundaries of an isolated endangered plant population. *Galium buxifolium* E. Greene [Rubiaceae] (sea-cliff bedstraw) is endemic to Santa Cruz and San Miguel islands in Channel Islands National Park, with a total of only 18 known populations. One of the largest populations on Santa Cruz Island is infested with *Vinca major* an invasive non-native ornamental groundcover known to eliminate natives where it invades. The project goal is to remove the *Vinca* so that the habitat can support a self-sustaining *G. buxifolium* population. Two herbicide application techniques were used in 2009 and 2010 to eliminate *V. major* from the steep cliff-and ocean-side habitat. As the *Vinca* and *Galium* were often literally intertwined, contractor staff developed specialized area preparation, safety and herbicide application techniques to protect the *Galium* and prevent accidental loss of this endangered endemic. Preliminary results indicate that only about three *Galium* plants out of the 200 known to grow at the site did not survive since treatment began. About 200 new plants were found at the site since treatment began. This project will provide a strategy for invasive plant removal where exotics and rare and endangered natives exist in very close proximity. It has improved chances for survival and expansion of one of the largest Santa Cruz Island *G. buxifolium* populations.

Hey, what are they doing over there? What we can learn from animal and pathogen prevention & control projects. John M. Randall. The Nature Conservancy, San Diego, CA jrandall@tnc.org

California has been the site of some of the most innovative and successful invasive plant prevention and control efforts. But from the start we have recognized that there is much to learn from outside the state and beyond the United States. Cal-IPC's creation in 1992 was itself inspired by the Florida Exotic Pest Plant Council which had been launched eight years earlier. We can also borrow and learn from the successes and failures of projects to prevent and control invasions by

animals and pathogens. For example, earlier failures to control or eradicate invasive lampreys and other freshwater fish have led to more recent efforts to suppress reproduction or manage population structure and thereby limit their abundance and impacts. On the other hand, some recent successes in controlling and eradicating small invasive ant populations in Australia and the Pacific hinged on use of a strategic hierarchy: detect and delimit all target ant populations/colonies in the area; contain target ant populations, reduce target ant numbers and distribution; eradicate target ants. Approaches used in combating plant and animal pathogens have featured a strong focus on prevention and on taking steps to boost resistance of the hosts and host communities and thereby slowing or halting spread. Fresh looks at these approaches and at applying them to invasive plant problems are warranted.

The Matilija Dam Ecosystem Restoration Project.

Zaich, Craig, and Steven Reinoel[†]. Natures Image, Inc. czaich@naturesimage.net (949) 705-5800

The Matilija Dam was built in 1947 within the County of Ventura to provide a local water supply. This dam over the years has adversely impacted the ecosystem. The dam has prevented the natural flow of sand and sediment from the mountains to the beaches; causing significant beach erosion. The sedimentation accumulating behind the dam has reduced the amount of water available therefore eliminating the dams' effectiveness. As a result, invasive species have dominated the native riparian habitat and caused a severe decline in wildlife diversity and abundance. Numerous project stakeholders were involved in how best to face the challenges to restore the watershed. One of the first phases to begin the Matilija Dam Ecosystem Restoration Project was to eradicate 1,200 acres of invasive species including *Arundo donax*, *Tamarix aphylla*, *Ricinus communis* and *Spartium junceum* through mechanical and chemical methods. Emphasis was taken to minimize damage to the native vegetation and prevent contamination of ground water resources during the entire removal process. During removal of the invasive species and after removal was complete, water testing revealed no groundwater contamination and the aquatic habitat for the native fish in the area has greatly improved. In addition, the fire hazards that are present in areas dominated by *Arundo donax* were significantly reduced by removing this one invasive species. The successful outcome of this project is just the first step in restoring the vitality to this ecosystem.

Avoiding inadvertent introductions of the invasive Argentine ants during native plant restoration projects. *Shors, Jessica Wade, PhD* TRA Environmental Sciences, Menlo Park, CA. shors@traenviro.com

The Argentine ant (*Linepithema humile*), an invasive ant species associated with human development, is able to displace most native ant species throughout coastal California. Many native ant species disperse seeds and protect mutualistic plants and butterfly larvae, so their

displacement can have cascading negative effects on native plant and insect communities. Argentine ant queens and workers cannot fly after leaving the nests, so the only way to disperse on their own is to crawl to new sites, a slow process compared to the dispersal of other ant species. However, Argentine ants can also be transferred to new sites by being carried in landscaping and native plant restoration supplies such as straw bales and the potting soil surrounding the roots of native plants. This occurs more frequently if the restoration supplies originate from suppliers or staging sites that are close to human development and therefore invaded by Argentine ants. Stanford University and TRA Environmental Sciences have recently collaborated in order to determine non-toxic best management practices that can be used during native plant restoration projects to avoid the inadvertent introduction of Argentine ants. These best management practices have been implemented on Catalina Island, Jasper Ridge Biological Preserve, and Mid-Peninsula Open Space District in coastal California. I will be presenting these best management practices and the results of on-going monitoring, which show that use of the recommended best management practices successfully eradicates Argentine ants from restoration supplies, and hence reduces the likelihood of inadvertent introductions of Argentine ants into restoration sites.

Solar tents demonstrated to be effective in several California climatic areas for inactivating plant propagative material. *Bell, Carl E.¹, Kristin A. Weathers², Milton E. McGiffer², and James J. Stapleton^{3*}*. ¹UC Cooperative Extension, San Diego, CA; ²Dept. of Botany and Plant Sciences, UC Riverside; ³Statewide Integrated Pest Management Program, UC Kearney Agricultural Center, Parlier, CA. *jim@uckac.edu

Throughout California, interest is high in removing invasive plants from riparian areas and other sensitive habitats. Many of these sites are accessible only by hiking through brush or into canyons. While hauling plants away for pickup and disposal, viable seeds and vegetative material can be left behind and/or scattered. Tent solarization, a safe, inexpensive, non-toxic, and effective technique, can be used to inactivate viable weed materials onsite. It can generate high temperatures (>70 °C = >158 °F) on a routine basis during summer months in warmer areas, and can eradicate hydrated pests over the course of a single days time. Previously, supportive results had been shown at Sierra Nevada foothill and Central Valley sites. In summer 2009, demonstrations were expanded to three inland and coastal Southern California locations, using local, invasive plants. In all cases, at Riverside (shortpod mustard), Del Mar (bristly oxtongue), and Lakeside (bristly oxtongue; curly dock) where nontreated seeds were germinable for comparison, the solar tents were 100% effective. The Lakeside location was set up as a field demonstration, with the help of local, volunteer "weed warriors". They were able to see the results—a mushy mass of "cooked"

weedy plant material. Updated information on constructing solar tents, maximizing heat, and efficacy will be discussed.

