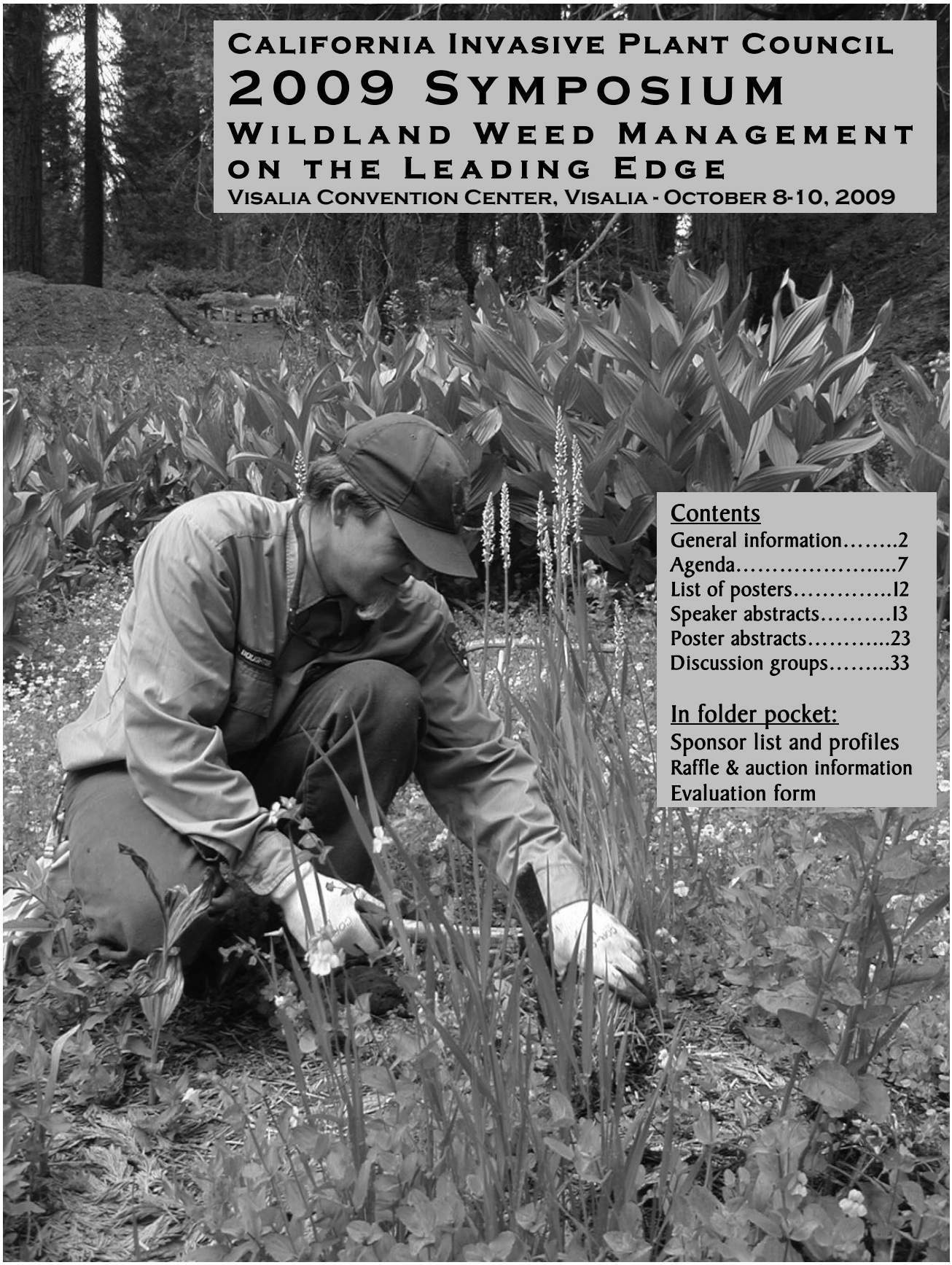
California Invasive Plant Council
2009 Symposium
Wildland Weed Management on the Leading Edge
Visalia Convention Center, Visalia - October 8-10, 2009



Contents

In folder pocket:

Sponsor list and profiles
Raffle & auction information
Evaluation form

Canarygrass (*Phalaris arundinacea*) removal from wet meadow at Kings Canyon National Park
Photo: Athena Demetry, National Park Service

Welcome to the 18th 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 2010 membership, joining 1000 fellow members in 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 Charter Oak AB and CD of the Visalia Convention Center. Posters are located in the San Joaquin Rooms. Discussion groups will be held in Charter Oak CD, Sequoia A and B, and Mineral King; 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 Rich Minnich of UC Riverside in presenting his new book, *California's Fading Wildflower: Lost Legacy and Biological Invasions*. His book casts new light on the historic prominence of forbs in the state's ecosystems, and the devastating impact of invasive plants throughout California.

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 San Joaquin Room. 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 at the Marriott Hotel, Sierra Nevada Ballroom, followed by the Awards Banquet and Auction in the Charter Oak Ballroom within the Visalia Convention Center. 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 Brewbaker's, 219 E. Main St., between N. Garden St. and N. Court St., to discuss ideas for student involvement in Cal-IPC. (Lunch is free for students.)

Saturday Field Trips: All field trip participants should meet in the Plaza Courtyard between the Convention Center and the Marriott at 7:45 am Saturday morning. Transportation will be provided for the Grand Weed Tour of Sequoia-Kings Canyon Park. Participants of the Kaweah Oaks Preserve & Atwell Island and the Winning Public Support: Sequoia National Park trips will carpool (maps will be provided). Lunch is provided for all 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)? Or preview a selection of raffle items and purchase raffle tickets in advance. Visit our sales table in the Charter Oak AB. 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 Registration for attendance sheets and scantron forms. Keep the codes and hours listed below for your records.

Codes and hours:

Field Course	5.0 hrs. Other	Code A-II30-09
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 and turn in a separate scantron for that session.** If not attending the Laws and Regulations, you may receive Other credit.	
	4.5 hrs. Other + 2.0 hrs. Laws & Regs. or 6.5 hrs. Other	Code A-II27-09
Friday	6.0 hrs. Other	Code A-II28-09
Saturday Field Trips	4.0 hrs. Other	Code A-II29-09

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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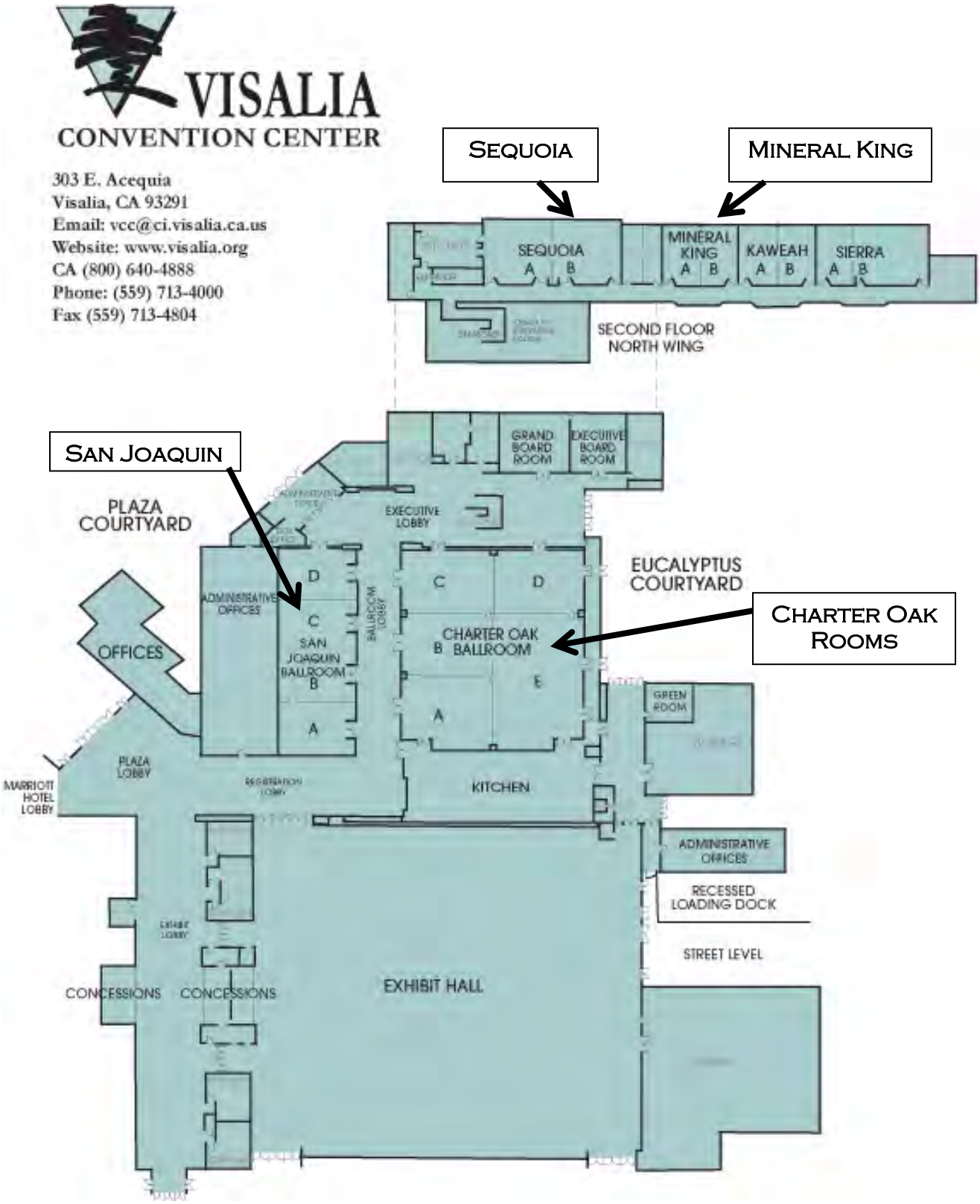
Visalia Convention Center Map



California Invasive Plant Council

2009 Symposium

"Wildland weed management on the leading edge"

✂ = sessions of special interest to students, * = presenter

All sessions are at the Visalia Convention Center unless otherwise noted.

Wednesday, October 7

9:00-5:00 **Herbicide Control Methods Field Course.** Exeter Women's Club and Kaweah Oaks Preserve

Thursday, October 8

7:30 **Registration & Breakfast.**

Session 1 –Weed Management on the Leading Edge. Charter Oak AB. Moderator: Cheryl McCormick.

9:00 From foothills grasslands to alpine peaks: Managing weeds at the leading edge in Sequoia and Kings Canyon National Parks, *Athena Demetry, Sequoia and Kings Canyon National Parks*

9:30 Managing the leading edge: Landscape-level control of invasive plant spread in the Sierra and beyond. *Wendy West, UC Cooperative Extension, El Dorado Co.*

10:00 The roles of animals and disturbance in plant invasion: Lessons from the Carrizo Plain, *Paula Schiffman, CSU Northridge*

10:30 **Break**

11:00 **Annual Membership Meeting.** Charter Oak AB
Executive Director's report, *Doug Johnson*
Board of Directors report, *Jason Giessow, Cal-IPC Board President*
Weed Alerts! *Joe DiTomaso, UC Davis*

Keynote Address
California's fading wildflowers: Lost legacy and biological invasions, *Richard Minnich, UC Riverside*

12:00 **Lunch** (provided). Charter Oak AB

1:00 **Session 2 - Posters & Exhibits.** San Joaquin
Posters listed on page 12. Talk to poster presenters about their projects and visit sponsor booths. The Student Poster entries are also in this room.

✂ **Session 3 – Student Paper Contest.**
Charter Oak CD.

2:00 Evaluating the potential for spread of an invasive forb, *Limonium ramosissimum*, in San Francisco Bay salt marshes. *Gavin Archbald*, Katharyn Boyer. San Francisco State University*

2:20 Experimental test of different treatments for control of terracina spurge (*Euphorbia terracina*): Comparison of hand pulling, glyphosate, and chlorsulfuron. *Erin Avina[1,2]*, Ann Dorsey[2], and Christy Brigham[2]. [1]CSU*

Session 4 – DPR Laws & Regulations.
Charter Oak AB. Moderator: David Chang. *Provides 2.0 hrs. Laws & Regs. credit for licensed applicators.*

2:00 Laws and regulations pertaining to the sale and movement of noxious weeds in California. *Kate Filippini, CA Dept. of Food & Agriculture*

2:30 The importance of vouchering for plant identification. *Fred Hrusa and Dean Kelch*, CA Dept. of Food & Agriculture*

Northridge, [2]National Park Service

2:40 Exotic grass and forb control in a California grassland. *Sara Jo Dickens* and Edith Allen. UC Riverside*

3:00 Urban invasions: Analyzing recovery of habitat fragments in San Francisco following the removal of *Genista monspessulana* and *Delairea odorata. Rachel Kesel, University College London*

3:20 Soil moisture stress tolerance of the leading biofuel *Miscanthus giganteus* is similar to the invasive weed *Arundo donax. Jeremiah Mann*, Jacob Barney, Guy Kyser, and Joe DiTomaso. UC Davis*

3:40 Evening the odds: Evaluating the combined effects of nitrogen fertilization and exotic annual removal on native annual forbs in the Colorado Desert. *Heather Schneider* and Edith Allen. UC Riverside*

3:00 Yeah, but what would Aldo think? A look at herbicide ecotoxicology. *Joel Trumbo, CA Dept. of Fish & Game*

3:30 Pesticide "Jeopardy!" *with your host David "Alex Trebek" Chang, Santa Barbara Co. Ag. Commissioner's Office*

4:00 **Break**

Session 5 – New Tools.
Charter Oak AB. Moderator: Ramona Robison

4:30 Developments in Herbicide Ballistic Technology. *James Leary, University of Hawaii at Manoa*

4:50 WeedSearch: A new tool for estimating time and cost of eradication. *Ramona Robison* and Gina Darin*, ICF Jones & Stokes*

5:10 Solar tents: A new twist on an established method for inactivating plant propagative material. *James J. Stapleton*, UC Statewide IPM Program*

Discussion Groups

4:30 See descriptions page 35.

