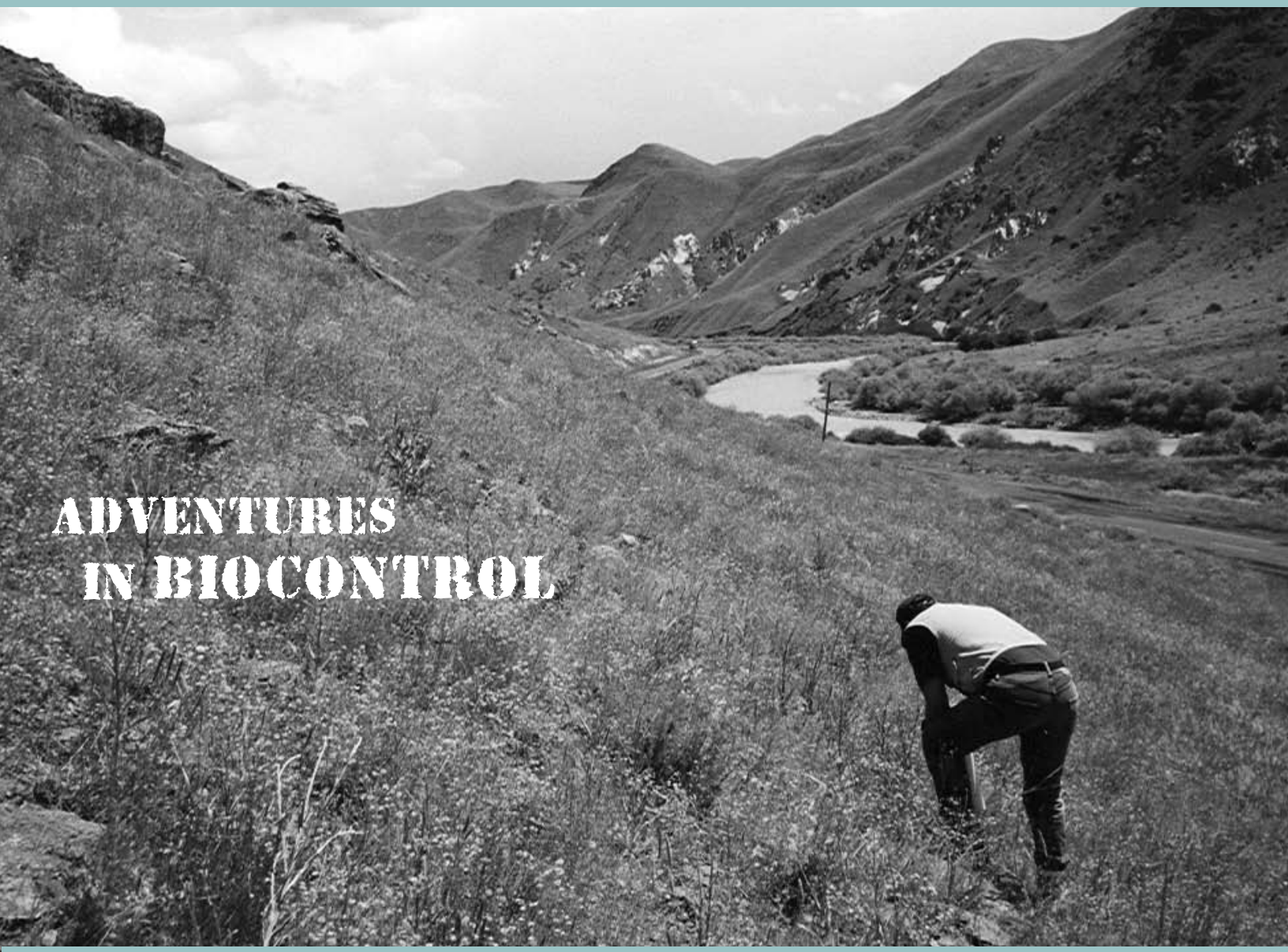
Cal-IPC News

Protecting California's Natural Areas from Wildland Weeds

Vol. 17, No. 4 Winter 2007-2008 Quarterly Newsletter of the California Invasive Plant Council



Biocontrol researchers explore wildlands worldwide, looking for natural predators of weeds in their home range. Above, beetle taxonomist and USDA collaborator Marek Volkovich of the Russian Academy of Sciences hunts for yellow starthistle biocontrol agents in Turkey. Story page 4.

Photo: Lincoln Smith, USDA-ARS.