Ecological correlates of fountain grass (*Pennisetum setaceum*) in California coastal sage scrub. Sweet, Lynn* and Jodie S. Holt. University of California-Riverside Dept. of Botany and Plant Sciences, Riverside, CA. *Lwihb001@ucr.edu

African fountain grass (*Pennisetum setaceum*) is invasive outside its native range and is now spreading in wildlands in Hawaii, Arizona and California. While fountain grass is increasing in California, its potential range and impacts on local communities have not been determined. The use of a climate-matching model to predict potential for spread of fountain grass showed that many areas of southern California are suitable for invasion by fountain grass, including areas that support coastal sage scrub (CSS) communities. Invaded CSS sites in southern California were analyzed for cover of native and exotic species, using replicated transects and

plots containing 4 cover classes of fountain grass. All six sites were located on steep, rocky slopes that were southwest-facing. Sites in the Santa Monica National Recreation Area (SAMO) showed a significant decline in native species richness and cover with increasing fountain grass cover, based on regression analysis. Sites in San Diego County showed significant but smaller declines in native cover as fountain grass cover increased, and no significant differences in native species richness. Principal Components Analysis (PCA) of abiotic variables associated with sites showed a significant separation by region: SAMO sites were characterized by less surface area covered by rock, but rockier and drier soil, which may explain differences in the relationship between natives and fountain grass by region. Analysis of second year-data as well as soil texture, nutrients, PAR and temperature may help determine whether these factors cause differences in recruitment of native species under increased fountain grass cover.

Poster Abstracts

Control of barbed goatgrass in serpentine grasslands. Aigner, Paul A.* and Rhett J. Woerly. University of California, Davis—Donald and Sylvia McLaughlin Reserve, Lower Lake, CA. *paaigner@ucdavis.edu

Serpentine grasslands are known for being relatively free of the invasive species that typify other California grasslands. Recently the special status of serpentine grasslands as strongholds of native plant diversity has been threatened by the spread of barbed goatgrass (*Aegilops triuncialis*), a Eurasian annual that is unique in its tolerance of serpentine soils. We evaluated nine treatments for their effectiveness controlling barbed goatgrass and for restoring native species cover and diversity: two grass-specific herbicides (fluazifop and clethodim) applied before goatgrass flowering (early-season), at flower initiation (mid-season), and at early seed development (late-season), a broad-spectrum herbicide (glyphosate) applied late-season, and mowing and hand pulling. Treatments were applied to 4-m² experimental plots in inner Coast Range serpentine grassland with high cover of barbed goatgrass but few other non-native species. After two years of treatment, all treatments except glyphosate and early-season clethodim reduced goatgrass cover. Hand pulling and mid-season fluazifop were most effective at controlling goatgrass, reducing cover by 60% (compared to a 30% increase on control plots). All treatments except late-season fluazifop increased native forb cover. Late-season clethodim and mid-season fluazifop also increased native bunchgrass cover. No treatment decreased the cover of any particular native species, including grasses, except for glyphosate, which tended to reduce or eliminate species that were actively growing at the time of application. The grass-specific herbicides show great potential to surgically control barbed goatgrass and other non-native annual grasses in grasslands that are otherwise dominated by native grasses and forbs.

Effects of invasive *Limonium ramosissimum* on native salt marsh communities in a changing environment. Cleave, Autumn¹, Katharyn E. Boyer. Romberg Tiburon Center for Environmental Studies and Department of Biology, San Francisco State University, 3152 Paradise Drive, Tiburon, CA 94920. ¹acleave@sfsu.edu

Limonium ramosissimum, Algerian sea lavender, is an established invader in southern California marshes that is forming monotypic stands in the

middle to high elevations of a number of marshes in the San Francisco Bay Estuary. *L. ramosissimum*'s high salinity tolerance, reproductive rate, and dispersal suggest potential for spread in the Estuary, and understanding of its interactions with native species and effects on ecosystem function is needed. In this project, we are assessing how invasion by *L. ramosissimum* affects abundance and function of the native amphipod, *Traskorchestia traskiana*, and how anthropogenic changes may further affect these interactions. At two salt marshes in South San Francisco Bay we established plots of *L. ramosissimum*, and a native plant, *Jaumea carnosa*, at two elevations (levels of inundation) as a proxy for sea level rise. To simulate anthropogenic nutrient enrichment, we added nitrogen (N) fertilizer every two weeks during the growing season. Early results indicate that at both marshes, Coyote Point Marina and Sanchez marsh, there was an increase in canopy height in correlation with nutrient addition, but *L. ramosissimum* canopies were still significantly shorter than *J. carnosa*. Field observations indicated that the native amphipod habitat preference is for *L. ramosissimum*. Additional study with stable isotope tracers, evaluation of native amphipod and other insect species use, and decomposition rates will help to further establish ecosystem changes occurring as result of the invasion. This will also help us assess any further anthropogenic induced modifications on ecosystem changes.

***Eriogonum* hybrid eradication program on Santa Cruz Island, California: Eliminating one island endemic to protect another.** Cory, Colleen,^{1*} David Chang², Robyn Shea³ and John Knapp³, ¹The Nature Conservancy, ²Santa Barbara County Agricultural Commissioner's Office, and ³Native Range, Incorporated, Ventura, CA. *ccory@tnc.org 805-642-0345.