1. Control methods roundtable (repeated Friday). Sequoia A
2. Mapping points, lines, or polygons: What data representation works best for my project? Mineral King A
3. Research needs for invasive plant management and ecology. Sequoia B.
4. The unique challenges of long-term follow-up monitoring, Mineral King

5:30 **Social Hour & Raffle.** Marriott Hotel, Sierra Nevada Ballroom

7:00 **Banquet.** Charter Oak Ballroom (included with registration)

8:00 **Awards Presentation & Live Auction.**

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 Award
National Park Service "Weedzilla"
Student Paper and Poster Contests
Photo Contest

FRIDAY, OCTOBER 9

7:00 **Breakfast**

Session 6 – Climate Change: Impacts and Responses. Charter Oak AB, Moderator: Julie Horenstein,

8:00 Interactions between fire and plant invasions under a warming climate in the Sierra Nevada Bioregion, *Matt Brooks, US Geological Survey*

8:30 The promise and pitfalls of species distribution modeling to predict future invasions, *Nicole Heller, Climate Central*

9:00 Climate change and protecting biological diversity: Implementation of California's report on adaptation strategy, *Rick Rayburn, California State Parks*

9:30 **Break**

Session 7 – Weed Management on a Large Scale.
Charter Oak AB, Moderator: Mark Newhouser

10:00 Density, compensation and the persistence of yellow starthistle populations across California. *Sarah Swope[1,2] * and Ingrid Parker[1], [1]UC Santa Cruz, [2]USDA Exotic and Invasive Weeds Research Unit*

10:20 Team Arundo del Norte: Lessons learned from a coordinated approach to weed management. *Mark Newhouser[1] *, Deanne DiPietro[1], David Spencer[2], Ron Unger[3], Bryan Sesser[1], Zhahai Stewart[1] ,[1]Sonoma Ecology Center, [2] USDA,* [3]EDAW

10:40 Lots of land, lots of weeds, and little time: Large scale baseline weed mapping. *Erin McDermott* and Heath Bartosh. Nomad Ecology*

11:00 PG&E's approach to management of noxious weeds in Sierra Nevada watersheds and expanding our invasive species efforts through WMA partnerships. *Michael E. Fry, Sr., Pacific Gas & Electric Co.*

Discussion Groups

10:00 See descriptions page 36.

1. Control methods roundtable (repeated). Sequoia A
2. *Brassica tournefortii* (Saharan mustard). Charter Oak CD
3. Careers in invasive species management. Sequoia B
4. Preventing introduction and spread of invasive weeds via construction equipment and supply materials. Mineral King

11:30 **Lunch in downtown Visalia**. On your own – See restaurant brochure
Student Lunch. Brewbaker's, 219 E. Main St.

Session 8 – Partnerships & Incentives.
Charter Oak CD. Moderator: Christy Brigham

1:30 Can a spiny shrub prick the collective ecological conscience? *Tara Athan[1] * and Peter Warner[2], [1]Mendocino Coast Cooperative WMA, [2]Independent botanical consultant and educator*

1:50 Show me the money! Developing a reimbursement program with the private sector. *Ellen Gartside* and Cindy Roessler.*

Session 9 – Invasive Plant Management.
Charter Oak AB, Moderator: Andrea Woolfolk

1:30 Aquatic weed management: A survey of techniques and environmental impacts 2001-present. *Michael Blankinship, Blankinship & Associates*

1:50 Refining mechanical removal methods for the eradication of *Spartina densiflora* at Humboldt Bay National Wildlife Refuge. *Trevor Goodman* and Andrea Pickart, U.S. Fish and*

	Midpeninsula Regional Open Space District		*Wildlife Service*
2:10	Working together against weeds: Workshops, materials, and Best Management Practices to prevent invasive species spread due to land management operations. *Christy Brigham*, Jay Goldsmith, and Sylvia Haultain. National Park Service*	2:10	Making room for native grasses: Physical control of coastal weeds. *Andrea Woolfolk*, Kerstin Wasson and Nina D'Amore. Elkhorn Slough National Estuarine Research Reserve*
2:30	The Southern Sierra Partnership. *Hilary Dustin, Sequoia Riverlands Trust*	2:30	Controlling the invasion of noxious rangeland weeds into an exotic-dominated grassland: Is there a role for native grass reseeding? *Valerie Eviner[1]*, Kevin J. Rice[1], Carolyn M. Malmstrom[2], [1]UC Davis, [2]Michigan State Univ*

3:00 **Break**

Session 10 – The Leading Edge of Weed Management: New Tools & Techniques.
Charter Oak AB, Moderator: Edith Allen

3:30 Can we keep invasive plants at bay by restoring with competitive native plants? *Beth Leger, University of Nevada, Reno*

4:00 From backpacks to jetpacks, handpicks to skidsteers: Leveraging old tools and new techniques for long-term restoration success. *Mark Heath, Shelterbelt Builders*

4:30 Beyond weed wrenches: New tools and techniques from around the state, *Joseph DiTomaso, UC Davis*

5:00 **Adjourn**

SATURDAY, OCTOBER 10

Field trips: Participants meet at 7:45 am in the Plaza Courtyard between the Convention Center and Marriott.

1. Grand Weed Tour of Sequoia-Kings Canyon National Parks

Leaders: Sylvia Haultain (Plant Ecologist) and Athena Demetry (Natural Resource Manager), National Park Service
Details: 8:00 am – 5:30 pm. Transportation and lunch provided.

Sequoia and Kings Canyon National Parks are best known as the home of the world's largest trees, the giant sequoias. The parks begin at 1,300 feet in the foothills and range to 14,491 feet at the summit of Mt. Whitney, the highest peak in the lower 48 states. The incredible range of habitats found in the parks includes over 200 marble caverns, many with endemic cave fauna. In 2001, the parks prepared a restoration and management plan that addressed invasive plants, including bull thistle, cheatgrass, foxglove, French and Spanish broom, and Himalayan blackberry. On our way to the high country, we will tour a community-led project in Three Rivers to control Arundo and yellow starthistle, and hear about a USGS study on post-fire control of Italian thistle. We'll lunch near Round Meadow and the Giant Forest, home of the world's largest tree, the General Sherman Sequoia, and talk about control of bull thistle and non-native grasses. Then on to Grant Grove to see a project controlling reed canarygrass that is aggressively invading mid-elevation meadows. Treatment methods have been adapted to the sensitivity of the habitat and the ability of the plant to sprout new roots from stems. We will have lots of mountain scenery on the way, and time for our guides to describe the particular challenges and opportunities of working in the mountain environment.

2. Kaweah Oaks Preserve and Atwell Island

Leaders: Nathan Higgins and Rob Hansen, Sequoia Riverlands Trust; Carol Combs, Tulare Basin Wildlife Partners; Elizabeth Palmer, NRCS; Steve Laymon, BLM; Dennis Haines, Tulare County Dept. of Agriculture
Details: 8:00 am – 4:30 pm. Carpool to the sites, 20 minutes from Visalia. Lunch provided.

Until a century ago, snowmelt from the southern Sierra filled the southern portion of the San Joaquin Valley to form Tulare Lake, the largest freshwater body west of the Mississippi. Surrounded by tule marshes, the lake was a major stop on the Pacific flyway. Upland riparian areas, flush with snowmelt draining from the Sierra, were crowded with majestic valley oaks, providing fingers of gallery forest habitat in the open savannah. Today, organizations have formed to protect and restore some of this heritage. Our tour features two premier sites on the front lines of this effort. The 324-acre Kaweah Oaks Preserve protects one of the last remaining valley oak forests in the San Joaquin Valley, as well as grassland and alkali meadow habitats. More than 300 plant and animal species live, feed or reproduce at the preserve, including gray fox, great horned owl, and Nuttall's woodpecker. The Sequoia Riverlands Trust uses timed grazing, prescribed burns, and other management methods to deal with invasive plants including milk thistle, yellow starthistle, bull thistle, tree of heaven, poison hemlock, Himalayan blackberry, tobacco tree, and five-hook bassia. Farther into the valley, the BLM oversees 7,000-acre Atwell Island, home to federally listed and sensitive animal species including mountain plover, Tipton's kangaroo rat, San Joaquin kit fox, tricolored blackbird, burrowing owls, horned lizards, and the blunt-nosed leopard lizard. Restoration of marshes, sloughs and ponds provides important wetland habitat, and offers an educational opportunity for the public. Preserve managers and local naturalists will share the natural history of this bountiful region, and describe how they are making restoration work within the region's agricultural economy.

3. Winning Public Support: Sequoia National Park - Cancelled

Leader: William Tweed, retired Chief Naturalist, Sequoia-Kings Canyon National Parks
Details: 8:00 am – 1:00 pm ending in park. Carpool to the park. Lunch and park entrance fee provided.

Sequoia and Kings Canyon National Parks are home to incredible ecological—and cultural—wonders. The General Grant Tree is the nation's official Christmas tree, and our only official living shrine, dedicated to those who have given their lives in service to our country. As two of the first national parks set aside in the United States, Sequoia and Kings Canyon are steeped in the historical movement to preserve parks for conservation and recreation. As management strategies continue to evolve for public lands, including programs for invasive plant control, resource managers work to gain public understanding and support for these programs. We will be joined in the Giant Forest area of Sequoia National Park by retired park naturalist Bill Tweed, co-author of *Challenge of the Big Trees: A Resource History of Sequoia and Kings Canyon National Parks*. Bill will share insights from recent and historical episodes in the parks' resource management, and lead a discussion on the roles that cultural perceptions play in our work. We will finish with lunch in the park—you are then free to head back to town or stay in the park to explore on your own. Nearby hikes include a 3-mile round-trip walk along the Marble Fork of the Kaweah River to 1,200-foot high Tokopah Falls, and a 3-mile round-trip to the granite dome summit of Little Baldy at 8,000 feet elevation, an excellent location from which to study the terrain of the Giant Forest Region.

Student Poster Contest

Evidence that plant-associated methylotrophic bacteria aid in grassland and coastal sage scrub restoration. *Irina Irvine*[1,2], Marti Witter[2]; Christy Brigham[2], Jennifer B.H. Martiny[1], and Katharine Suding[3]. [1]UC Irvine; [2]Santa Monica Mountains National Recreation Area, [3]UC Berkeley*

Genetic identity and phylogenetic relationships of invasive brooms in California. *Annabelle Kleist*, and Marie Jasieniuk, UC Davis*

Assessing the effects of *Foeniculum vulgare* on seedling germination, soil legacy effects and restoration strategies. *Heather Liu, UC Santa Barbara*

Evaluating the seed bank of a disturbed site to determine potential ecological restoration strategies. *Cory Olesen*, Daniel Doran, and Carla D'Antonio. UC Santa Barbara*

Comparing the competitive ability of *Elymus multisetus* seedlings collected from invaded and uninvaded habitats. *C.J. Rowe*, and Elizabeth Leger, University of Nevada, Reno*

Ecological impacts of French broom invasion management. *Michael K. Tom* and Peter M. Vitousek, Stanford University*

Adapting an agricultural technique for use in wildlands: Testing variations on solarization for invasive control in a severely disturbed plant community. *Kristin A. Weathers*, Edith B. Allen, and Milton E. McGiffen, UC Riverside*

Contributed Posters

Time and temperature requirements for thermal death of seeds of yellow starthistle (*Centaurea solstitialis* L.). *Stacy Betts[1], Carrie Tuell-Todd[1], Ruth M. Dahlquist[1], and James J. Stapleton[2]*. [1]Fresno Pacific University; [2]UC Statewide Integrated Pest Management Program*

Invasive aquatic weeds: Implications for mosquito and vector management activities. *Charles E. Blair, Mosquito and Vector Management District of Santa Barbara County and Southern California Vector Control Environmental Taskforce*

Using smart phones and citizen scientists to map invasive species and track spread over time. *Christy Brigham[1]*, Eric Graham[2], Sasank Reddy[2], Eric Yuen[2], and Olmo Maldonado[2]. [1]National Park Service, [2]UC Los Angeles*

Camp Pendleton's rapid response Non-native Invasive Plant Species Program. *Meghan F. Dinkins* and Deborah Bieber. MCB Camp Pendleton, CA*

Mapping weeds from the ground, the air or beyond. *Margot Griswold*, Dane Williams, Brian Schmid, and Rob Robinson, NewFields Agricultural and Environmental Resources, LLC.*

Diluting the hybrids: How much is too much? *Ingrid Hogle[1]*, Debra Ayres[2], Don Strong[2] and Laura Feinstein[2]. [1]San Francisco Estuary Invasive Spartina Project, Berkeley, CA; [2]UC Davis*

New vector to spread invasive species: Tanker trucks, air tankers, dry hydrants and more. *Jennifer Holman, Holman Environmental*