Inside:

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A California 501(c)3 nonprofit organization

Protecting California's natural areas
from wildland weeds through
research, restoration, and education.

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Editors: Doug Johnson, Elizabeth Brusati, Cora Puliatch

Biocontrols: Can we do the job without them?

If our goal is to effectively control invasive plants at the landscape scale, long-time weed workers tell us, "No, we cannot do it without biocontrols." Even if we are able to significantly increase the resources available for weed management, landscape-level control for powerful invaders like yellow starthistle, *Arundo donax*, or Cape-ivy may well be impossible without biocontrols. Recent successes, like that of the *Diorhabda* beetle on tamarisk (see Vol. 11, No. 4), suggest that help may be on the way.

The weed control potential of a dedicated work crew of host-specific insects is enormous. The ideal "biological control agent" works year after year, spreading throughout the range of the targeted invasive plant, finding the most hard-to-reach plants. Though a biocontrol agent can never completely eradicate their targeted host plant (as dictated by basic population dynamics), agents can knock a weed population's numbers way back, reducing the weed's impact while making it more readily controlled with other integrated methods.

Developing such a successful biocontrol agent takes a large investment of resources. First, there is exploration in the target plant's home range to identify potential agents. Then comes extensive testing to ensure that the agent is narrowly "host-specific" and will not attack other related plants (especially those native to, or commercially produced in, the target region). Finally, there are substantial regulatory permitting requirements, and eventually field release monitoring. It is a long row to hoe, and steady funding for what can be a decade-long process is challenging to come by.

We are fortunate in California to have some valuable resources for such development, including the University of California, the USDA-ARS lab in Albany, as well as the California Department of Food & Agriculture and county agricultural departments, who have long-standing networks for dispersing approved agents.

These are heady days for biocontrol agents, and their potential to make a significant impact on our work should be acknowledged and supported. *Diorhabda* beetles appear to be a major biocontrol success story, addressing perhaps the most widely known weed in the western US. New yellow starthistle agents are in the pipeline, and permit applications for two Cape-ivy agents are in the final stages of preparation. We hope our feature article demystifies the topic and gives you a better idea of what is on the horizon for biocontrols.

A thing of beauty. *Eustenopus villosus*, the yellow starthistle hairy weevil, is reducing seed production across California. *Photo by Lincoln Smith, USDA-ARS.*

Wildland Weed NewsNewsNewsNewsNews

A new draft of the **National Invasive Species Management Plan** for the next five years (2008-2012) has been released by the National Invasive Species Council. *www.invasivespeciesinfo.gov*

US protections against introductions of invasive species are inadequate, according to a report by the World Conservation Union. Risks to our environment and economy are inadequately addressed by federal policy. *www.iucn.org/places/usa*

Zebra mussel, a mollusk that has wreaked havoc on the Great Lakes, **has been found for the first time in California**. The Dept. of Fish & Game announced that a fisherman found the invaders at San Justo Reservoir in San Benito County. *LA Times*, 1/16/2008.

Cal-IPC has become an official voting member of the **National Environmental Coalition on Invasive Species** (NECIS), joining with groups including Defenders of Wildlife, Union of Concerned Scientists, The Nature Conservancy, and National Wildlife Federation. *www.necis.net*

The **Texas Invasive Plant & Pest Council was born Nov. 16, 2007**, at a 3-day meeting hosted by the Lady Bird Johnson Wildflower Center. The state already has significant infrastructure, including a reporting system for early detection, and outreach to the horticultural community. *texasinvasives.org*

A **Northern Rockies Exotic Pest Plant Council may be forming**, as well. Regional weed workers organized a conference in Missoula, Feb. 13-14 to discuss invasive species in natural areas, and to strategize forming an EPPC. *missoulaeduplace.org/weeds_conference.php*

The New York State Dept. of Environmental Conservation has created **a new office to address invasive species**. With a staff of four and budget of $5 million, the office will undertake outreach, early detection, policy, research, and granting. Associated Press 12/27/07.

Early Announcement!

2008 Cal-IPC Symposium

Oct. 2-4, Chico State University

Paper and Poster abstract submissions accepted March 1 through July 1

See www.cal-ipc.org for details

Registration open for our 2008...