Santa Cruz Island buckwheat (*Eriogonum arborescens*) is a northern Channel Islands endemic shrub common in coastal scrub habitat on Santa Rosa, Anacapa and Santa Cruz islands. However, it is genetically threatened on Santa Cruz Island (SCI) by the introduction of *Eriogonum giganteum* var. *giganteum* which is endemic to Catalina Island. *E. giganteum* was introduced from Catalina to Santa Cruz in the late 1960s for landscaping around ranch buildings in the central portion of the island. Evidence of hybridization between the two species (*E. xblissianum*) was observed by 1972. The Nature Conservancy owns the portion of SCI where the Catalina buckwheat was introduced and has

opportunistically controlled non-native *Eriogonum* since the early 1980s. Following an island-wide weed survey in 2007, all mapped non-native *Eriogonum* populations, both the species and hybrids, were targeted for eradication and treated. Funding was secured in 2010 to systematically resurvey known infestations and the surrounding areas on-foot and from low-level helicopter flights. Approximately 10 new populations were found, and all individuals were treated with 100% Garlon 4 Ultra as a cut-stump method or were hand pulled. One hundred percent of the populations were detected from the air, while only 20% of those populations were detected from the ground, suggesting that aerial surveys are more accurate at detecting incipient populations than ground surveys. Additional surveys and treatment will occur in 2011. These actions are designed to protect and preserve the genetic integrity of this endemic island buckwheat species.

Use of non-native plants by island foxes: conservation implications. *Cypher, Brian**, *Alexandra Madrid, Christine Van Horn Job, Erica Kelly, Stephen Harrison, and Tory Westall.* California State University–Stanislaus, Endangered Species Recovery Program, Bakersfield, CA. *bcypher@esrp.csustan.edu

Endangered island foxes (*Urocyon littoralis*) occur on the six largest Channel Islands off the coast of southern California. Anthropogenic activities on the islands have resulted in the introduction of a number of exotic plant species. We examined fox foraging patterns during 2009 in part to determine use of non-native plants. Non-native fruits consumed by foxes included ice plant (*Carpobrotus chilensis*, *C. edulis*, *Mesembryanthemum crystallinum*, and *M. nodiflorum*), Australian saltbush (*Atriplex semibaccata*), and myoporum (*Myoporum laetum*). Ice plant was a primary food item for foxes (>10% frequency of occurrence in scats) during two seasons on San Clemente, three seasons on San Miguel, and all four seasons on San Nicolas. Saltbush was a primary food item during one season on San Clemente and Santa Rosa, and during two seasons on San Nicolas. Myoporum was a primary item during 1 season on San Nicolas. For all four seasons combined (i.e., annual diet), ice plant was a primary item for foxes on Miguel and Nicolas (41.8% and 35.0% of scats, respectively), and saltbush was a primary item on Nicolas (21.1% of scats). Although these plants are providing a benefit to foxes by increasing the diversity of available food items, these plants also may be excluding native species. Reducing or eliminating these non-native plants probably could be conducted without adverse impacts to foxes, with the exception of San Nicolas. On this island, foxes may be at least partially dependent on these

species, and any reductions should be conducted gradually and preferably in conjunction with active restoration of native species to provide alternate foods for foxes.

Linking vegetation dynamics with physical processes to develop invasive plant control and riparian restoration strategies for a semi-arid river and its floodplain. *Diggory, Zooney^{*}, Bruce Orr¹, Amy Merrill¹, Gretchen Coffman², William Sears^{2,3}, Peter Brand⁴*, ¹Stillwater Sciences, Berkeley, CA, ²University of California, Los Angeles and Santa Barbara, CA, ³San Francisco Public Utility Commission, San Francisco, CA, ⁴California Coastal Conservancy, Oakland, CA, *zooney@stillwatersci.com

The lower Santa Clara River (Ventura County, CA, USA) has been significantly altered by levees, water diversions, agriculture, invasive plant species, and urbanization that have altered natural physical and ecological processes, causing riparian habitat loss or degradation. The California Coastal Conservancy's Santa Clara River Parkway project seeks to ameliorate these impacts and conserve existing riparian habitats by acquiring and restoring a 25 mile-long floodplain corridor. Understanding the physical drivers for riparian vegetation distribution and composition is a crucial part of developing feasible restoration strategies for the Parkway project. We used a variety of analytical tools, including historical analysis, vegetation classification and mapping, and riparian dynamics analysis to elucidate the conditions and processes that shape vegetation distribution and composition. We found that the extent of riparian vegetation has been dramatically reduced by levees and floodplain development; that large areas of native riparian vegetation have been replaced by invasive, non-native species; and that longitudinal position, groundwater, time since last flood and relative elevation are the physical variables most strongly correlated with riparian plant species distribution. Our understanding of watershed conditions and vegetation response to physical variables allowed us to develop effective and feasible restoration strategies for the lower Santa Clara River Parkway, including: identification of priority areas for restoring floodplain connectivity, conserving native vegetation, as well as active (horticultural) and passive (process-based) revegetation; tools for developing site-appropriate planting palettes; and development of a strategy for non-native invasive plant species control.

Preventing invasion through mineral materials inspections. *Hutten, Martin* National Park Service, Yosemite, El Portal, CA. martin_hutten@nps.gov

The prevention of new introductions is a critical component of a comprehensive invasive plant management program. The import of contaminated sand and gravel for road construction projects provides a rapid and common way to introduce major new infestations. Yosemite National Park no longer operates its own quarries, and all mineral materials are now purchased from external sources. Many quarries in the outlying areas are heavily infested from which the park must be protected. Yosemite National Park is developing a gravel pit inspection and certification program that will be in full compliance with the national standards for weed-free gravel as developed by the North American Weed Management Association. Additionally, the program conforms to the California state mandate to control all A-listed noxious weeds as defined by the California Department of Food and Agriculture. While ultimately this project is a preventative measure to keep invasive plants out of the park, the program is conducted as an outreach service to gravel pits. The aim is to work collaboratively with gravel pit operators, providing the botanical skills and access to resources necessary for efficient and effective weed control. Successful participation in this program by gravel pits allows the sale of mineral material to Yosemite National Park and provides a marketable certificate that can increase the value of mineral materials. Similar programs are in place in the Lake Tahoe basin, Glacier National Park, and the greater Yellowstone area.

Trials of aminopyralid and a cut-and-dab method for Himalayan blackberry control. *Jones, Laura J.* and Martin Hutten.* Yosemite National Park, El Portal, CA. *laura_jones@nps.gov.