Maintaining riparian habitats after initial invasive plant treatments on Camp Pendleton. *Benjamin M. Lardiere*, and Deborah Bieber, MCB Camp Pendleton*

Sinapis alba seed meal as a pre-emergent control for French broom (*Genista monspessulana*) seedlings. *Ken Moore[1]* and Carla Bossard[2], [1]Wildlands Restoration Team, [2]St. Mary's College of California*

Birds and invasive plants: A review of interactions and management considerations. *Hildie Spautz[1] and Elizabeth Brusati[2]. [1]AECOM Design + Planning, [2]Cal-IPC*

Timing of application influences the efficacy of glyphosate on giant reed (*Arundo donax*). *David Spencer*, Greg Ksander[1], Wailun Tan[2], and Pui-Sze Liow[1]. [1]USDA ARS Exotic & Invasive Weeds Research Unit, [2]UC Davis*

Tulare County WMA cost-share invasive weed control. *J.L. Sullins[1]*, Steve Wright[2], and Elizabeth Palmer[3]. [1]UC Cooperative Extension, [2]UC Cooperative Extension, [3]USDA-NRCS*

Active and passive restoration of fountain thistle habitat following jubatagrass removal. *Thomas, Don.* San Francisco Public Utilities Commission.*

Weed control and habitat restoration in saline habitat. *David Thomson, San Francisco Bay Ecotone Vegetation R&M*

Planting the seed: Student participation in habitat enhancement. *Matthew J. Yurko[1]*, and Jennifer Naegele[2]*. [1]California Coastal Commission, [2]Orange County Park*

Evaluating the potential for spread of an invasive forb, *Limonium ramosissimum*, in San Francisco Bay salt marshes. *Archbald, Gavin*, Katharyn Boyer, San Francisco State University, Romberg Tiburon Center for Environmental Studies. 3152 Paradise Drive, Tiburon, CA 94920, archbald@sfsu.edu.*

Because invasive plants threaten San Francisco Bay's salt marsh plant communities, evaluating whether recently introduced species will spread rapidly can help managers prioritize conservation actions. Several populations of *Limonium ramosissimum* (Algerian sea lavender) were discovered in South San Francisco Bay in 2007. While this halophytic forb is invasive in southern California, whether *L. ramosissimum* is likely to spread by rapidly dispersing, recruiting, and reproducing in marshes across the Bay's salinity gradient, is unknown. We floated seeds at different salinities in aquaria to test effects on germination, and grew *L. ramosissimum* from seed to flowering under crossed inundation and salinity treatments in a tidal simulator experiment testing the potential for an estuary-wide invasion. Whether seeds floated for 1, 2, 4, 7, or 14 days or in 0, 15, or 30 salinity water, on average 86.7% of seeds across treatments germinated 16 days after being removed from aquarium tanks- indicating seeds have high dispersal potential. In the second experiment, after two months of *L. ramosissimum* growth in the tidal simulator, regardless of treatment, seedling mortality was extremely low (99.9% survivorship), however both salinity (0, 15, or 30) and inundation treatments (daily, bi-weekly or bi-monthly) affected growth. Plants grew 27 percent faster at salinities of 0 than 30, and 40 percent faster when inundated bi-monthly than daily, indicating while seedling survivorship is high across salinity and inundation gradients, plants will grow more rapidly both in the high marsh and further up-estuary where salinities are lower. *L. ramosissimum*'s potential to spread warrants early removal.

Can a spiny shrub prick the collective ecological conscience? *Athan, Tara[1]*, and Peter Warner[2], Mendocino Coast Cooperative Weed Management Area, Ukiah, CA; [2]Independent botanical consultant and educator, Fort Bragg, CA. *coord@mcwma.org*

The woody legume gorse (*Ulex europaeus* L.) has colonized many sites along the Pacific Coast of North America. In the community of Caspar, Mendocino County, California, European settlers planted the spiny shrub as an effective hedgerow over 150 years ago, and gorse has long since become a well established resident, spreading into adjacent coastal grasslands, scrub, and forests. Gorse alters soil chemistry through nitrogen-fixing symbiosis, and its dense, sprawling growth reduces native plant cover -- threatening a number of rare taxa -- increases wildfire potential, and interferes with human recreational opportunities. Past efforts to contain or eradicate gorse on both public and private lands have failed due to lack of political consensus and long-term strategic commitment. Over the past several years, the Caspar Community and residents have backed gorse containment efforts by the California Department of Parks and Recreation, the California Department of Transportation, the Mendocino Fire-Safe Council, and the Mendocino Coast Cooperative Weed Management Area (MCWMA), yet funding gorse control efforts remains a significant challenge. The MCWMA has developed an innovative multi-objective strategy to link targeted funding sources to components of a coherent strategy. While this program has achieved some early success, budget concerns and lack of political consensus remain huge challenges to the integrity of affected ecosystems. Long-term success will likely depend upon increasing community support for gorse management under a broader umbrella of local ecological sustainability and conservation.

Experimental test of different treatments for control of terracina spurge (*Euphorbia terracina*): Comparison of hand pulling, glyphosate, and chlorsulfuron. *Avina, Erin[1, 2]*, Ann Dorsey[1], and Christy Brigham[1]. National Park Service, Santa Monica Mountains National Recreation Area, Thousand Oaks, CA; [2]California State University-Northridge, *Erin_Avina@nps.gov*

Terracina spurge (*Euphorbia terracina*) has become a major invasive plant pest threatening wildlands in coastal southern California. This species is highly invasive in Australia but is only found in the Malibu area and Pennsylvania within the United States. This species has been spreading rapidly over the past five years in the Los Angeles area and has demonstrated an ability to invade a wide variety of habitats and microclimates. We tested three different treatments for control of this species (glyphosate, chlorsulfuron and hand pulling). We also investigated the need to hand pull individual weeds around regrowing native vegetation. Our experiment was initiated as part of a post-fire revegetation project in Solstice Canyon, a site within the Santa Monica Mountains National Recreation Area. The experiment included six treatments: hand pulling in the plot with and without hand pulling around individual native plants; spot spraying of 2% glyphosate with and without hand pulling around native plants; spot spraying of chlorsulfuron at 15g/hectare with and without hand pulling around native plants.

We did not include a control treatment because we are trying to eliminate this species at the site, however, we did take observational data on *Euphorbia* performance at an adjacent site where it is not being controlled. This data allowed us to evaluate yearly fluctuations in *Euphorbia* performance independent of our treatments. Initial results indicate that glyphosate was the most effective treatment (75% decrease in *Euphorbia* cover) followed by chlorsulfuron (52% decrease). Hand pulling was ineffective (196% increase in *Euphorbia* cover overall). We are continuing the treatments for another two years to examine long-term effects of herbicide and hand pulling on both the seedbank and native plant regeneration post-fire. We will also present results on native plant response to the treatments.

Aquatic weed management: A survey of techniques and environmental impacts 2001-present.
Blankinship, Michael, Blankinship & Associates, Davis CA* mike@h2osci.com*

The tools for aquatic weed management over the last decade have evolved to include new chemical, biological and mechanical control methodologies. Implementation of Integrated Pest Management (IPM) including Best Management Practices (BMPs) for the protection of sensitive ecological resources and water quality are more common than 10 years ago. Although permitting requirements to perform aquatic weed abatement has been a cost burden to land owners, data gathered for permit compliance purposes suggests that for many abatement approaches, ecological resources are well protected. For some weed abatement techniques, however, an assessment of risk must be made so that cost/benefit scenarios can be clearly communicated to stakeholders and decision makers.

Working together against weeds: workshops, materials, and best management practices to prevent invasive species spread due to land management operations.
Brigham, Christy[1], Jay Goldsmith[2], and Sylvia Haultain[3]. [1]National Park Service, Santa Monica Mountains National Recreation Area, Thousand Oaks, CA; [2]National Park Service, Pacific West Regional Office, Oakland, CA; [3]National Park Service, Sequoia-Kings Canyon National Park, Three Rivers, CA. *Christy_Brigham@nps.gov*

Unintentional spread of invasive species during management operations is often overlooked and may be a major driver of invasions in some management areas. Operational activities such as road maintenance, weed abatement, research activities, planting, seeding, hiking, backpacking, pack stock, and other activities can all spread weeds. Finding workable solutions to these operational hazards is not easy and takes participation from all sectors of the organization. The Pacific West Region of the National Park Service has recently embarked on a multi-faceted effort to raise awareness of unintentional weed spread, cooperatively develop best management practices to limit spread, and improve management operations with respect to invasive species management. We will present our general approach, provide examples of operational weed spread, highlight tools we have developed (workshop materials, field guides, maps, and cds), and discuss examples of the best management practices developed as part of this process.

Interactions between fire and plant invasions under a warming climate in the Sierra Nevada bioregion.
Brooks, Matt[1], Rob Klinger[2], and Jan Van Wagtendonk[1]. [1]USGS Western Ecological Research center, Yosemite Field Station-El Portal Office, 5083 Foresta Road, El Portal, California 95318; [2]USGS Western Ecological Research Center, Yosemite Field Station-Bishop Office. *(559) 240-7622, mlbrooks@usgs.gov*

Climate is one of the principal factors influencing vegetation types, fire regimes, and plant invasions. At any single point in time, native and non-native vegetation (as fuel) affects ignition rates and the behavior of fire, while fire behavior is a primary force in post-burn succession patterns. This feedback between fuels and fire behavior can have a major effect on the characteristics of subsequent vegetation stands, including physiognomy, species diversity, dominance of native vs. non-native species, and fuelbed characteristics. Predicted future changes in precipitation and temperature regimes in the Sierra Nevada bioregion suggest a general shift of vegetation zones upward in elevation. However, other factors such as soil characteristics and topography also influence vegetation and fire regimes, and may create variable effects that do not strictly adhere to the hypothesis of upslope shifts. Shifting landscape invasibility and effects of plant invasions on vegetation and fire regimes may contribute additional complexity to these changes. The potential future scenario that emerges from these interacting factors is a shifting mosaic of vegetation zones, rather than a uni-directional upward elevational shift. In this presentation we will describe some of the potential future changes that might occur relative to vegetation and fire regimes, including the role of plant invasions, in the Sierra Nevada bioregion.

Pesticide Safety *Jeopardy*. *With your host, David "Alex Trebek" Chang and a select group of contestants. County of Santa Barbara Agricultural Commissioner's Office. 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.

From foothills grasslands to alpine peaks: Managing weeds at the leading edge in Sequoia and Kings Canyon National Parks. *Demetry, Athena. Sequoia and Kings Canyon National Parks, Three Rivers, CA, athena_demetry@nps.gov.*

Sequoia and Kings Canyon National Parks, located in the southern Sierra Nevada, range from 1,300 feet in the foothills to 14,491 feet at the summit of Mt. Whitney. Invasive plant management strategies are as broad as the vegetation along this gradient, from containment of widespread weeds in the foothills to early detection and rapid response in the weed-free zones of the middle to upper elevations. Vectors of new introductions at this leading edge include pack stock, backpackers, fire crews, helicopters, construction, and varied NPS operational activities, so prevention and education are central strategies. The parks are also beginning to consider how to adjust weed management strategies as the climate changes, such as shifting resources from control of established populations to early detection and rapid response. Can Sequoia and Kings Canyon National Parks remain free of yellow star thistle into the future? This is the test of the parks' management success at the leading edge.

Exotic grass and forb control in a California grassland. *Dickens, Sara Jo* and Edith B Allen. University of California-Riverside Dept. of Botany and Plant Sciences, Riverside, CA. *sdick002@ucr.edu*

California grasslands have been invaded by a suite of Mediterranean annual grasses for over 200 years. The conversion from a native bunchgrass and annual forb grassland to non-native, annual grassland has negative impacts on native soils, vegetation and wildlife. These non-native grasses can limit germination and establishment of native perennial species by altering water availability and overcrowding seedlings. Prescribed burning of invaded grasslands is a common method of non-native plant control. Following prescribed fires, exotic forbs may increase in cover in the absence of exotic grasses. The objectives of this study were to assess the effectiveness of prescribed fire and hand removal of exotics in reducing exotic grasses and releasing native forbs from competition. Following an owl assisted wildfire in 2006; three treatments were established within and adjacent to the burn area: burn only (BO), burn + weeding (BW) and control (C). Plant species percent cover was recorded annually for three years. One year after fire, exotic forbs had highest cover in both burn treatments, while native grass, forb and exotic grass cover did not differ. In year two, exotic forbs remained higher in the BO treatment, while the BW treatment had less exotic forb cover than the other two treatments. Native grass and forb cover was highest in both burn treatments with highest cover in the BW treatments. These patterns in native cover continued into the third year. Native species richness increased most in BW treatment. Our results suggest that prescribed burns effectively reduce exotic grasses and may increase native cover; however, native cover and richness can be increased further with follow-up control of exotic forb species.

Beyond weed wrenches: New tools and techniques from around the state. *DiTomaso, Joseph M., Weed Science Program, Department of Plant Sciences, UC Davis, jmditomaso@ucdavis.edu*

The closing talk at this year's Symposium will focus on new tools and techniques to help weed workers and volunteers. Dr. Joe DiTomaso will give a round-up of new ideas to make your work more effective gleaned from what he and his staff have heard from land managers and researchers throughout the state. New tools will include an online weed identification tool that can be adapted for users' needs.