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WWFC-1: Know your Wildland Weeds! Biology & Identification *NEW!*

WWFC-2: Know your Tools! Control Methods for Wildland Weeds

WWFC-3: Wildland Weed Mapping

WWFC-4: Revegetation for Wildland Weed Projects *NEW!*

Santa Barbara:
Sedgwick Reserve
April 21 - Biology & Identification
April 22 - Control Methods

South Lake Tahoe:
Lake Tahoe Community College
May 28 - Biology & Identification
May 29 - Control Methods

San Diego:
Mission Trails Regional Park
June 6* - Biology & Identification
June 7* - Control Methods

Berkeley:
Brazil Room, Tilden Regional Park
July 23 - Biology & Identification
July 24 - Control Methods

Chico:
Bidwell Park*
October 1 - Revegetation

Berkeley:
East Bay Regional Parks District, Trudeau Training Center
November 6* - Mapping

* to be confirmed

Join us in Sacramento for

2008 Invasive Weeds Day at the Capitol

March 12, 2008

Policy updates, Capitol training, visits to your legislators!

Work to:

- *Secure WMA funding*
- *Establish an interagency council for coordination*

Your advocacy has been key in maintaining WMA program funding so far. Let's keep it up, and work on a state interagency coordination body while we're at it!

Register at www.cal-ipc.org

Feature Article

Biocontrol 101: Classical biological control of weeds

Lincoln Smith, USDA-ARS

Modified from an earlier version published in CDFA's Noxious Times, *Spring 2006. Dr. Smith is a Research Entomologist with the Exotic and Invasive Weeds Research Unit at the USDA-ARS Western Regional Research Center in Albany, CA.*

When I first moved to California in 2000, I stopped in the town of Weed, north of Mount Shasta. In the center of town was a display of planted flowers depicting the Klamath weed beetle (*Chrysolina quadrigemina*), and a plaque commemorating how this insect had saved California from the scourge of Klamath weed. This year, when I happened to pass through Weed, I noticed that the memorial had been replaced by something more contemporary. I imagine that most Californians are no longer aware of how serious a problem Klamath weed was, nor are they aware that the beetles are still "doing their job" of keeping the weed in check. This is the beauty of classical biological control—it keeps on working long after we have forgotten that we ever had a problem.

You probably recognize the name St. Johnswort (Klamath weed, goat weed, *Hypericum perforatum*) as an over-the-counter herbal medication. However, by 1930 this alien plant had become the scourge of ranchers in Northern California and Oregon. The plant contains hypericin, which is toxic to sheep and cattle. If it were just a rare wildflower, it would not be a problem; however, the plant multiplied and became the most common plant on many ranches in Northern California and Oregon.

This was before the invention of herbicides, and ranchers helplessly watched as their land became invaded. The problem was so intractable that bankers refused to loan money to ranchers whose land was infested. Why had the plant suddenly become such a big problem? It was an alien plant that had colonized a new region where the climate and soils were just right, and where there were few diseases or herbivores to attack it. This was enough to tip the ecological balance in favor of the weed, especially in heavily grazed grasslands.

A field in Mendocino County before and after biocontrol by *Chrysolina quadrigemina.* At top, from 1948, the foreground is filled with Klamath weed. By 1950, range grass had replaced Klamath weed. The lower photo, from 1966, shows sustained control of Klamath weed. *Photos by J.K. Holloway, USDA-ARS.*

Today, despite the development of highly effective herbicides and other treatments, we are faced with an increasing number of alien plants that are invading areas so large or environmentally sensitive that non-biological control methods alone cannot bring them under control. Can these weeds also be controlled the way Klamath weed was?

How it works

The theory behind classical biological control is grounded in the concept that plant populations are generally limited by a combination of adverse environmental factors: climate, soil, competition with other plants and attack by herbivores (pathogens, insects, grazing animals, etc.). These herbivores are known as "natural enemies." In the region where the plant first evolved, natural enemies also evolved to exploit the plant, which helps to limit the plant's population size. However, if the plant is moved to a new continent where its natural enemies do not occur, then the plant may be able to multiply much faster than it did in its homeland.

If we can find natural enemies in the land of origin that attack only this weed, then we could release them here to help bring the plant back under natural control. The key is to find natural enemies that will not attack other plants. It takes time to discover potential biological control agents, to evaluate them to determine that they are safe, and to obtain approval by regulatory agencies. This can take 5 to 10 years, and even longer if the program is not sufficiently funded.

It is not always possible to find safe, effective agents, but if the alien plant does not have any close relatives in North America, then there is a very good chance of finding natural enemies that will not attack non-target native or commercially important plants. About 30 to 90% of adequately funded projects are successful, depending on how you define a project or success.