Himalayan blackberry (*Rubus armeniacus*) has gained a stronghold in many riparian areas throughout the western United States and Canada. Herbicide has been shown as an efficient and effective tool for Himalayan blackberry removal yet land managers sometimes must consider other natural or cultural resource issues that restrict its use. Some of these issues, such as off-target kill of desirable native plants or contamination of water may be mitigated with a selective herbicide or a targeted application technique. Here, we report first-year results of two of these mitigation measures—the use of aminopyralid, a selective herbicide, and application of glyphosate using the cut-and-dab method—as well as a foliar application of glyphosate for use in Yosemite National Park. Reduction of Himalayan blackberry

density and cover occurred in all three treatments compared with the control. We observed that the aminopyralid treatment was highly effective at some sites and only marginally effective at others. These results suggest that there are unknown factors affecting the efficacy of aminopyralid such that we need further field experimentation before using on a wider scale. The cut-and-dab method was effective but was time-intensive compared with foliar application. The cut-and-dab method therefore offers a promising mitigation tool for sites that require special consideration.

Herbicide control of velvet grass in Yosemite National Park. *Hutten, Martin, Laura Jones*, Garret Dickman, and Caroline Nelson.* Yosemite National Park, El Portal, CA. *laura_jones@nps.gov.

Wetland ecosystems are in constant flux, making them particularly susceptible to weed invasions. Once established, wetland weeds tend to spread quickly because of high habitat connectivity and animal usage. Common velvetgrass (*Holcus lanatus*), a perennial European grass noted as a prolific seed-producer, has invaded many highly-valued wet meadows in Yosemite National Park (YOSE). Three years of manual treatment of *H. lanatus* in YOSE did not lead to notable long-term improvements and were very time-intensive. Furthermore, manual methods cause soil disturbance that may activate the *H. lanatus* seed bank. Chemical treatment of velvet grass may provide better control because of the greater efficacy of herbicide and because the plants can be removed without soil disturbance. To evaluate the efficacy of herbicide and effects on the plant community we conducted a field study comparing glyphosate treatment with a control. Preliminary observations indicate that velvet grass plants may have had lower survival in the herbicide-treated plot than the control. However, velvet grass was still present in the treated plots and velvet grass cover was not significantly reduced. Plants in the treated plots appeared to be regenerating from both seed and rootstock. These results indicate that the seed bank was quite active and that some plants experienced “top-kill” in which the high concentration of herbicide worked only to kill the above-ground biomass. Based on these findings, our prescription recommendations are to 1) Treat velvet grass before seed-set and 2) Test lower herbicide concentrations such that the herbicide can translocate to the roots and affect the whole plant.

Adaptive integrated vegetation management of invasive *Spartina densiflora* in the San Francisco Estuary. Kerr, Drew.* State Coastal Conservancy Invasive *Spartina* Project, Berkeley, CA. drew@spartina.org

Spartina densiflora (Chilean cordgrass) was introduced to Creekside Park along Corte Madera Creek, Marin County in the 1970's as part of a restoration effort. It had been misidentified as native *Spartina foliosa* (Pacific cordgrass) and was subsequently imported from Humboldt Bay where it infests more than 2000 acres after dry ballast was deposited there during the timber trade with South America in the 19th Century. By 2004, *S. densiflora* dominated the marsh at Creekside Park and had spread to 12 other marshes in Marin as well as Point Pinole and Mare Island across the North Bay. The Invasive *Spartina* Project and Friends of Corte Madera Creek Watershed began treatment on these infestations in 2004-2006, relying predominantly on imazapyr application in the initial years to gain control of the problem while also digging isolated plants and outliers with the Conservation Corps. Until receiving an amendment to the Biological Opinion in 2008, entry into many infested marshes was restricted until the end of endangered California clapper rail breeding season on September 1. Since *S. densiflora* sets seed by early July, that initial timing made it impossible to stay ahead of the infestation. In addition, imazapyr produced extremely variable results, especially on established meadow areas and on small plants with less leaf surface area. Mowing the persistent dead biomass remaining at meadows of previously-sprayed *S. densiflora* allowed for fresh green growth that could identify targets for retreatment with imazapyr or digging. Despite these considerable challenges, the annual imazapyr treatment significantly reduced the infestation, allowing the IVM strategy to shift by 2010 to purely manual removal by ISP biologists at 93% of the sites.

Contrasting effects of *Carpobrotus edulis* on arthropods in a coastal dune ecosystem. Knapp, Denise A.* University of California-Santa Barbara Dept. of Ecology, Evolution, and Marine Biology, Santa Barbara, CA. *dknapp@lifesci.ucsb.edu

Highway iceplant (*Carpobrotus edulis*) is known to have numerous impacts on the habitats that it invades, including reducing native plant species cover, stabilizing dunes, decreasing soil pH, and increasing litter biomass. Yet little is known about its effects on the arthropod fauna, which is a critical component of biodiversity and ecosystem function. Abundance and richness of both below- and above-ground arthropod assemblages were compared between invaded and undisturbed native backdune habitat at Coal Oil Point Reserve in

February and May of 2010 utilizing both sand sifting and yellow-pan traps. Consistent with predictions, below-ground arthropods were significantly less abundant in iceplant habitat than in intact habitat in February (Student's t-test, n=16, p=0.002), and May (Student's t-test, p=0.02). Order-level below-ground arthropod richness was significantly lower in iceplant habitat in February (immatures excluded; Student's t-test, p=0.028), but not in May. Contrary to predictions, aerial arthropods were significantly more abundant (aphids excluded; Wilcoxon signed-rank test, p=0.02) and order-level richness was significantly higher (Student's t-test, p=0.015) in iceplant habitat than in intact habitat in February. Again, there was no significant difference in May. Differences in composition (family and morphospecies level) and function will also be presented. Future work will include a comparison across multiple coastal dune sites.

Santa Clara River Research Station: Developing a preserve with a watershed focus. Lambert, Adam. M.* and Tom L. Dudley. Marine Science Institute, University of California, Santa Barbara, CA. *lambert@msi.ucsb.edu

The Santa Clara River is one of the few major river systems in the State which retains much of its natural hydrology and provides the ecosystem functions necessary to sustain more than 17 listed endangered species within its watershed boundaries. It is because of these environmental opportunities juxtaposed with anthropogenic threats that the California Coastal Conservancy and The Nature Conservancy have designated protection, habitat restoration and ecosystem management of the Santa Clara River as a conservation priority. Thus, there is increasing recognition of the need for a central facility and locally-based capacity to promote and co-ordinate research, restoration and monitoring activities within the watershed, and to develop public education programs that convey environmental science information about the watershed to schools and the general public. In partnership with government and nongovernment organizations, and private landowners throughout the region, we are working toward a multi-disciplinary, permanent research station and ecological reserve comprised of satellite locations throughout the watershed focused on research and education, invasive species management, riparian restoration, and providing science-based resources to managers, policy-makers and the public.