The Southern Sierra Partnership. *Dustin, Hilary. Sequoia Riverlands Trust, Visalia, CA. hilary@sequioariverlands.org*

The Southern Sierra Partnership (SSP) is a new alliance of conservation and business organizations dedicated to rapid collaborative action to develop and implement climate action strategies, expand protection of sustainable human and natural communities, maintain ecosystem services, and mobilize new funding and other resources for conservation in the southern Sierra Nevada.

The group's first major project is a landscape-level conservation planning effort that incorporates the most recent thinking on climate change adaptation and ecosystem services. Major outcomes will be a set of strategic actions designed to achieve significant conservation in the southern Sierra Nevada and

Tehachapi Mountains, as well as planning tools to help others grapple with the uncertainties of climate change.

Hilary Dustin, Conservation Director at Sequoia Riverlands Trust, will review the SSP planning process to date, highlighting the group's assessment of the invasive plant threat, how it might interact with climate change, and what to do about it. She'll be looking for feedback to take back to the planning team.

Controlling the invasion of noxious rangeland weeds into an exotic-dominated grassland: Is there a role for native grass reseeding? *Eviner, Valerie[1*], Kevin J. Rice[1], Carolyn M. Malmstrom[2] [1]UC Davis Department of Plant Sciences, [2]Michigan State U, Dept. Plant Biology. *veviner@ucdavis.edu*

In California grasslands, noxious weeds (e.g. *Taeniatherum caput-medusae, Aegilops triuncialis*) remain active late spring and early summer, when the long-term exotics (e.g. *Avena, Bromus*) have senesced. Native perennial grasses also have a later season phenology, and their displacement may promote noxious weeds. We planted two-way and three-way mixtures of these 3 groups of species, and exposed these plots to fall, spring, or no grazing. In ungrazed conditions, long-term exotics greatly suppressed establishment of both noxious weeds and natives. Natives and noxious weeds had minimal impacts on each other. Spring grazing more than doubled the prevalence of noxious weeds and reduced native grasses. While native grasses have similar phenology to noxious weeds, seeding with them does not inhibit the noxious weeds *initially*, but actually promotes them by displacing long-term exotics. Reseeding with native grasses may become an effective control for the noxious weeds with increased establishment time.

Laws and regulations pertaining to the sale and movement of noxious weeds in California. *Filippini, Katie. Agricultural Biologist, California Dept. of Food and Agriculture, Sacramento, CA. kfilippini@cdfa.ca.gov*

The California Department of Food and Agriculture has identified several noxious weed species and has listed them in the California Code of Regulations (CCR), Section 4500. Any plant listed in CCR 4500 is designated as a plant pest by California state law and cannot be produced, held or offered for sale as nursery stock, as per CCR Section 3060.3. Resulting from these regulations is the prohibition of any listed noxious weed for commercial sale within California as ornamental nursery stock.

Interstate and intrastate shipments of nursery stock (from commercial and non-commercial sources) are not subject to the regulation pertaining to sale of nursery stock within the state. However, such shipments are subject to inspection upon arrival and must be found free of pests, including plants that are considered pests due to their invasive characteristics. In addition to the weed species listed in CCR 4500, the California Department of Food and Agriculture maintains an Action-Oriented Pest Rating System. This pest rating system conveys the actions that county and state agricultural inspectors should take when any pest is detected or intercepted in trade or in the environment. Shipments found containing a weed pest can be rejected under CCR 4500 or the California Food and Agricultural Code, Sections 6461.5 (for interstate shipments) and 6521 (for intrastate shipments).

PG&E's approach to management of noxious weeds in Sierra Nevada watersheds and expanding our invasive species efforts through WMA partnerships. *Michael E. Fry, Sr. Consulting Scientist, Environmental Services Department, Pacific Gas and Electric Company, San Ramon, California. mef4@pge.com, 925-415-6352*

Long-term monitoring of natural resources at the landscape level is a challenging task. Pacific Gas and Electric Company's hydroelectric project watersheds, located throughout the Sierra Nevada Mountains of central and northern California, collectively represent tens-of-thousands of acres where ecological monitoring activities are required by the Federal Energy Regulatory Commission (FERC).

Noxious weeds, and the habitats they affect, are often associated with managed linear rights-of-way that comprise elements of our hydro power system. These elements include roads, transmission corridors, canals, and penstocks. The control of noxious weeds within FERC project boundaries is increasingly made the responsibility of the Licensee under specific Articles or Conditions of a federal project license.

In this paper we describe use of commercially available mobile computing and geographic information system (GIS) technologies used to inventory, monitor, and document control treatments for noxious weed populations. Advantages identified include:

1. Aids navigation through GPS-enabled moving map display,
2. Acquires electronic data compatible with standard office software, avoiding transcription costs,
3. Synchronizes with desktop or laptop PC's for file back-up, preparation of report documents, and preparation of map figures, and

4. Allows monitoring to be done by any qualified professional, regardless of their prior experience in the project area (important for long-term monitoring).

PG&E's developing corporate-level program of invasive species control is focused at partnering with stakeholder groups like local Weed Management Associations (WMA's). These groups benefit by leveraging member weed control activities in applying for grant funds to perform other project work in their areas. PG&E benefits from positive exposure that enhances our relationship with the communities we serve.

Show me the money! Developing a reimbursement program with the private sector. *Gartside, Ellen* and Cindy Roessler. Midpeninsula Regional Open Space District, Los Altos, CA. *egartside@openspace.org*

Slender false brome (*Brachypodium sylvaticum*) is an invasive, perennial, bunchgrass spreading through the redwood forests of Woodside and Portola Valley, California. Slender false brome (SFB) has spread to over 10,000 acres in Oregon, forming dense stands and outcompeting native plants and tree seedlings. If left unchecked, SFB could eventually disrupt the native California redwood ecosystem. In California and Oregon, SFB has been designated a "noxious weed".

The Midpeninsula Regional Open Space District (MROSD) began eliminating SFB from their preserves in 2004, but it also occurs on adjacent private properties. MROSD collaborated with private property owners to develop a reimbursement plan that would encourage property owners to participate in the eradication of SFB.

The MROSD SFB Integrated Pest Management program includes 1) pretreatment surveys and preparatory measures; 2) herbicide application or manual control measures; and 3) post-treatment restoration and monitoring.

This presentation will discuss the challenges and positive aspects of developing a collaborative reimbursement program with the private sector. Some of the challenges encountered were differences of opinion regarding herbicide use, the amount of reimbursement, and developing a plan applicable to multiple properties. Positive aspects have been the involvement of a diverse group of creative people who want to protect the redwood habitat and acknowledgement of the project through the receipt of grant funding that has allowed MROSD to hire a coordinator for the program. By collaborating with private property owners, the District hopes to completely eradicate slender false brome in California.

Refining mechanical removal methods for the eradication of *Spartina densiflora* at Humboldt Bay National Wildlife Refuge. *Goodman, Trevor* and Andrea Pickart, U.S. Fish and Wildlife Service, Humboldt Bay National Wildlife Refuge, Lanphere Dunes Unit, 6800 Lanphere Road, Arcata, CA 95521, *trevor_goodman@fws.gov*

Over the past five years, the staff at Humboldt Bay National Wildlife Refuge has developed a method for the mechanical removal of the invasive cordgrass, *Spartina densiflora,* using metal-bladed brushcutters. This method has been used successfully to remove *S. densiflora* from approximately 10 ha (25 ac) of salt marsh. All established *Spartina* is killed within two years, although seedlings continue to emerge from newly dispersed seeds (confirming the need for regional eradication). Revegetation methods were tested but native species recovery occurs rapidly without revegetation. The Action Plan for the West Coast Governors' Agreement on Ocean Health released in 2008 calls for eradication of all invasive *Spartina* from the West Coast by 2018. With the increased likelihood of available funding for regional eradication of S. *densiflora* in Humboldt County in mind, the Refuge staff established experimental plots in summer 2008 to refine mechanical eradication techniques. These plots compare summer- vs. winter-initiated mowing in terms of efficiency (including labor needs, resprout density and seedling emergence), and the effectiveness of a higher mow height to suppress seed production and allow for phased implementation over a large area. We are also following algal colonization and succession, and native species recovery. Preliminary results indicate that the summer mow results in fewer initial resprouts but increased seedling emergence in the spring following mowing. We will present updated monitoring results and treatment recommendations based on overall efficiency, including native species recovery.

From backpacks to jetpacks, handpicks to skidsteers: Leveraging old tools and new techniques for long-term restoration success. *Heath, Mark. Shelterbelt Builders, Berkeley, CA. mark@shelterbeltbuilders.com*

This talk will present case studies and demonstrations on the strategic use of tools and techniques for invasive plant management in challenging areas. I will review equipment and strategies from heavy construction, timber management and agriculture for their utility in habitat restoration projects, with special consideration given to how these strategies can also benefit worker health and safety. Finally, I will engage in a bit a dreaming about what future technologies may bring for those working in wildland weed management.

The promise and pitfalls of species distribution modeling to predict future invasions. *Heller, Nicole, Climate Central, 895 Emerson Ave, Palo Alto CA 94301, nheller@climatecentral.org, 650-833-9049*

Climate change is emerging as a central challenge for land management, including invasive species management. It is extremely difficult to predict which species are likely to become invasive in the near-term; a rapidly changing climate makes those predictions even more complicated. Species that are invasive in places today may not be tomorrow. There is great interest in making predictions about the future (25 years+) given directional climate change. This interest is driven by pragmatic considerations – we need to spend limited resources prioritizing and controlling species that will show high fitness in a warmer world. But are long-term predictions feasible? Can they be accurate and produce results that will alter management actions today? I will address these questions by reviewing species distribution modeling approaches, examples with invasive species, and case studies that apply modeling results to invasive species control and planning. The results of this review highlight that incorporation of climate change projections into invasive species management is not straightforward. Significant improvement in modeling methodologies and assumptions is needed before widespread application of results is warranted. Distribution data is a major limiting factor in model development suggesting important opportunities for data input by managers. Engaged, creative dialogue, experimentation and collaboration among researchers and practitioners will be necessary to meet this challenge.

The importance of vouchering plant identifications. *Hrusa, Fred, and Dean Kelch.* California Department of Food and Agriculture - Herbarium of the Plant Pest Diagnostics Laboratory. FHrusa@cdfa.ca.gov, DKelch@cdfa,ca.gov*

A voucher specimen documents a plant's presence and provides the means by which accurate identifications can be made. Voucher specimens accessioned by the herbarium of the California Department of Food and Agriculture have been identified by either an official plant taxonomist or a specialist contracted by them. This specimen can then be observed by anyone with an interest in the legality, or reality, of the species where it was found. The collection has also thus been officially recorded and the specimen retained in a permanent, publicly accessible collection and electronic database where it is available for observation or further study. In short, the vouchering of a weed sample produces a verifiable record of the plant's identity and presence.

The California Department of Food and Agriculture regulates certain plants as noxious weeds. A property can be declared a public nuisance, but a legal record of the identity and accession of a noxious weed is required before that process can occur.

While vouchering is important for noxious weeds, it is also important in all scientific investigations. Without verified, publicly available voucher specimens, scientific data collected from or about these specimens have no long-term value, and indeed are actually not true scientific data in the sense that the study could not technically be repeated.

In terms of invasive species control or eradication activities, herbicide use on locations that have not been vouchered can also, in the event of a misidentification by the herbicide user, result in lawsuits. A specimen submitted to the CDFA Botany Laboratory, and identified there, will avoid such actions. Thus, vouchering plants provides for both scientific veracity and, where applicable, the legality of control activities.

Urban invasions: Analyzing recovery of habitat fragments in San Francisco following the removal of *Genista monspessulana* and *Delairea odorata*. *Kesel, Rachel. University College London, London, UK. rachelkesel@gmail.com*

Restoration of urban habitat fragments often includes extensive invasive species removal projects. Historical and continuing patterns of disturbance necessitate vigilant follow-up and containment efforts to control the spread of urban invasions. This research, conducted during the spring and summer of 2009, will produce a GIS of historical and current distributions of priority weeds in four San Francisco natural areas. The investigations will target *Genista monspessulana* in the grasslands of Twin Peaks and Bayview Hill, as well as *Delairea odorata* in willow dominated wetland areas of Glen Canyon Park and Lake Merced. This research includes vegetation sampling of removal project sites, intact areas, and areas where these weeds remain. Analysis of species diversity, community composition, and native vegetation cover will describe the role of these weeds in grassland and wetland habitat fragments. The GIS will illustrate removal and containment successes while indicating persisting challenges. Results will be discussed in the context of management implications with emphasis on the development of priorities with increasingly constrained budgets.

Developments in Herbicide Ballistic Technology. *Leary, James, University of Hawaii at Manoa, 808-352-8774, leary@hawaii.edu*

An important component to all invasive weed management strategies is to effectively eradicate incipient satellite populations. However, incipient weed control can be inefficient when needing to cover large areas in difficult terrain. Herbicide Ballistic Technology (HBT) is a new technique designed to improve the efficiency of incipient weed management with accurate long-range delivery of effective herbicide doses. The technology of liquid encapsulation and pneumatic ballistics developed for recreational paintball have been adopted in the development of HBT with the basic concept of encapsulating herbicidal aliquots into 0.68 caliber gelatin projectiles that can be delivered to specific weed targets with a pneumatic applicator. HBT is a "boots on the ground" technology for assisting field crews with safer pesticide handling, improved application technique and an enhanced management strategy. Encapsulated HBT projectiles are by design ready-to-use and will eliminate the need for handling liquid pesticides in the field. The long-range accuracy of HBT allows for directed applications to multiple weed targets within a 20 m radius from a single reference point, which improves time efficiency and also reduces disturbance to a site. We have demonstrated the ability to target incipient weed populations residing on steep cliffs and deep ravines, thus expanding the range of weed targets that would otherwise be untreatable. We have also successfully demonstrated the use of HBT as a compliment to helicopter spray operations, which can contribute to flight safety and lower operating costs. Overall, the mission for developing HBT is to advance herbicide applications in natural areas with a more refined approach.