Biocontrol development requires connections between researchers around the world. Conducting on-the-ground exploration for potential biocontrol agents requires a strong knowledge of natural history, local languages, and ability to travel well. Adventurous weed workers should consider the career option of becoming globe-trotting field biologists for biocontrol research! Here, Marek Volkovich from the Russian Academy of Sciences researches biological control agents for yellow starthistle in Turkey. *Photo by Lincoln Smith, USDA-ARS.*

"Classical biological control" refers to the discovery and release of naturally occurring species to control a pest (plant or animal). It involves releasing a relatively small number of biological control agents, which then multiply and spread on their own. Other methods of biological control or "biocontrol," involve repeated releases of high numbers of biological control agents (often pathogens, tiny parasitic insects or predaceous mites) to control pests. Some pathogens can be mass-produced and applied like a conventional insecticide or herbicide. Genetic modification of plants or insects and use of pheromones (insect perfumes) has also been called biocontrol by some.

What can go wrong?

Usually the first question someone asks after they hear about classical biological control is, "After they finish eating all the weeds, what will the insects attack?" It is a natural question and the one that scientists, like me, spend most of our time working on.

Although some insects attack a wide variety of plants, most herbivorous insects feed on only a few species of closely related plants. This is because insects have been trying to eat plants for a long time, and each plant species has evolved ways to defend itself. We are all aware that most wild plants are not good for humans to eat. Furthermore, we have livers that detoxify the harmful chemicals found in the plants that we do like to eat. Cooking also deactivates many potentially toxic proteins in our food.

Of course insects do not cook, and they do not have livers, but they do have some pretty effective enzymes to detoxify plant toxins. However, because plants have developed so many different kinds of toxins, most insects are forced to specialize. Insects must also specialize to be able to find their plants, often by odor and taste, and they must specialize to be at the right developmental stage at the right time to attack the right part of the plant to feed on.

Thus, when Klamath weed populations suddenly decreased as the Klamath beetle population exploded, the beetles did not start attacking other plants. Although there was some feeding on a few other *Hypericum* species, the insects continued to search for Klamath weed and when the weed became scarce, so did the beetles.

Scientists have been extremely effective in predicting which plants may be attacked

Tamarisk

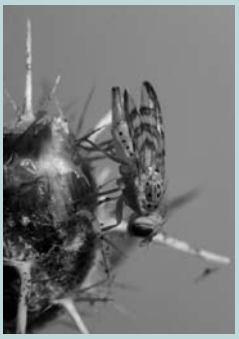
After more than a decade of testing, the *Diorhabda* beetle was released at test sites in Nevada and other western states in 2001 (see *Cal-IPC News*, Winter 2004). Tamarisk populations at many sites had been damaged substantially (some with mortality of 75%), giving hope for controlling for one of the west's most destructive weeds. In California, the beetle has been tested at Cache Creek west of Sacramento, and was distributed by CDFA northward to Glenn and Tehama counties in 2007. Testing in southern California watersheds with warmer-climate ecotypes has been completed, and *Diorhabda* will be released along the Mojave River and three other major watersheds in 2008. An excellent article on tamarisk biocontrol appeared in the Nov. 26, 2007 issue of *High Country News*, available online at hcn.org. *Photo by Raymond I. Carruthers, USDA-ARS.*

Cape-ivy

In 1997, CNPS stalwart Jake Sigg began soliciting donations to support research on biocontrols for Cape-ivy, one of the top weeds in California's coastal watersheds. To date, over $250,000 has been contributed to Cal-IPC, which passes all funds to USDA-ARS to support South African partners conducting research in Cape-ivy's home range. Dr. Joe Balciunas at the Albany lab has completed host-specificity testing for the two most promising agents, a gall fly (pictured) and a stem-boring moth. He is submitting his research to USDA-APHIS, and will begin field-testing the agents in the Big Sur area, with simultaneous testing in southern California by UC Santa Barbara collaborators, once permits are obtained. *Photo by Joe Balciunas, USDA-ARS.*

Yellow starthistle

Five agents were approved for release from 1984 to 1992. The most effective are the hairy weevil (*Eustenopus villosus*) and false peacock fly (*Chaetorellia succinea*, pictured). Each lays eggs in the flower heads of yellow starthistle, where larvae later eat the plants' seeds. These agents are widely established around California. In two undisturbed sites monitored by CDFA over the last decade, yellow starthistle populations declined significantly. However, populations along roadsides and in heavily grazed areas are not as well controlled. Dr. Lincoln Smith at the Albany lab has researched a new rosette weevil from Turkey that damages the root system, and has formally requested permission to release it. Two additional agents are currently being researched: a flea beetle from Russia that damages young stems, and a blister mite from Bulgaria that damages young flowers. A rust pathogen was released in 2003, but has not established well.