The spread and control of *Dittrichia graveolens*. Marriott, Meg. USFWS, 9500 Thornton Avenue, Newark, CA, 94560. Meg_Marriott@fws.gov

This poster summarizes the current information available on *Dittrichia graveolens*, a Cal-IPC

designated red alert species whose range is rapidly expanding in California and elsewhere. First recorded in California in 1984, this plant invades disturbed areas throughout many habitat types including marsh/upland ecotones. It poses a potential threat to wildlife habitat as it forms dense stands/monocultures that can choke out native competitors. This poster presents background information on *D. graveolens*, as well as a biological summary and an in-depth discussion of techniques and methods for control.

Avian response to *Arundo donax* invasion on the Lower Santa Clara River. Orr, Devyn A. University of California-Santa Barbara Marine Science Institute, Santa Barbara, CA. devyn@umail.ucsb.edu

Arundo donax is among the top invasive plant species degrading California's riparian ecosystems. While previous studies have examined the effects of other exotics, such as *Tamarix spp.*, on riparian systems of the American Southwest, relatively little is known regarding the wildlife implications resulting from *A. donax* invasion, despite the scale of resulting habitat transformation. In 2009, I began an avian monitoring study to assess the habitat value of *A. donax* stands relative to native vegetation types (primarily *Salix spp.*). Habitat value was determined by abundance of individuals and diversity of species present. I conducted point count surveys at two sites on the Lower Santa Clara River, Ventura Co., once a month from May through August. Each site contained an equal distribution of points among *A. donax* (over 70 percent cover), mixed *A. donax* and natives, and natives (over 70 percent cover). Preliminary results show diminished species diversity and fewer total individuals in *A. donax* relative to native stands, with intermediate diversity in mixed patches. I intend to continue this study and use results to inform river restoration efforts to maximize habitat value for vulnerable avian populations present in this system, including the Least Bell's Vireo, Yellow-billed Cuckoo, and Southwestern Willow Flycatcher.

Using native shrubs to control re-establishment of giant reed (*Arundo donax*). Palenscar, Kai T.* and Jodie S. Holt. University of California-Riverside Dept. of Botany and Plant Sciences, Riverside, CA. *kpale001@ucr.edu

Giant reed (*Arundo donax*) is a hydrophytic invasive grass found widely in southern California riparian ecosystems. Common methods of control include both mechanical and chemical means. Research is underway to test cultural control methods for giant reed as a component of active restoration. Our objective is to test competitive control by native shrub species as a means of inhibiting the re-establishment of giant reed.

Sandbar willow (*Salix exigua*) and mulefat (*Baccharis salicifolia*) were planted during spring 2009 from whip cuttings at various densities and allowed to establish for 0 or 90 days prior to the introduction of giant reed within an irrigated field at the University of California, Riverside. A second replicate field was planted in fall 2009 adjacent to the first field in order to test seasonal differences in *Arundo* establishment. It was found that mulefat significantly reduced the relative growth rate (RGR) of giant reed at all planting densities within the spring 2009 harvests, whereas sandbar willow displayed limited competitive effects even under high planting densities (9/m²). These results demonstrate the differences between the competitive effects of native species, potentially influencing land managers' decisions on restoration designs. Results from the fall 2009 harvests suggest similar findings and dry biomass will be ready for RGR analysis shortly.

Prioritizing invasive plant eradication in the San Francisco Bay Area. Perlmutter, Mike,¹ Aviva Rossi,¹ Andrea Williams,² and Dan Gluesenkamp,³.¹Bay Area Early Detection Network (BAEDN), 1812 9th Street Berkeley, CA 94710. ²Marin Municipal Water District, 220 Nellen Avenue, Corte Madera, CA 94925. ³Audubon Canyon Ranch, 4900 Highway One, Stinson Beach, CA 94970. *Mike@BAEDN.org

The Bay Area Early Detection Network (BAEDN) coordinates Early Detection & Rapid Response (EDRR) to infestations of invasive plants throughout the nine county San Francisco Bay Area, proactively dealing with new outbreaks before they can grow into large and costly environmental threats. This strategy is applied to regional eradication of invasive species from the Bay Area, the feasibility of which, will be higher the earlier eradication is conducted and the less established and widespread target species are. Limited-distribution invasive species in the Bay Area were identified by analyzing occurrence records within the Calflora database. These were then prioritized according to an abbreviated weed risk assessment model with supplemental expert opinion from throughout the region. This species assessment folded in state-wide eradication targets of the California Department of Food & Agriculture (CDFA) and included information on known invasiveness, impacts, reproductive biology, and feasibility of treatment. The results of this analysis comprise a priority early detection species list for the San Francisco Bay Area and are being applied to early detection efforts around the region. We then prioritize populations of high-priority species for eradication using a new tool: *Weed Heuristics: the Invasives Population Prioritization for Eradication Tool* (WHIPPET) - that

prioritizes eradication targets based on relative impact, invasiveness, and feasibility of eradication. The protocols for both prioritization systems (species and populations) will be addressed, as will initial reports from the field, and next steps for refining this model in the Bay Area and transferring it to other scales and regions.

Predicting the spread of invasive plants in the Sierra Nevada. Powell, Cynthia, Elizabeth Brusati, and Falk Schuetzenmeister. California Invasive Plant Council, 1442-A Walnut St. #462, Berkeley, CA 94709. *edbrusati@cal-ipc.org, cpowell@cal-ipc.org

The Sierra Nevada will likely be heavily impacted by climate change. Temperatures may rise as much as 3°C over the next decades and more extreme precipitation events will be likely. These changes would shift suitable habitats of invasive plants toward higher elevations. Land managers need to know which invasive plants are most likely to spread into their region in order to make decisions about where to most effectively spend time and money for control and eradication efforts.

In the past, Cal-IPC mapped abundance and spread for 35 invasive plants by expert opinion of land managers for all California counties divided in Jepson regions. We then projected areas of suitable habitat under current and future climate conditions. We are now mapping and modeling the spread of an additional 30 species, focusing on plants that are of concern for early detection in the Sierra Nevada. We are using MaxEnt a program that uses the maximum entropy principle to produce more detailed models using a 4 km and a 800m raster (2.5' and 30").