Can we keep invasive plants at bay by restoring with competitive native plants? *Leger, Elizabeth A., Department of Natural Resources and Environmental Science, University of Nevada, Reno, Mail Stop 186, 1000 Valley Road, Reno, NV 89512, eleger@cabnr.unr.edu*

Changes in the species composition of biotic communities may alter patterns of natural selection occurring within them. Native perennial grass species in the Intermountain West are experiencing a shift in the composition of interspecific competitors from primarily perennial species to the exotic, annual grass *Bromus tectorum*. Thus traits that confer an advantage to perennial grasses in the presence of novel annual competitors may evolve in invaded communities. I will present evidence that native perennial grasses may be able adapt to the presence of cheatgrass, using examples from six different native Great Basin species collected from five separate cheatgrass invaded and cheatgrass uninvaded populations. In three of the five collection locations, species collected from invaded areas were significantly more competitive with *B. tectorum* than plants from uninvaded areas. Traits that appear to be adaptive in competition with cheatgrass are early fall green-up (in adult plants) and early seedling root growth (in seedlings). These traits were present in higher frequencies in populations growing with *B. tectorum* competitors.

While it is tempting to restore degraded areas to higher densities of natives (usually done by bringing in outside seed material), such actions may impede long-term adaptation to new conditions by arresting or reversing the direction of ongoing natural selection in the resident population. If hot spots of rapid evolutionary change can be identified within invaded systems, these areas should be managed to promote desirable change and could serve as possible sources of restoration material or reveal traits that should be prioritized during the development of restoration seed material.

Soil moisture stress tolerance of the leading biofuel *Miscanthus giganteus* is similar to the invasive weed *Arundo donax*. *Mann, Jeremiah,[1*], Jacob Barney, Guy Kyser, and Joe DiTomaso[1]. [1]UC Davis Dept. of Plant Sciences. *jjmann@ucdavis.edu*

Crops grown for energy production are becoming integral in the nation's energy portfolio to meet policy mandates at the state and federal level. Miscanthus (*Miscanthus* x *giganteus*) is a leading biofuel crop and not native to the US. Both parents of this sterile hybrid are recognized invasive species in the eastern United States. Lack of seed production, however, does not guarantee non-invasive status, as is the case with *Arundo donax*, which was included for comparison in this greenhouse study. We subjected both species to moisture deficit conditions of -0.5 and-4.0 MPa, standing water, and control (no stress) conditions. We constructed two groups of plants: Group 1 had 8 weeks of establishment followed by 8 weeks under treatment conditions, and Group 2 under treatment conditions for 16 weeks. Allometric, leaf xylem sap tension, and photosynthetic data were collected throughout the experiment. Total biomass of both species under standing water conditions was not different from the control regardless of age. However, drought did affect the two levels of establishment differently–in Group 1 the -0.5 and -4.0 MPa treatment resulted in a 56% and 66% reduction in biomass compared to the control

averaged over both species. Likewise, in Group 2 the -0.5 and -4.0 MPa treatments resulted in a 92% and 94% reduction in biomass averaged over both species. This study is important in our efforts to understand the conditions suitable for vegetative propagule establishment of *Miscanthus* outside cultivated lands based on plant maturity and soil moisture status. Although our results do not indicate that *Miscanthus* has the potential to escape and establish in wildland ecosystems, it does show a similar habitat preference as *Arundo donax*.

Lots of land, lots of weeds, and little time: Large-scale baseline weed mapping. *McDermott, Erin* and Heath Bartosh. Nomad Ecology, Martinez, CA. *emcdermott@nomadecology.com*

The first step in a successful weed management program is obtaining an inventory and baseline map of weeds within the land management area, which can be difficult for large-acreage land stewards. Knowing the identity, location, and relative abundance of weed species is essential to planning strategy as well as securing funding and support. Budget constraints require an efficient method to survey as much area as possible in the least amount of time, while still providing the necessary information required to develop weed management strategies.

We utilized a highly efficient data collection method to map a total of 65 invasive plant species on the 23,000-acre Peninsula Watershed in San Mateo County, owned and managed by the San Francisco Public Utilities Commission. Fieldwork was conducted by six people for 10 days. This talk will outline the methods used for invasive plant surveys and data collection. Results of the mapping were used to identify well-established species and early invaders, demonstrate observable trends, develop priorities for control, and recommend changes to current management regimes.

California's fading wildflowers: Lost legacy and biological invasions. *Minnich, Richard A., Department of Earth Sciences University of California, Riverside, Riverside, CA 92521, richard.minnich@ucr.edu*

Spanish explorers in the late 18th century found springtime coastal California covered with spectacular carpets of wildflowers. Nineteenth century botanists and naturalists describe flower fields across the Central Valley and interior southern California. Invasive annual grasses and forbs from the Mediterranean basin and Middle East have devastated this nearly forgotten botanical heritage. Defenders of the perennial bunch-grassland (*Nassella)* model as the aboriginal vegetation baseline built their case on "scientific" evidence that began in the mid-19th century, but 19th century writings clearly show that bunch grasses were not important to the vegetation and that invasive species spread across California, far ahead of grazing. California wildflower pastures were displaced by invasive species without disturbance. The invasive species—fire feedback hypothesis in coastal California is refuted in view of Crespi's remarkable account (1769) of Native American burning in indigenous fuels, but may have merit in the interior barrens now covered with cured exotic annual grassland. The role of grazing should be viewed in geological time scales because the evolution of the California flora coincided with diverse megafauna that exerted a cattle-like disturbance until the end of the Pleistocene. Packrat middens document that wildflowers have been part of California's heritage as conspecifics since at least the last glacial maximum, perhaps long before. California's wildflower heritage has been overlooked because of a flawed hypothesis that bunch grasses were pervasive in the past, thus preventing us from observing, doubting, and searching for alternative evidence to construct alternative stories. California invasive grasses and forbs are productive and aggressive not because of intrinsic life traits, but because they are new world "goats on islands," without their old world pathogens. The restoration of California's wildflower flora will require management strategies involving the entire landscape, with a historical perspective. Potential avenues for effective management and conservation include spring burning, seasonal grazing by domesticated livestock, and use of old world pathogens as biological controls of invasive species.

Team Arundo del Norte: Lessons learned from a coordinated approach to weed management. *Newhouser, Mark[1*], Deanne DiPietro[1], David Spencer[2], Ron Unger[3], Bryan Sesser[1], Zhahai Stewart[1] [1]Sonoma Ecology Center, Sonoma, CA; [2] USDA ARS Exotic & Invasive Weeds Research Unit, Davis, CA; [3]EDAW, Sacramento, CA. *mnewhouser@sonomaecologycenter.org*

Team Arundo del Norte (TAdN) was formed in 1999 around the concept that sharing common resources in the battle against giant reed invasion would help do more with limited funding. For the past 8 years, TAdN has conducted a program involving partner organizations in nine watersheds spanning the Sacramento and San Joaquin Bay-Delta region. The program focused on integrating several aspects of the work of controlling an invasive, including: coordination and outreach, especially sharing of expertise among partners; regulatory compliance and attempts at

regional permitting; eradication methods research to get answers weed managers needed most; technical support for weed mapping and monitoring; and mapping of the overall region's Arundo problem with prioritization of future efforts. This program ends in 2009 and this presentation shares our eradication accomplishments as well as the benefits and challenges encountered by program coordinators, partners, and research scientists. We will conclude with lessons learned and recommendations for future efforts.

Climate change and protecting biological diversity: Implementation of California's report on adaptation strategy. *Rayburn, Rick, Chief, Natural Resources Division, California State Parks. rrayb@parks.ca.gov*

The Governor's California Climate Adaptation Strategy (2009) sets forth goals and tasks to reduce impacts on the State's extraordinary biodiversity. The specific strategies seek to maximize long-term species protection while recognizing fiscal limitations in all conservation sectors. The presentation will focus on implementing actions relative to strategic land and habitat protection, managing and restoring natural resources and research. Relevant and transferable examples from the experience of State Parks and the Department of Fish and Game will be discussed, including reducing environmental stressors and restoring ecological function.

WeedSearch: A new tool for estimating time and cost of eradication. *Robison, Ramona* and Gina Darin*. ICF Jones & Stokes, Sacramento, CA. *rrobison@jsanet.com*

The first questions often asked in a new weed eradication project are, "How much will this cost?" and "How long will this take?" A new tool helps to answer these questions. WeedSearch is the first comprehensive estimating tool for the cost and time of eradicating weed populations. It is an Excel program based on work of Oscar Cacho, an Australian economist. In order to use the model, a weed manager would enter specific details about the plant's biology and the amount of time invested in searching for it. The model outputs are time to eradication, cost and probability of success. An estimate of the total number of hours spent searching for weeds and the number of hours spent killing weeds once they have been found is also simulated. We will run WeedSearch using Red Sesbania as a model and change some of the input parameters to demonstrate the range of applications of this model. WeedSearch is available for free from Gina Darin (gdarin@cdfa.ca.gov) and the software will continue to evolve as feedback is received.

The role of animals and disturbance in plant invasion: Lessons from the Carrizo Plain. *Schiffman, Paula*, Department of Biology, California State University, Northridge, paula.schiffman@csun.edu*

Annual grasses and forbs that originated in the Mediterranean region quickly came to dominate California's grasslands soon after European settlement. Incredibly, these massive invasions and the processes that facilitated them went completely unnoticed at that time. A synthesis of historical information and modern ecological studies of grasslands at Carrizo Plain National Monument and elsewhere indicates that native small burrowing mammals (e.g., ground squirrels, gophers, and kangaroo rats) were key facilitators of these early invasions. A large body of evidence indicates that, historically, populations of these rodents were huge and that their soil disturbances were chronic and extensive. Enormous expanses of grassland were riddled with patches of disturbed soil. When the ruderal and opportunistic plant invaders encountered these disturbed microenvironments in California, they were conveniently pre-adapted. Therefore, the widespread rodent-produced disturbed soil patches served as nascent foci for invasive species, enabling them to disperse rapidly across broad grassland landscapes by hopscotching from patch to patch. It is likely that seed dispersal by animals also played an important role in this invasion process. These relationships extend into modern times because burrowing rodents continue to be very abundant in grasslands. Disturbance and dispersal by small native animals are among the factors that enable invasive annuals to persistently dominate California's grasslands and they complicate the task of resource management in these now rare ecosystems. It is likely that facilitation relationships between non-native plants and native animals exist elsewhere in California as well and that their relevance to conservation and restoration is underappreciated.

Evening the odds: Evaluating the combined effects of nitrogen fertilization and exotic annual removal on native annual forbs in the Colorado Desert. *Schneider, Heather* and Edith Allen. Department of Botany & Plant Sciences, 2150 Batchelor Hall, UC Riverside, Riverside, California 92521. *hschn001@ucr.edu*

Invasive plant species and anthropogenic nitrogen deposition are altering southern California landscapes. One particularly susceptible ecosystem is the desert, where resources are naturally low and native plants are adapted to a stochastic environment. As urbanization expands into the desert, nitrogen deposition is creating a nutrient pulse that may provide an advantage to

invasive species. These invasive species are often adapted to lower seed dormancy and earlier germination than native annuals, allowing them to take advantage of increased soil nutrients and moisture before natives appear aboveground. The purpose of this study is to evaluate the effects of nitrogen on native forbs in the absence of the exotic annuals *Schismus spp., Erodium cicutarium,* and *Brassica tournefortii*. Plots were fertilized using ammonium nitrate and exotics were removed using hand weeding and the grass-specific herbicide Fusilade. There are two study sites, Willow Hole I and Willow Hole 2, located in the Coachella Valley, CA. We hypothesized that native forbs will respond best in plots treated with both exotic removal and nitrogen fertilizer and exotics will respond best in fertilized plots without exotic removal. Analysis of the data showed a positive response of both groups to fertilization, with native cover increasing with fertilization and exotic removal. This work has relevance for land managers and restoration with respect to the use of Fusilade for exotic grass control and removal, as well as the implications for native annual success after exotic removal. It also has legislative implications because it addresses how increasing nitrogen deposition is directly impacting natural lands.

Solar tents: A new twist on an established method for inactivating plant propagative material.
Stapleton, James J., UC Statewide IPM Program, Parlier, CA, jim@uckac.edu

In 2002, Stapleton et al. developed a "double tent" solarization method for disinfesting soil of weed seeds, fungal pathogens, and nematodes. It generates high temperatures (>70 °C = >158 °F) on a routine basis during summer months in warmer areas, and can eradicate pests in a single day's time. The method was approved by CDFA for regulatory prevention of nematode pests in commercial nursery soil and planting media. More recently, the technique was modified to eradicate aerial seeds of weedy plants, rather than soil borne propagules, in the Sierra Nevada foothills and Central Valley. This procedure can be of value for on-site eradication of seeds and vegetative, propagative material from localized infestations of invasive plants. The safe, inexpensive, non-toxic, and effective technique is adaptable to weed infestations discovered in remote areas, or where transport of such material to disposal sites might result in unwanted dispersal en route. Experimental results of tent construction, heating characteristics, and pesticidal efficacy will be discussed.