Getting agents out

To distribute biocontrol agents into the field, the California Dept. of Food & Agriculture (CDFA) helps researchers establish initial field sites for new biocontrol agents, monitors these nursery sites, multiplies biocontrol populations, and eventually invites county agricultural commissioners to a field day where they receive training and collect agents to take back to their counties. Agricultural commissioners are then able to get the agents out to landowners locally. Recent distribution programs include releases of a leaf weevil on Mediterranean sage in northeastern California and two leaf beetles on purple loosestrife statewide.

by a prospective biological control agent, despite the fact that it is impossible to test every species of plant. During foreign exploration for a new biological control agent, scientists quickly eliminate species known to attack other plants, and focus on those that are thought to be highly host specific. Scientists also focus on species that are not likely to be eaten by generalist predators to avoid wasting time on a "dud" that may never become abundant enough to reduce the weed population.

The infamous ecological disasters caused by releasing mongoose or cane toads in the past were not done by scientists, and these "biological control agents" did not undergo any approval process by regulatory agencies. In fact, many invasive species were once "intentionally" introduced for ornamental purposes or because someone wanted to "free" a pet. None of these underwent the intensive evaluation and approval process required today for introducing biological control agents for weeds.

Approval process

In order to release a classical biological control agent into the wild in North America, approval must be given by both the state and federal governments. The formal evaluation process requires the person proposing to make the release to submit a "petition" to TAG (Technical Advisory Group). TAG is a committee that has a representative from each of the U.S. federal departments, agencies with land management responsibilities (U.S. Fish and Wildlife, Bureau of Land Management, Bureau of Indian Affairs, etc.) and representatives from Canada and Mexico. TAG specifies the information required in their Reviewers Manual.

Before beginning research on a prospective biological control agent, the scientist must submit a proposed host plant test list to TAG for review and approval. This provides the opportunity to criticize the research plan and to add non-target plants that should be tested. The scientist then conducts tests to determine what non-target plants the agent may attack under extreme conditions (ie. none of their preferred host is available) and under more realistic conditions (choice of target weed and non-target plants). The results are summarized in the petition to TAG, that also includes all that is known about the prospective biological control agent and the target weed.

The petition reviews both the known harms and benefits of the target weed and potential risks and benefits of releasing the agent. TAG reviews the petition and makes a recommendation whether to approve the agent or not, and may request that the petitioner conduct additional experiments to answer specific concerns. If TAG recommends approval, then the petition goes to USDA-APHIS (Animal and Plant Health Inspection Service), which reviews the information, consults with USFWS to determine if there is no significant risk to threatened or endangered species, announces the proposed permit in the Federal Register, and receives public comment. If this process results in a FONSI (finding of no significant impact), then APHIS can issue a permit for the scientist to make releases. Any state where a release is to be made must also give permission.

The permit specifies the conditions under which the releases can be made. Often the first releases are conducted inside cages, both to confine the agents and improve their chances of establishing, but also to permit further testing of any non-target plants thought likely to be affected by the agent. Once the agent is established, and there are no further non-target concerns, the cage is removed and the agent may be released at additional sites.

Whether or not to release a biological control agent is a governmental decision that weighs potential risks against benefits and is aided by scientific information and analysis. An important part of this decision is public opinion of what is acceptable risk to non-target species and what is the perceived benefit of reducing the weed population. Public opinion can change over time, and this has created some of our invasive species problems. For example, in 1969 the beetle *Rhinocyllus conicus* was approved for release to control musk thistle (*Carduus nutans*). The petition stated that the insect would also attack some species of North American native thistles (*Cirsium* spp.), but at that time this was acceptable because many people considered all thistles to be undesirable.

Today, public opinion has changed and there is a much greater desire to protect all native species, including thistles. Under today's standards, *R. conicus* would not be approved for release, but that is little consolation to those seeing the beetle attack native thistles. Once a biological control agent is released and becomes widespread, it cannot

be "recalled." Thus, it is important to be as foresighted as possible when making decisions to release a biological control agent.