Using occurrence data in MaxEnt, we predicted areas with a high probability of suitability for these species under current and future (2080) climate conditions. Information from the native range and other invaded ranges will also be incorporated into these models. While this project focuses on the Sierras, we will develop models for all of California.

Our poster includes preliminary results for some of these species. We ask for your feedback on how we should present our results so that they can be most useful for your work in the field. The completion of the project will include watch lists for WMAs (Weed Management Areas) in the Sierra Nevada.

Successful tactics for controlling invasive fennel (*Foeniculum vulgare*) on Santa Cruz Island, Channel Islands National Park. Power, Paula*, Roberts, James R., Clark Cowan, and Rocky Rudolph. Channel Islands National Park, Ventura, CA. *paula_power@nps.gov

Santa Cruz Island, largest of the islands in Channel Islands National Park, is home to many endemic and rare plants and animals. Past management practices resulted in extensive disturbance of native plant communities and vast areas highly susceptible to invasion by non-native species. After the removal of sheep and cattle from the island during the 1980s and 1990s, the invasive fennel (*Foeniculum vulgare*) was the first species to colonize overgrazed areas. The park has undertaken an aggressive effort to control outlier populations of fennel on the east end of the island to provide a window of opportunity for the recovery of native vegetation. As part of the effort native seed was broadcast into randomly placed plots in areas where fennel treatment is on-going. Data collected from treatment plots provide a measure of the effectiveness of the fennel treatment, an indication of the extent of the seed bank, and the value of seeding into treated areas. An effective treatment method for fennel, predicting future needs for fennel control, and native plant recovery efforts will be presented.

Effects of exotic mustard on native insect communities in California grassland. Schreck, Tadj K.* and Kailen Mooney. University of California-Irvine Dept. of Ecology and Evolutionary Biology, Irvine, CA. *tschreck@uci.edu

Invasive plants are known to affect native plants, but little is known about how exotics affect higher trophic levels. In particular, the effect of exotic plants on insect communities is poorly understood. Most work connecting invasive plants to insect communities considers these interactions from the perspective of biological control (e.g. the Biotic Resistance Hypothesis or the Enemy Release Hypothesis). Because insects represent the majority of animals found in an ecosystem, it's crucial that we understand these interactions. In Southern California, Black Mustard (*Brassica nigra*) has invaded Grassland and Coastal Sage Scrub communities. Few plants can grow with Black Mustard without high fitness costs. In a one-season common garden experiment, we sought to understand how Black Mustard affects the insect communities found on the co-occurring native species, *Deinandra fasciculata*. Native *D. fasciculata* individuals were grown with and without Black Mustard. Insects were surveyed on *D. fasciculata* at peak flower, using visual counts. Growth and fitness were measured for both *D. fasciculata* and Black Mustard. Because Black Mustard tends to lower plant fitness and may lower plant allocation to defense against herbivores, we expect to find a greater abundance of insects on the plants grown with mustard. However, we expect there to be a higher diversity of insects on the plants grown

without mustard because these plants will allocate more resources towards defensive chemicals, attracting a more diverse specialist insect community. In summary, we expect that Black Mustard may increase herbivore abundance on natives, but at a cost to insect diversity.

An evaluation of flooding risks associated with giant reed (*Arundo donax*). *Spencer, D. F., USDA ARS, Davis, CA, david.spencer@ars.usda.gov or dfspencer@ucdavis.edu*

Arundo donax may grow directly in a watercourse. Existing reports indicate that it constricts flows and alters hydrological regimes. However, there is little data with which to quantitatively gauge its direct impact on water movement within streams and channels. We determined the roughness coefficient for *Arundo donax*. This information was supplied to the HEC-RAS model in conjunction with data from three stream reaches. Two stream reaches were within Cache Creek (Yolo County, CA) and one was within Stony Creek (Glenn County, CA). Simulation results show that *Arundo donax* within a stream channel has a direct effect on flooded area. Storm size and vegetation density directly increase the flooded area. However, it appears that *Arundo donax* growing within the low flow portion of the channels studied for this project does not dramatically increase the flooded area, no matter the density or flow. This study points toward the importance of understanding the effects of *Arundo donax* within the channel. Results could be used in conjunction with other studies or natural resource conditions, such as soil type, to help prioritize projects aimed at *Arundo donax* removal. The results from this study indicate that large channels that are braided in nature, but have the majority of *Arundo donax* growing only within the low flow portion of the channel, might be ranked lower than other stream reaches that show significant changes in flood areas due to the presence of *Arundo donax*.

Developing time-temperature inactivation models for thermal death of black mustard (*Brassica nigra*) seeds. *Betts, Stacy¹, Ruth Dahlquist², Megan Marshall², Jean VanderGheynst³, Carrie Tuell-Todd⁴, and James Stapleton^{4*}.*
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Many of California's native plants and wildflowers are being out-competed by invasive weed species. Solarization is a nonchemical method of that can

provide an environmentally friendly alternative for inactivating weed propagules, as well as certain other pests. However, information is lacking on the duration of solarization treatment and temperatures required to control various weed species. We determined the time required for mortality of black mustard [*Brassica nigra* (L.) Koch] seeds at constant temperatures of 42, 46, 50, and 54 C. Seeds were placed in organandy bags and allowed to imbibe water at room temperature for 2 hours before heat treatment. Seed bags were placed in jars filled with sand wetted to field capacity, maintained at constant temperature in a water bath, and removed at several time intervals for each constant temperature. After removal from the jars, seeds were incubated in a growth chamber, and germination percentages were determined after 14 days. At sampling times with 0% germination, seeds with intact seed coats were confirmed as nonviable using a tetrazolium test. Seed samples reached 100% mortality by 3 hours at 54 C, 9 hours at 50 C, and 240 hours at 42 C, and 97% mortality at 57 hours at 46 C. Nonlinear models were developed to estimate seed mortality as a function of heat treatment duration and temperature. These models have potential applications for predicting mortality of black mustard seeds during solarization, and other heat-based treatments, in the field.