Density, compensation and the persistence of yellow starthistle populations across California.
*Swope, Sarah[1,2] * and Ingrid Parker[1], [1]University of California, Santa Cruz, 1156 High St., EMS-A316, Santa Cruz, CA. [2]USDA Exotic and Invasive Weeds Research Unit, 800 Buchanan St., Albany, CA 94710 *swope@biology.ucsc.edu*

We used a field experiment to explore the factors that regulate the growth and persistence of *Centaurea solstitialis* (yellow starthistle) populations across its full longitudinal range in California. Density-dependent processes at all life-stage transitions can decouple seed input from germination, survival, fecundity and population growth, with implications for the role of seed predators (biocontrol agents) to control these invasions. We conducted a seed addition experiment (0, 50, 500 and 1000 seeds added to 0.25m^2 plots) and coupled it with an observational study within established invasions to estimate seed rain, seedling recruitment, mortality and fecundity at natural *C. solstitialis* densities. Seed limitation occurred in both experimental and observational plots in all populations. Density was correlated with mortality only in the site with the highest seedling density. The seed limitation that was evident at the seedling stage persisted to flowering. Seed-limited populations ought to be highly sensitive to losses to seed predators; however, flowering plant density was decoupled from seed production by a strong compensatory response in the surviving plants. Seed production was nearly constant in plots across all seed addition levels (50, 500, 1000 seeds added), regardless of flowering plant density, thus eliminating the impact of seed predation by the established biocontrol agents.

Yeah, but what would Aldo think? A look at herbicide ecotoxicology. *Trumbo, Joel, Staff Environmental Scientist, California Department of Fish and Game jtrumbo@ospr.dfg.ca.gov .*

Herbicides have been an important tool in invasive weed control for many decades. In spite of their widespread use, many wildland managers still have questions about the non-target impacts these products pose. This presentation will review the basic wildlife toxicology and environmental fate information for six commonly-used invasive weed herbicides; aminopyralid, chlorsulfuron, clopyralid, glyphosate, imazapyr, and triclopyr. Acute toxicity values for wildlife species will be reviewed as well as information on environmental persistence and mobility in soil, air and water. A basic understanding of this information is a critical prerequisite for land managers who walk the fine line between protecting important ecological resources and eliminating the pest species that threaten them.

Managing the leading edge: Landscape-level control of invasive plant spread in the Sierra and beyond. *West, Wendy[1*], Doug Johnson[2], and Cheryl McCormick[3], [1]University of California Cooperative Extension; [2]California Invasive Plant Council; [3]Cal-IPC Board of Directors. *wkwest@ucdavis.edu*

Invasive plant populations at a range of scales often have "leading edges" where the population is expanding spatially into previously uninfested territory. These leading edges present potential management opportunities for preventing the further spread of a population. An effective leading edge program requires solid distribution data for the species, preferably over a time period long enough to document the rate, direction, and mode of spread. This spatial data provides the basis for defining a leading edge containment line, and for setting program goals. The second essential component is a management program that can eradicate infestations that occur outside the containment line. By comparing programs designed around the leading edge concept, including the Sierra Foothills Yellow Starthistle Leading Edge project in California and the Continental Divide Barrier Zone project in Idaho and Montana, we determine common features, best practices, and specific challenges. As California's natural resource managers increase regional capacity for early detection networks, it will be key to consider leading edge principles for designing effective management response.

Making room for native grasses: Physical control of coastal weeds. *Woolfolk, Andrea*, Kerstin Wasson and Nina D'Amore. Elkhorn Slough National Estuarine Research Reserve, Watsonville, CA. *amwoolfolk@gmail.com*

Non-native species are the single greatest obstacle to restoring native grasslands in California. Generally, grassland restoration projects include not only removal of non-native species, but also the planting of native species. However, materials and labor for establishing native plants can be expensive and time-consuming, limiting the ability of land managers to restore large areas. Finding methods that allow for restoration of non-native dominated landscapes to native grasslands that do not include native planting efforts would greatly increase restoration capabilities. In two studies, we investigated the ability of weed removal alone to restore native grasses in areas near extant stands of native grasses and forbs.

In the first study, we hand pulled iceplant in the transition zone between salt marsh and a complex of grassland and coastal scrub. We compared plant composition before and after pulling. In the second study, we mowed four annual grassland plots for approximately four years, and compared plant cover in these plots to unmowed controls at the end of the mowing regime. In the iceplant removal area, transects that had been dominated by iceplant before pulling were converted to an average of 67% native plant cover within months after pulling. In the mowing experiment, mowed areas had significantly more cover by native species than unmowed plots, although results varied by area and species. These studies suggest that, in some situations, short-term native grass restoration can be achieved without the planting of native species.

Poster Abstracts

Time and temperature requirements for thermal death of seeds of yellow starthistle (*Centaurea solstitialis* L.). *Betts, Stacy[1], Carrie Tuell-Todd[1], Ruth M. Dahlquist[1], and James J. Stapleton[2]*. [1]Dept. of Biology, Fresno Pacific University; [2]Statewide Integrated Pest Management Program, University of California, Kearney Agricultural Center. *jim@uckac.edu*

We determined the time required for mortality of seeds of yellow starthistle (*Centaurea solstitialis* L.) at constant temperatures of 46, 50, and 60 C. Seeds were placed in organdy 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 and maintained at constant temperature in a water bath. After removal from the jars, seeds were incubated in a growth chamber, and germination percentages were determined after 14 days. The time to 100% mortality was 48 hours at 46 C, 16 hours at 50 C, and 0.5 hours at 60 C.A tetrazolium test was performed on seeds with intact seed coats that had not germinated to determine viability. At sampling times with 100% mortality, no seeds tested as germinable. Nonlinear models for seed mortality as a function of duration of heat treatment were developed. These models have potential applications for predicting mortality of yellow starthistle seeds in management strategies that rely on high temperatures, such as burning or solarization.

Invasive aquatic weeds: Implications for mosquito and vector management activities. *Blair, Charles E., Trustee, Mosquito and Vector Management District of Santa Barbara County (MVMDSBC) and member Southern California Vector Control Environmental Taskforce (SCVCET) Lompoc, Ca. blairce@verizon.net*

Healthy natural wetlands are far less likely to be breeding areas for disease-carrying mosquitoes than degraded ones. Degradation of these bodies of water by invasive aquatic weeds and other influences can result in their being potential habitat for mosquitoes that can carry the West Nile Virus, encephalitis, and other diseases. They also degrade wildlife habitat and aesthetic values. Control of these invasive plants can be an important part of the Integrated Weed/Pest Management efforts of both Weed Management Areas and Mosquito and Vector Control Agencies. Adverse effects of water hyacinth, (*Eichhornia crassipes),* hydrilla (*Hydrilla verticillata),* water evening-primrose (*Ludwigia* spp), smooth cordgrass (*Spartina spp., S. densiflora* x *foliosa),* and other species on water quality and facilitating mosquito breeding will be shown. A successful collaboration to control Spartina *spp.* in Francisco Bay will be described. Demonstration of these relationships and successes can enhance both agency and public awareness of their importance.

Using smart phones and citizen scientists to map invasive species and track spread over time. *Brigham, Christy[1*], Eric Graham[2], Sasank Reddy[2], Eric Yuen[2], and Olmo Maldonado[2]. [1]National Park Service, Santa Monica Mountains National Recreation Area, Thousand Oaks, CA; [2]Center for Embedded Networked Sensing, UC Los Angeles, Los Angeles, CA. *Christy_Brigham@nps.gov, egraham@cens.ucla.edu*

In 2005, the Santa Monica Mountains National Recreation Area staff completed a comprehensive inventory of nineteen invasive species on all public lands within the boundary of this national park. This all out field effort involved two full-time staff working for two years and cost approximately $250,000. Although this map serves as an excellent planning and education document, it was almost instantly out of date due to our own and partners treatment efforts and the continued spread of many of our target species. National Park Service staff are now working with scientists from UCLA to develop software applications for smart phones that will allow users (citizens and staff) to photograph target invasive species when they see them and have these photographs and GPS locations uploaded and displayed as a map on a public webpage (www.whatsinvasive.com). We are hoping to use this technology to educate and involve the public in invasive species work, track the spread of target invasive species, and identify population for control as part of an early detection and rapid response program. During a two-week trial run working with park staff from a variety of field jobs, workers carrying out other duties (tracking wildlife, maintaining roads and trails, inventorying fuel modification treatments) located 811 infestations of six different target species. We overlaid these points on our existing weed map and found significant population expansions in the majority of the species. We are now modifying the program and hope to involve the general public via I-Phone application and other programs within the coming year.

Camp Pendleton's rapid response Non-native Invasive Plant Species Program. *Dinkins, Meghan F.[*] and Deborah Bieber. Land Management Branch AC/S Environmental Security, MCB Camp Pendleton, CA. [*]meghan.dinkins.ctr@usmc.mil*

Marine Corps Base Camp Pendleton initiated an Emergency Non-native Invasive Species (NIS) Plant Control Program in 2005 to rapidly control incipient weeds and weed populations in small areas with high ecological and/or training value. Contractors on Base working with Camp Pendleton's Land Management Branch are required to report new populations of NIS they may observe; a weed reporting form is provided in the appendices of statements of work.

Camp Pendleton faces many incipient NIS difficulties. NIS propagules have the potential to be introduced by vehicles coming in from exotic locations, recent construction, wildland fires and dispersal through the I-5 corridor. Treatment must be done around busy military training schedules in a timely manner. Risk assessment, prioritizing existing incipient NIS for treatment and forecasting future NIS problems is always a challenge. To address some of these difficulties in the future, roadside and construction area monitoring and treatment projects are being developed to complement the Emergency NIS Program.

Mapping weeds from the ground, the air or beyond. *Griswold, Margot, Dane Williams, Brian Schmid and Rob Robinson, NewFields Agricultural and Environmental Resources, LLC. *mgriswold@newfields.com*

With advances in remote sensing technology and image analysis techniques, more options are available to weed managers for mapping invasive species than ever before. These new technologies include advances in airborne scanners, higher resolution satellite imagery, sophisticated land cover mapping techniques, and advanced software approaches. To understand and demonstrate the capabilities that these technologies can provide to weed managers, land-based mapping of

select invasive species was performed near the Santa Clara River in Southern California and compared to new, advanced remote sensing techniques. Specifically demonstrated was the ability to take advantage of free, readily available (3) band aerial imagery to quantitatively map select invasive species like giant reed (*Arundo donax*). While factors such as spatial resolution, radiometric resolution, revisit frequency, timeliness and purchase cost are important considerations for any remote sensing approach, this project demonstrated the ability to use widely available low cost (3) band imagery to accurately, efficiently, and quantitatively map select invasive species over time. The ability to make use of free (3) band imagery opens the door to cost effective mapping solutions that allow more time, money and effort to be spent on removal and restoration efforts associated with invasive species control.

Diluting the hybrids: How much is too much? *Hogle, Ingrid[1]*, Debra Ayres[2], Don Strong[2] and Laura Feinstein[2]. [1]San Francisco Estuary Invasive Spartina Project, Berkeley, CA; [2]UC Davis Dept. of Evolution and Ecology. *ibhogle@spartina.org*

Since the hybridization between introduced smooth cordgrass (*Spartina alterniflora*) and native Pacific cordgrass (*S. foliosa*) was first documented by Daehler and Strong in the early 1990s, we have witnessed a population explosion in which cordgrass hybrids crossed with other hybrids and backcrossed to the native species to create a genetically variable hybrid swarm. Hybrid cordgrass threatens tidal habitats through ecological engineering and the native species through pollen swamping. The State Coastal Conservancy's San Francisco Estuary Invasive *Spartina* Project has systematically removed plants with obvious invasive traits, e.g. tall, robust stems; large inflorescences, etc. as they work to eradicate invasive *Spartina* from the San Francisco Estuary. In the course of monitoring eradication efforts, we used molecular fingerprinting to test hundreds of cordgrass samples each year. The results of these genetic tests show that highly backcrossed hybrid plants, with no obvious morphological characteristics to distinguish them from natives, are "hiding" in the marshes of the Bay. If not identified and removed, these "cryptic hybrids" may further dilute the native genome. But if they look and behave like natives, is it worth the effort to identify and treat these highly backcrossed hybrids? In working to eradicate invasive *Spartina*, how should the ISP respond to these "cryptic hybrids"?

New vector to spread invasive species: Tanker trucks, air tankers, dry hydrants and more. *Jennifer Holman, Principal, Holman Environmental, jennifer@holmanenvironmental.com, 505-577-4129*

Tanker trucks transfer thousands of gallons of water from one surface waterbody to another. Although many associate fire departments with tanker trucks, they are only one group of users of tanker vehicles. Fire department training exercises (twice per month) and back-flushing maintenance of dry hydrants (twice per year) result in between 5,000 and 80,000 gallons of water being transferred from one waterbody to another. Essentially, these tanker trucks are "on-land ballast containers". This critical vector to spread aquatic invasive species has been overlooked nationally as well as internationally.