Invasive pine tree impacts on coastal scrub vegetation in the Marin Headlands. *Steers, Robert*, Jen Jordan, James Cartan, and Kaitlyn Hacker.* National Park Service, Inventory and Monitoring Program, Fort Cronkhite Bldg 1063, Sausalito, CA 94965. *robert_steers@nps.gov

In southern Marin County, large expanses of coastal scrub vegetation have been colonized by Monterey pine (*Pinus radiata*) cultivars. To determine the impact of pine invasion on coastal scrub vegetation, floristic surveys were conducted in 20 blocks that consisted of invaded and uninvaded plots. An invaded plot contained two subplots located under the canopy of an isolated Monterey pine while a paired, uninvaded plot contained two subplots located in coastal scrub adjacent to each pine. Pine trees utilized ranged in size from 2.8 to 119 cm basal diameter. Our results showed that understory native cover and species richness decreased linearly as trees increased in size. Also, the cover and depth of litter found in the understory, which was mostly composed of pine needles, were positively correlated with tree size. Understory exotic plant cover and richness of species other than Monterey pine did not show any correlation with tree size. When comparing invaded (Monterey pine understory) versus uninvaded coastal scrub based on size classes of trees, only the understories of medium- (16 – 40

cm basal diameter) and large-sized trees (41 – 120 cm) exhibited lower native cover and species richness. Coastal scrub under small trees (2 – 16 cm) did not differ compared to paired, uninvaded scrub. Thus, removing Monterey pines before they reach a size of around 16 cm basal diameter will likely minimize negative effects from individual trees. However, removal of larger trees is also important for numerous reasons, one of which is to limit recruitment.

Prescribed burning controls barb goatgrass (*Aegilops triuncialis* L.) in Central Valley rangeland for up to five years. Marty, Jaymee T¹, Sara Sweet^{*1}, and Jennifer J Buck². ¹The Nature Conservancy, Sacramento, CA. ²California Native Plant Society, Sacramento, CA. *ssweet@tnc.org

Barb goatgrass (*Aegilops triuncialis* L.) is an invasive annual grass from the Mediterranean region that can strongly decrease both native plant biodiversity and the forage value of grasslands in California. The Cosumnes River Preserve has used fire as a grassland management tool to control invasive grasses like barb goatgrass and to enhance biodiversity. In June 2005, The Nature Conservancy and CAL FIRE conducted a 120-ha prescribed burn at the Howard Ranch, a cattle ranch near Lone, CA. We established four, paired study plots in burned and unburned areas to measure the response of the plant community to the fire. Additionally, we tested for percent germination of goatgrass seeds in burned and unburned plots. One year after the burn, goatgrass cover in burned plots was 3% compared to 21% in unburned plots. This reduction in goatgrass cover was still strong two years after the burn (burned = 6%; unburned = 27%) and weaker, but still significant for another three years. The burn also reduced percent germination of goatgrass seed by 99%. The native plant community responded positively to the burn treatment in the first year following the burn with 33% native cover in burned plots versus 13% cover in unburned plots, but the effect was not detectable in subsequent years. Our study shows that a single springtime burn can result in a short-term boost in native species cover, reduced seed germination of barb goatgrass to near zero and reduced cover of barb goatgrass for up to five years after the burn.

Effects of the invasive species *Arundo donax* on bank stability in the Santa Clara River, Ventura, CA. ¹ten Brinke, Jiana, ¹Edward Keller, and ²Tom Dudley. University of California-Santa Barbara. ¹Dept. of Earth Science and ²Marine Science Institute, Santa Barbara, CA. *jiana@umail.ucsb.edu, 530-902-5029

The spread of *Arundo donax* in freshwater coastal systems in the western US poses a major threat to

ecosystem and river stability. While the effects of *A. donax* on biotic systems has been well documented, there is no quantification of the physical effects. Based on observations in the field, it is hypothesized that *Arundo* may lead to massive cantilever type failures as the bank gets undercut due to the shallow root system of *Arundo*. This study found that, when compared to a common native riparian species, Red Willow (*Salix laevigata*), there is a significant difference between the distribution and tensile strength of their roots systems. *Arundo donax* has more roots and occupies more area in the stream bank than Red Willow in the top 10cm. This relationship reverses below 10cm depth in the bank, where Willow has more roots and occupies more area compared to *Arundo* (down to 100 cm depth). A linear regression of root diameter (mm) to tensile strength (MPa) shows that *Arundo* is stronger for root sizes between 0.1 and 3.0 mm. On average, for root sizes between 0.5 and 3.0mm, *Arundo* is 40% stronger than Willow. A regression between diameter and tensile strength for *Arundo* and Willow produced coefficients of determination (r^2) of 0.24 and 0.20, respectively. Overall, this study shows that *Arundo donax* contributes more to bank cohesion when bank height (bh) is small ($0 < bh < 20\text{cm}$) than Red Willow. However, as bank height increases, *Arundo* provides little or no cohesion at lower depths in the bank compared to Red Willow and, therefore, may lead to greater destabilization of the bank through undercutting, and subsequent cantilever failure.

Can carbon addition be used to reverse the effects of atmospheric nitrogen deposition?

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Soil deposition of air-borne nitrogen originating from automobile exhaust has a detrimental effect on serpentine grassland because it stimulates the growth of non-native annual grasses, to the competitive disadvantage of native plants. The addition to the soil of a labile form of organic carbon, such as sucrose, has been shown to reduce plant-available nitrogen and inhibit the growth of these grasses more than that of native perennial bunchgrasses. I conducted an experiment to test the effect of carbon addition on the growth of annual grasses in test plots to which nitrogen fertilizer was applied to simulate atmospheric nitrogen deposition. The test was carried out in serpentine grassland in the Peninsula Watershed of the San Francisco Public Utilities Commission. There were four treatments: control (no sucrose and no nitrogen), addition only of sucrose, addition only of nitrogen and addition of both sucrose and nitrogen. I found that addition of carbon to unfertilized test

plots significantly reduced mean dry weight (at the 0.05 level), indicating the efficacy of applying labile carbon amendments. This effect was also found for test plots that were fertilized with nitrogen. However, because there was no significant difference in dry weight between the control treatment and the treatment of only adding nitrogen, it was not possible to demonstrate that carbon addition reversed a stimulatory effect of increased nitrogen. Though these results were inconclusive, this method should be further explored to evaluate its utility in the restoration of serpentine grassland habitat degraded by atmospheric nitrogen deposition.