Following several months of protocol development, press release generation, coordination and facilitation of public outreach efforts, presentation to the Mississippi River Basin Panel/Aquatic Nuisance Species Task Force, and conference calls with Federal and State regulators, I have developed quick, nondestructive, cost effective protocols to disinfect tanker trucks and any landscaping equipment.

Evidence that plant-associated methylotrophic bacteria aid in grassland and coastal sage scrub restoration. *Irvine, Irina*[1,2], Marti Witter[2]; Christy Brigham[2], Jennifer B.H. Martiny[1], and Katharine Suding[3]. [1]Ecology and Evolutionary Biology, UC Irvine; [2]Santa Monica Mountains National Recreation Area, Thousand Oaks, CA; [3]Environmental Science, Policy and Management, UC Berkeley. *iirvine@uci.edu*

Recent evidence suggests that plant-microbe interactions can play a role in the success of biological invasions and therefore may affect restoration outcomes. Pink-pigmented facultative methylotrophic bacteria (PPFMs, *Methylobacterium*) are mutualists associated with the roots, leaves and seeds of most terrestrial plants. Previous studies have shown that PPFMs enhance plant germination, growth rates and productivity and even confer drought and pathogen resistance. Here we investigated the distribution of PPFM abundance along gradients of invasion in a California coastal sage scrub ecosystem. We found that the abundance of PPFMs varied between plant species and that the zones of mixed native/non-native species in invasion gradients harbor more PPFMs compared to pure zones. Further, we found that the herbicide, glyphosate, reduces PPFM abundance. An *in vitro* experiment manipulating glyphosate and PPFMs showed that glyphosate-treated non-native mustard (*Hirschfeldia incana*) seeds benefited from the loss of

PPFMs by germinating earlier than controls. In contrast, native seedlings (*Artemisia californica*) benefited from the presence of PPFMs by reducing germination time and increasing seedling size. In a Southern California grassland restoration that had been treated multiple times with glyphosate, we found 10% fewer PPFMs in glyphosate-treated soil compared to control soil. Spraying a 20% methanol solution, a PPFM substrate, on the post-glyphosate treated soil resulted in a 30% increase in *Nassella pulchra* germination rates and seedling size. Together, these results suggest that increasing PPFM populations may be a promising method for understanding plant-microbe interactions in invasions and improving restoration outcomes.

Genetic identity and phylogenetic relationships of invasive brooms in California. *Kleist, Annabelle* and Marie Jasieniuk, UC Davis Dept. of Plant Sciences. *ackleist@ucdavis.edu*

More than half of the most highly invasive plants in natural areas of California arose from the horticultural trade. These invaders are often difficult to identify as a result of hybridization among ornamental cultivars and species, and naturalized populations. Evidence of hybridization is important because hybridization can increase invasiveness and make management, especially biological control, difficult. The goal of this research is to identify the cultivated sources of invasive broom populations in California, and determine whether hybridization between ornamental cultivars, species, and populations in natural areas has occurred. To determine the species identity and evolutionary history of invasive broom populations in California, we are assessing genetic variation in ornamental and invasive plants at nuclear and chloroplast DNA regions. We are reconstructing a phylogeny of the brooms as a whole, and of a densely sampled French broom clade, to determine the identity and origins of invasive brooms in California. Preliminary results suggest that the chloroplast genome of invasive French broom was inherited from *Genista canariensis*, rather than *G. monspessulana*, and thus suggest that interspecies hybridization has occurred. To test for hybridization, we are presently genotyping individuals at six chloroplast and six nuclear microsatellite loci, and will perform Bayesian assignment analyses to identify specific ornamental cultivars and species that are contributing to invasive populations. Our results have implications for understanding the genetic and demographic processes that underlie the success of invasive plants of horticultural origin, and for working with the horticultural industry to prevent the introduction of potential invaders.

Maintaining riparian habitats after initial invasive plant treatments on Camp Pendleton. *Lardiere, Benjamin M., and Deborah Bieber. Land Management Branch, AC/S Environmental Security, Bldg. 22165, MCB Camp Pendleton, CA, 92055, USA, (760) 763-5850, Fax: (760) 725-9722. benjamin.lardiere.ctr@usmc.mil*

Camp Pendleton manages the removal and control of non-native invasive species (NIS) within riparian habitat in 4 major and 10 minor drainages. Following large-scale removal projects of arundo (*Arundo donax*) and salt cedar (*Tamarix* spp.) infestations, the Base maintains these riparian areas through herbicide treatments, active restoration, and habitat monitoring.

Following initial treatments, known NIS populations such as perennial pepperweed (*Lepidium latifolium*), arundo, and salt cedar are re-treated with foliar herbicides throughout all Base drainages on a rotating schedule. The re-treatment program also serves a dual purpose for monitoring any newly discovered NIS infestations that the contractor encounters within the re-treated drainages. Following newly implemented control methods for the large-scale removal projects, native revegetation methods are being developed to supplement any NIS re-treatments. Furthermore, a post-NIS removal monitoring plan implemented in 2009 is being used to track the health and recovery of these treated areas. To date, nearly 900 acres of exotic invasives (primarily arundo and salt cedar) have been removed from Base riparian corridors and nearly 5000 acres of riparian habitat is re-treated annually.

Assessing the effects of *Foeniculum vulgare* on seedling germination, soil legacy effects and restoration strategies. *Liu, Heather. Cheadle Center for Biodiversity and Ecological Restoration, Santa Barbara, CA; UC Santa Barbara Dept. of Ecology, Evolution and Marine Biology. cliu@lifesci.ucsb.edu*

Fennel *(Foeniculum vulgare*) is an invasive perennial that dominates disturbed environments and is suspected of suppressing the germination of other plant species. Ecological restoration often involves controlling non-native plants, but sometimes the impact of these plants can remain in the soil as a legacy effect, which makes restoration challenging. To evaluate different restoration strategies and the importance of plant communities on soil characteristics, we conducted a reciprocal planting experiment within two habitat types—fennel-dominated areas and *Nassella*-dominated areas. The treatments (replicated 6 times) were 1) uncontrolled fennel, 2) cut fennel, 3) cut fennel with 3 inches of topsoil removed, and 4) uncontrolled

Nassella. Soil samples collected from all plots were analyzed for conductivity, texture, pH, available nitrogen, phosphorus, and potassium. Seeds of both species were planted in all replicates and protected by rodent exclosures. Control groups of *Nassella* and fennel were grown in a greenhouse to evaluate seed viability. Soil analyses revealed little difference in conductivity, texture and pH among the treatments. Fennel soils had higher phosphorus and available nitrogen, and lower potassium levels than *Nassella* soils. *Nassella* germination was significantly greater in cut fennel and topsoil removal plots than the other treatments; however, there was little difference in germination between these two treatments. Germination of fennel and *Nassella* was low in uncontrolled fennel. In *Nassella* plots, fennel had the highest germination. These findings suggest that fennel inhibits germination of both *Nassella* and itself through factors other than changing soil characteristics, and that controlling the fennel would be a sufficient restoration strategy.

Sinapis alba seed meal as a pre-emergent control for French broom (_Genista monspessulana_) seedlings. *Moore, Ken[1]* and Carla Bossard[2], [1]Wildlands Restoration Team, ken@wildwork.org; [2]Biology Dept., St. Mary's College of California, Moraga, CA, 94575. *cbossard@stmarys-ca.edu*

Over the 2008-2009 growing season, *Sinapsis alba* pressed seed meal was tested as a pre-emergent inhibitor of French broom (*Genista monspessulana*) seedlings in oak Savannah/meadow habitat. *S. alba* seed meal, known to contain 4-hydroxybenzyl isothiocyanate, releases a quinone that hydrolyzes in soil to form SCN-, a known bioherbicide. The meal was applied by broadcasting, onto the surface of the soil of six replicate per treatment, I meter diameter circular blocks at a rate of 8.8 kg of SCN-/ha, and I3.2 kg of SCN-/ha. The soil seed bank content, soil fauna and nutrient content of soils was also analyzed. The content of French broom seeds in the soil was 3256/m^2. Twenty four species germinated from the soil samples. Germination was dominated by native species. A significant decrease of broom seedlings was observed in treated plots compared to controls at both levels of application with the greatest inhibition resulting from the higher application rate. No significant differences were found in soil fauna or nutrient content between treated and untreated blocks at the lower application rate, in the soil tested at the beginning or the end of the experiment. However a significant decline in nitrate and phosphorus content of soils was noted in all plots between the soil tested in October and that tested in mid-May at the end of the experiment. Neither treatment level prevented germination of I00 % of broom seedlings in a season with late spring precipitation. This limits its usefulness as a control agent. Considering the effects of the *S. alba* seed meal application rates regarding overall efficacy as an inhibitor of broom seedlings and cost, the 8.8kg of SCN-/ha is recommended as the preferred application rate for those sites where this control may have some utility in inhibiting broom seedlings in small areas where adult broom plants have been cleared but the soil has a rich content of broom seeds in the soil seed bank and use of synthetic pre-emergent chemicals is prohibited.

Evaluating the seed bank of a disturbed site to determine potential ecological restoration strategies. *Olesen, Cory,[1]*, Daniel Doran[2], and Carla D'Antonio[1,3], [1]UC Santa Barbara, Dept. of Ecology, Evolution, and Marine Biology; [2]UCSB Geography; and [3]UCSB Environmental Studies. *coryo@umail.ucsb.edu*

South Parcel is a 69 acre area receiving University of California Santa Barbara funding for restoration by the Cheadle Center for Biodiversity and Ecological Restoration (CCBER). It is hypothesized that removing the top 3 inches of soil could reduce exotic seed abundance. At South Parcel, community types are dominated by mustard (*Brassica nigra*), fennel (*Foeniculum vulgare*), pampas grass (*Cortaderia jubata*), exotic grasses, or native purple needlegrass (*Nassella pulchra)*. To analyze seed bank characteristics, two soil samples were collected from twelve locations per community (surface to 3 inches and 3-6 inch depth), and samples were spread on trays in a green house to allow seed germination. Seedlings were counted and removed following identification. Soil samples were collected and analyzed for conductivity, texture, pH, available nitrogen, phosphorus, and potassium. Mustard had highest nutrient levels, fennel had low potassium, and nutrients were otherwise fairly constant. Pampas grass and mustard had the highest pH, conductivity did not vary much, and there were no significant differences in soil texture (except sandier soils in pampas grass). Seed bank analysis showed much lower seed density at 3-6 inches depth compared to surface soils. Except for patches in exotic grass habitat, native or perennial species were rare in all sites and depths, and pampas grass communities had the highest diversity of native and non-native species. With greatly reduced seed abundance lower than 3 inches in the soil, removing topsoil could be an effective restoration strategy to reduce non-native species abundance and allow planted native vegetation to establish.

Comparing the competitive ability of *Elymus multisetus* seedlings collected from invaded and uninvaded habitats. *Rowe, C.J.,* and Elizabeth Leger. U. of Nevada, Reno, Natural Resources & Environmental Sciences, Reno, NV; *cjrowe@cabnr.unr.edu*

Elymus multisetus (big squirreltail) (M.E. Jones) is a native perennial grass that can grow in areas that are highly invaded with *Bromus tectorum* (cheatgrass). This project tested whether big squirreltail seedlings from invaded areas were more competitive than seedlings from adjacent uninvaded areas. Previous results had demonstrated that that mature transplants from invaded areas are more competitive against cheatgrass. The results presented here demonstrate that seedlings from invaded environments are also more competitive than native plants.

Collections of big squirreltail seed were made from invaded and uninvaded areas at Balls Canyon, CA. In a greenhouse, seeds from 50 maternal families were planted both with and without cheatgrass competitors. Destructive harvesting at I0, 50, and I00 days after planting was used to quantify root and shoot growth characteristics. Competitive ability was measured by comparing measurements of big squirreltail seedlings from the same family grown with cheatgrass and those without. Competitive ability was greater for families from invaded sources (p=0.045). Additionally, biomass of cheatgrass grown with invaded source big squirreltail was significantly less than both the control and uninvaded source (P<0.00I).

Lastly, correlations between competitive ability and both biomass and early phenological traits were examined. Competitive ability was correlated to several early root growth traits: I0 day root length (P=0.00I), weight (P=0.00I), root:shoot ratio (P=0.00I) and ultra fine root production percentage (<0.Imm dia.) (P=0.005). These root traits varied by family, indicating that they are likely heritable. If these traits are heritable and increase competitive ability, and if competitive ability can be linked to overall fitness, than it can be inferred that *Elymus multisetus* seedlings from cheatgrass-invaded areas may possess adaptive traits that allow for increased fitness in a cheatgrass competitive environment.

Birds and invasive plants: A review of interactions and management considerations. *Spautz, Hildie[1], and Elizabeth Brusati[2*]. [1]AECOM Design + Planning, 2099 Mt. Diablo Boulevard, Suite 204, Walnut Creek CA 94596; [2]California Invasive Plant Council, I442-A Walnut St. #462, Berkeley, CA 94709, *edbrusati@cal-ipc.org*

Invasive plants alter ecosystems in a variety of ways, most of which are assumed to be detrimental. Ecological effects are one of the criteria used by Cal-IPC to rate invasive plants; however, the effects of invasive plants on wildlife are unknown for most systems. During research for the 2006 Cal-IPC Inventory update, we found few published studies examining direct interactions between birds and invasive plants. For this poster, we reviewed available studies of the relationship between birds and invasive plant species in California. Available information ranges from qualitative observations to fine-scale GIS-based spatial modeling. We will summarize case studies representing a range of invasive plants and avian communities. For some species, strong data shows the negative effects of invasive plants on birds and the benefits of removing weeds. Other invasive plants appear at first glance to have a positive effect on measures such as avian density but may in fact be "ecological traps" that reduce the birds' nesting success. In still other cases, the results are mixed depending on the avian species of interest. Understanding these interactions becomes increasing critical as land managers and policy makers develop long-term plans to buffer wildlife species against climate change, plans that may include prioritizing which invasive plants to remove and where.