Mapping flammable invasive weeds in the South Shore area of Lake Tahoe. *Jan Turner*, Tahoe Resource Conservation District, South Lake Tahoe, CA iturner@tahoercd.org

Deforestation and erosion due to wildfire are major concerns to land managers and stake holders in the Tahoe Basin. Lake Tahoe's famous clarity could be comprised if a wildfire were to contribute high amounts of sediment to this fragile ecosystem. Additionally, the threat of wildfire to private, public

and commercial properties could be elevated if a vegetation component of flammable invasive weeds were to establish itself in the Basin. The objective of this study is to map three invasive weed species that pose a fire risk: medusahead (*Taeniatherum caput-medusae*), cheatgrass (*Bromus tectorum*) and broom (*Cytisus*) species. Both cheatgrass and Broom species can be found in the Tahoe Basin; medusahead has yet to be documented in this area.

We intend to focus our surveys and mapping on "high priority" areas— areas within the Tahoe Basin that have been deemed "at risk" of invasion (i.e. meadows) and locations at the urban/wildland interface. In 2010 this study may be limited to the South Shore region of the Tahoe Basin (South Lake, Stateline, and Myers), with plans to expand Basin wide in the future. Mapping in the area affected by the 2007 Angora Fire will also be of high priority to this study. Weed infestation in this disturbed area will undermine revegetation efforts and potentially set the stage for an elevated wildfire risk.

Results of study forthcoming; mapping is in progress.

JOIN US NEXT FALL IN TAHOE FOR CAL-IPC'S 20TH ANNIVERSARY!

Cal-IPC 2010 Discussion Groups

Thursday 4:00-5:20pm (All rooms are on the first floor.)



Mobile Technologies for Weed Management

Room: Santa Rosa

Leaders: Christy Brigham, NPS Santa Monica Mountains National Recreation Area, Dan Gluesenkamp, Bay Area Early Detection Network

For those who would like to learn more about implementing mobile phone technologies, Christy and Dan will lead a discussion that follows up from their morning session talks. They will discuss: use of mobile phones in early detection efforts; strategies for volunteer engagement and volunteer-led surveying; and workflows that integrate these tools in mapping and treatment tracking by natural resource managers.

A Management Decision Tool for Perennial Pepperweed

Room: Santa Cruz

Leaders: Christine Whitcraft, California State University - Long Beach and Bill Winans, San Diego County Department of Agriculture

During the San Francisco Bay NERR/ Solano Land Trust / Coastal Conservancy *Lepidium latifolium* (LELA) symposium series in Fall 2008, the organizers and participants identified a series of important projects that would improve the state of knowledge about LELA and would also help direct management efforts. The decision guide is an attempt to streamline decision-making about control/treatment of LELA by managers and landowners. It highlights important characteristics of the habitat (e.g. plant biomass, height, soil parameters, native plant composition) that should be considered when deciding on a treatment course.

In addition, a case study in San Diego County and the Weed Management Area's (WMA) experiences with grazing, mowing and herbicide treatments on *Lepidium latifolium* within a flood plain setting and habitat for several listed species.

Weed Free Sand and Gravel

Room: Anacapa

Leaders: Martin Hutten, Yosemite National Park, and Peter Beesley, PG&E

Erosion control materials such as hay and straw used for construction projects or sand and gravel hauled in for road construction and maintenance projects are frequently contaminated with invasive plant seeds. Due to the soil disturbance associated with these projects, large new infestations can rapidly establish and overwhelm our capacity for control. Such mishaps are common; bring your stories and hear about others. But why are there so few efforts nationwide that effectively address this problem? What programs are operating successfully? Come join us to discuss how we can work with regulators and material suppliers to increase the availability of weed-free materials. Bring your ideas, experiences and questions!

Communicating Your Message

Room: Buena Ventura

Leader: Yvonne Menard, Channel Islands National Park

This discussion session is designed for weed workers and researchers who receive inquiries from the media and the general public about invasive plant and related resource management issues. Although we are trained in weed management and research, most of us have less experience with outreach to convey our message about invasive species issues, including new invasions, controlling invasions, regulatory issues, volunteer opportunities, and others. Yvonne Menard, Chief of Interpretation and Public Information Officer for Channel Islands National Park, will lead a discussion to point out the kinds of questions frequently asked by members of the media and the public, and the level of detail and background information required to help weed workers prepare responses and presentations.

Cal-IPC 2010 Discussion Groups

Friday 1:30-3:00pm (All rooms are on the first floor.)

Designing Restoration Projects to Meet Invasive Plant and Wildlife Goals

Room: Santa Rosa

Leader: Tom Dudley, UC Santa Barbara

We will convene a discussion in which participants can share the conflicts they we have had when implementing weed control projects in which there are wildlife use concerns. Such conflicts are particularly problematic when confronting invasive species that have major ecological effects on ecosystems and have a large areas extent, for example in the management of widespread dominant invaders such as *Tamarix* and *Arundo*. We will use these species as a launching point to compare and contrast approaches that have...or have not...worked for others in the discussion group.

Minimizing Non-Target Impacts of Herbicide Use

Room: Santa Cruz

Leaders: Susan Kegley, Pesticide Research Institute, and Mark Lea, San Luis Obispo Co. Agricultural Commissioner's Office

The use of herbicides to control invasive vegetation can have an impact on a variety of non-target species-- plants, birds, small mammals, aquatic species and people who may be exposed to herbicides. In this group, we will discuss methods for eliminating or mitigating these impacts, and provide strategies for weed control for those situations where effects cannot be mitigated. Please bring your ideas and your success (and disaster) stories as well!

Job Skills for Natural Resource Management and Tailoring Your Resume to a Job Announcement

Room: Buenaventura

Leaders: Cal-IPC Student Chapter. Panel: Jutta Berger, Irvine Ranch Conservancy; Brent Johnson, National Park Service; Julie Horenstein, California Dept. of Fish & Game; Shea O'Keefe, National Resource Conservation Service; Marc Blain, BonTerra Consulting

This is a discussion for current and recent students who are or will be on the job market, and are interested in invasive species management and related natural resource management positions. Managers from private and public agencies will describe what they are looking for in an employee. This will include descriptions of the kinds of jobs available and what education levels are required, what skills are needed, what students should bring from their educational and other experiences, what skills would be learned on the job, and what information a resume should include.