Timing of application influences the efficacy of glyphosate on giant reed (*Arundo donax*). *Spencer, David[1]*, Greg Ksander[1], Wailun Tan[2], and Pui-Sze Liow[1]. [1]USDA ARS Exotic & Invasive Weeds Research Unit, Davis, CA; [2]UC Davis Dept. of Plant Sciences. *David.Spencer@ars.usda.gov*

We performed two experiments, in which glyphosate (I.5%) was applied on different dates. For container grown plants at Davis, application dates were September, October, November, 2006, April, June and August, 2007. In another experiment conducted near Fresno, CA, treatments were applied in September, October 2006 and June, August 2007. For container grown plants, leaf chlorophyll values declined the month following treatment and did not recover. The proportion of living stems displayed a similar response. By one year post treatment all treated plants appeared to be dead. For the larger Fresno plants, leaf chlorophyll values declined the month following treatment but recovered, except for plants treated in September, 2006. Plants treated in September had statistically significant lower values than untreated plants while plants treated in the other months did not. The proportion of living stems m^{-2} displayed similar results. Plants treated in September and October had the lowest proportion of living stems m^{-2} one year after

treatment. The lowest number of new stems produced in the growing seasons following treatment was for plants treated in September. These results suggest that late fall treatments (September, October) provide the greatest impact on giant reed.

Tulare County WMA cost-share for invasive weed control. *Sullins J. L.[1]*, Steve Wright[2], and Elizabeth Palmer[3]. [1]County Director/Farm Advisor, UC Cooperative Extension, [2]Farm Advisor, UC Cooperative Extension, [3]Area Biologist, USDA-NRCS. *jlsullins@ucdavis.edu*

Yellow starthistle proliferation is a serious threat to the biodiversity and the productive potential of California's rangelands. In 1985, over 8 million acres were infested, and by 1995 an estimated 12 million acres were infested. YST has continued to rapidly colonize susceptible habitats including 20,000 thousand acres in Tulare County foothill range. UC Cooperative Extension, the Tulare County Agricultural Commissioner, Tulare County RCD and the USDA NRCS formed the Tulare County Noxious Weed Task Force. This early organization led to official designation as a Weed Management Area (WMA). The WMA provides a structure to coordinate and collaborate in a local successful weed management effort, with key areas of research, education, outreach, inventory, control program, and monitoring.

Research trials were conducted from 1997 to 2008 to determine best strategies for YST control in the Tulare County foothill range. Based on research trials, from 2002 thru 2005 Transline® was used in the control program; however based on continued trial results, from 2007 to the present, the control program has used Milestone® due to increased efficacy on several other invasive weeds that impact rangeland values, such as fiddleneck and Italian thistle.

In 2002, a rangeland YST cost-share control program was initiated with a three-year grant for $70,000. Grant funding has varied annually from a high of $46,000 in 2009 to zero funding in 2007. From 2002 to 2008, six out of seven years, the TCWMA has conducted a cost share program for YST control. During this period, 209 sites/properties were treated for a total of 1,219.5 acres. Eighty one percent of sites were treated once during this period; 16% and 10% were treated 2 and 3 times, respectively in the seven-year period. Sixty-six percent of the acreage was treated once, and 15% and 13% treated twice and three times respectively in the seven-year period. Direct cost per acre for WMA without grant or land owner match ranged from $117 per acre to $46 per acre with a six-year average of $60 per acre.

Active and passive restoration of fountain thistle habitat following jubatagrass removal. *Thomas, Don, San Francisco Public Utilities Commission, dethomas@sfwater.org*

Fountain thistle (*Cirsium fontinale* var. *fontinale*) is a federally endangered plant species endemic to the San Francisco Peninsula, with the majority of its populations occurring within the Peninsula Watershed of the San Francisco Public Utilities Commission (SFPUC). One of the populations has been heavily invaded by jubatagrass (*Cortaderia jubata*). As the result of a 12-year-long control program, the SFPUC has removed almost all of the jubatagrass, and this has permitted fountain thistle to begin to reclaim the lost habitat. A monitoring program is being conducted to track the progress of re-colonization of the habitat by fountain thistle. Initial surveys revealed an average rate of expansion of the fountain thistle population of 1.7 ft. (0.5 m) between 2007 and 2008 and of 2.6 ft. (0.8 m) between 2008 and 2009, or an average rate of about 2.2 ft. (0.7 m) per year. At this relatively slow rate of spread, there is the risk of re-invasion of cleared habitat by invasive plants. Tall fescue (*Festuca arundinacea*) is rapidly increasing at the site and threatens to exclude fountain thistle from its potential habitat. Therefore a program of active restoration, involving the planting of California hairgrass (*Deschampsia cespitosa),* the most common native associate of fountain thistle in the Watershed, was begun in 2009 to supplement revegetation through passive recruitment and to provide a matrix of native plants that would resist further invasion. Survivorship of hairgrass will be followed to determine the effectiveness of this approach.

Weed control and habitat restoration in saline habitat. *Thomson, David, San Francisco Bay Ecotone Vegetation R&M. San Francisco Bay NWR Complex, Alviso, CA, d.x.thomson@gmail.com*

Vegetation management is often just hard work: control weeds, amend soils, plant natives, maintain things during establishment, and maybe some long-term maintenance to ensure the community stabilizes as intended. However in habitats adjacent to San Francisco Bay basic tactics have not met with success, forcing managers to reconsider dominant paradigms and test novel tactics. For three years we have attempted to establish grasses in an effort to preclude invasive forbs during habitat creation as recommended in the site's management plan, but have found grasses difficult to establish onsite and ineffectual against invasive forbs. Further background research and the casual introduction of native forbs led us to reconsider the grassland focus, so we will be testing native forbs

this fall. Another novel tactic is the use of saltwater as an herbicide against intolerant weeds. It is relatively inexpensive, in saline habitats it can be applied heavy enough to hold ground against intolerant weeds longer than any herbicide, and the treatment is essentially supplemental irrigation for native halophytes.

Adapting an agricultural technique for use in wildlands: Testing variations on solarization for invasive control in a severely disturbed plant community. *Weathers, Kristin A.*, Edith B. Allen,* and *Milton E. McGiffen*, UC Riverside Dept. of Botany and Plant Sciences *kristin.weathers@email.ucr.edu

Exotic propagules often greatly outnumber native seeds in the soil seed bank of invaded plant communities. This makes restoration very difficult, often requiring multiple years of invasive species management to establish native species. Solarization, a technique used in agriculture, places clear plastic over moist soil during the summer. This heats the soil as high as 55 ^{o}C, killing weed seed. Two studies used variations of the method successfully in a wildland setting. One study used irrigation and clear plastic during the summer, while another applied black plastic during the winter with no irrigation. Our goal was to compare the success of plastic color (black, clear and no plastic), season of application (winter and summer) and level of soil disturbance (tilling, scraping and no disturbance) in reducing exotic weed seeds in the seed bank. Plots were not irrigated. Preliminary results show that clear plastic placed in the summer controlled the most species. Black plastic winter treatment did not control exotic broadleaf species as well as clear plastic, but did increase the germination of natives in the first growing season compared to clear and no plastic treatments. Results will provide information to managers on an alternative non-chemical invasive control method in invaded plant communities.

Planting the Seed: Student participation in habitat enhancement. *Yurko, Matthew J.[1]*, and Jennifer Naegele[2]*. [1]California Coastal Commission, Newport Beach, CA; [2]Orange County Parks.*
**myurko@coastal.ca.gov,*
jennifer.naegele@rdmd.ocgov.com

Upper Newport Bay has benefited from hands-on restoration work performed by students from Early College High School (ECHS). A unique partnership with ECHS has proven an excellent tool for improving the health of natural communities while increasing environmental awareness and community participation through practical education of high school students. Students participate in four field sessions over the course of a school year. They learn to recognize a variety of invasive plants in local wild spaces, soon realizing that many of these plants exist in their own backyards. Over the course of the year, they remove exotic species, install native plants and seed, and maintain their plantings, all while observing the subtle changes of southern California's seasons reflected in their adopted restoration site. The successes and challenges of this program have yielded many programmatic lessons over a three-year partnership between the California Coastal Commission, Orange County Parks and ECHS. Follow a simple "toolkit" highlighting methods for creating similar programs with high schools to increase habitat awareness in students and reap rewards for your site!

See you next year in Ventura!
October 14-16, 2010

Cal-IPC 2009 Discussion Groups

Thursday 4:30-5:30 pm, Rooms other than Charter Oak are on the 2nd floor

Control methods roundtable **Charter Oak CD**
Joe DiTomaso, UC Davis, and other experts from around the state

Join a panel of weed management experts, led by Dr. Joe DiTomaso, to discuss the newest challenges and solutions for invasive plant control. Bring your questions and your success stories. Hear from fellow attendees, share information, and learn who else is working on your problem species. This group will be repeated in the Thursday and Friday discussion group sessions.

Points, lines, or polygons: What data representation works best for my project? **Sequoia A**
Jason Casanova, Los Angeles/San Gabriel River Watershed Council

This year's mapping workgroup session will examine the ever-present question, "What data representation(s) should one use when collecting data for an invasive plant monitoring/management program?" Inquiries that frequently arise in mapping include: What data representation works best in my situation? What are the pros and cons of each representation? In what situations should I use multiple representations? Are there guidelines or resources available to assist me in choosing a method? After I select a representation to implement, what BMPs (Best Mapping Practices) or data collection techniques apply to that particular representation?

A panel of experts will present a brief synopsis of their monitoring program, representations they use frequently, and BMPs they utilize to collect those representations. A majority of the meeting will be an open discussion where participants will be able to share their own experiences (pros and cons) with data representations. Those participants that are new to mapping will have the opportunity to ask questions relative to their own situations and use the group Q&A session as a "help desk" to jump start their own mapping efforts.

Research needs for invasive plant management and ecology **Sequoia B**
Edith Allen, UC Riverside

Discussion on invasive plant research needs for managers, researchers, and regulators. Cal-IPC recently developed a framework on research needs for invasive plant management and ecology, including regulatory and social issues (www.cal-ipc.org/ip/research/researchneeds.php). However, managers are continually faced with local, site-specific issues for invasive species control, and new species are introduced with unknown ecological characteristics. This discussion is an opportunity to help set the invasive species management research agenda for California. We will also discuss finding and developing sources of funding to carry out the research.

The unique challenges of long-term follow-up monitoring **Mineral King**
Sue Hubbard, Bureau of Land Management

You just had some great volunteer events removing invasive plants from a site, there was funding available and your manager appreciated your efforts. You have removed all the original plants and the site looks so much better. But you know there will be new seedlings that will soon need your attention. Your volunteers have lost interest, the funding has dried up and your manager is ready for you to move on to the next project. We all know follow up is critically important but how do we handle the unique challenges this stage brings. Challenges include keeping volunteers and employees motivated, finding widely scattered plants, keeping track of sites, knowing what level of monitoring is appropriate, deciding when the project is complete, and communicating the importance of this work to funders and managers. We will discuss these and other issues related to follow up and learn from each other's experiences.

Cal-IPC 2009 Discussion Groups

Friday 10:00-11:30am, Rooms other than Charter Oak are on the 2nd floor

Control methods roundtable (repeated) **Charter Oak CD**
Joe DiTomaso, UC Davis, and other experts from around the state

Join a panel of weed management experts, led by Dr. Joe DiTomaso, to discuss the newest challenges and solutions for invasive plant control. Bring your questions and your success stories. Hear from fellow attendees, share information, and learn who else is working on your problem species. This group will be repeated in the Thursday and Friday discussion group sessions.

Saharan mustard (*Brassica tournefortii*) **Sequoia A**
Matt Brooks, US Geological Survey

Brassica tournefortii (Saharan mustard) is an abundant weed in the Sonoran and Mojave Deserts as well as south-coastal California. It has spread rapidly in recent years and appears in periodic outbreaks. Saharan mustard may increase fire risk and change the physical structure of the desert dune ecosystem. Learn more about the latest research on this species and discuss strategies to prevent and control its spread.

Careers in invasive species management **Sequoia B**
Cal-IPC Student Chapter

This group will provide an opportunity for career-seekers to hear from a diverse group of professionals working with weeds. Panelists will represent the government, non-profit, private, and educational sectors. A formal discussion addressing selected topics will be followed by an informal question and answer section. This group will provide valuable information and insight from experienced professionals to first time career-seekers, as well as career-changers.

Preventing introduction and spread of invasive weeds via construction equipment and supply materials
Wendy West, UC Cooperative Extension **Mineral King**

This discussion group will explore guidelines, regulations and educational programs aimed at preventing the introduction and spread of invasive weeds during site-disturbing construction, fuels management and road projects. What agency policies are in place and working? How can we work with the industry to encourage the use of best management practices and guidelines for equipment? What's new in working with materials suppliers (e.g. gravel, road base, erosion control materials) to achieve weed-free supplies and prevent the movement of plant seeds and parts? Come join us and bring your ideas, experience and questions!