Integrated management and biological control

Not every alien plant that is introduced to a new region becomes invasive. In fact, only about 10% of the alien plants introduced to North America have become established in the wild, and only about 10% of those have become serious weeds. For this 1% that become invasive, if we could prevent their establishment or eradicate them soon after they establish, then we could save ourselves lots of trouble. However, once they become widespread, the cost of conventional control methods (herbicides, hand-pulling, burning, mowing, etc.) can become astronomical. Managing an invasive weed is a bit like controlling a wildfire: focus on stopping the spread and extinguish the small outlier patches. However, the center of a fire burns itself out, whereas an invasive weed continues growing and producing seed year after year.

When faced with such a large, persistent infestation, classical biological control is sometimes the only effective solution. Though biological control agents do not completely eradicate a weed, since the population sizes of the weed and the agent are dynamic and interrelated, they can greatly decrease the size of weed populations, and make remaining plants more susceptible to control using other techniques. Weeds that have been successfully controlled in North America by introduced agents include tansy ragwort, musk thistle, puncturevine, and purple loosestrife. Recently success is being achieved for leafy spurge, melaleuca, saltcedar and several knapweeds. However, in order to avoid replacing one weed by another, it is important to remember that biological control is just one component of a vegetation management plan.

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For more information:

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USDA-APHIS, Technical Advisory Group. www.aphis.usda.gov/ppq/permits/tag/

Researcher Massimo Cristofaro, a biologist at ENEA, an Italian research center in Rome, studies damaged yellow starthistle during foreign exploration in Turkey.

In the pipeline...

Russian thistle: USDA finished evaluation on a mite and is waiting on the approval process. Foreign cooperators are searching for additional agents.

Scotch thistle: USDA is testing agents approved in Australia and conducting additional exploration in Eastern Europe.

Brooms: Cal-IPC is partnering with others in Oregon, Washington and Australia on the International Broom Initiative. Prospective agents are undergoing initial testing in Montpellier, France.

Arundo: Scientists at ARS and UC Santa Barbara are evaluating several prospective agents, two of which are already established in California.

Perennial pepperweed: Foreign cooperators have discovered several potential agents and are beginning to test them.

Medusahead: ARS has discovered a smut in Turkey and conducted preliminary tests.

The Albany lab

The USDA Exotic Invasive Weeds Research Unit in Albany, CA (just north of Berkeley) has one of the few quarantine laboratories west of the Mississippi. This lab is set up to test prospective biocontrol agents without accidentally releasing them. Funding for the lab was threatened in the late 1990s, and Cal-IPC and CNPS joined with agricultural stakeholders to advocate for the lab's survival. Cal-IPC works to support increased funding for biocontrol research, with the Albany lab being one of the most critical resources.

Not just for weeds

Other invasive organisms can be candidates for biocontrol as well. For instance, UC Santa Barbara has received funding from the US Fish & Wildlife Service to research a parasitic agent for the New Zealand mud snail, which has invaded California waterways in the last three years.

Common reed as an invader in California

Adam Lambert, Department of Biology, Eastern Connecticut State University
Tom Dudley, Marine Science Institute, University of California, Santa Barbara

Common reed, *Phragmites australis* Cav., is a large-statured grass (1-3m tall) with both native and exotic genotypes present in North America. An invasive genotype has been well studied in the eastern United States, where it is super-abundant and has replaced native genotypes in a wide range of wetland types. In the east this expansion is attributed, in part, to anthropogenic changes in wetland ecosystems that facilitate *P. australis* dispersal and growth (Bertness *et al.* 2002, Marks *et al.* 1994); many of these same conditions (urban development, nutrient enrichment) exist in California.

P. australis expansion has deleterious effects on biodiversity and wetland ecosystem functions (Chambers *et al.*1999, Marks *et al.* 1994), leading to many control efforts against the invasive forms (Cross and Fleming 1989, Hellings and Gallagher 1992). Invasive populations form monotypic stands after invasion, excluding other wetland plants (Marks *et al.* 1994, Meyerson *et al.* 2000), reducing arthropod diversity (Gratton and Denno 2005) and impairing essential fish habitat (Weinstein and Balletto 1999). However, very little information is available on the distributions and impacts of invasive common reed genotypes in the western US or California, including impacts to native *P. asutralis* genotypes. Currently, we do not have accurate data on the distributions of native genotypes in the western US to effectively control exotic populations without harming native ones. In the most recent invasive plant inventory of California (Cal-IPC 2006), *P. australis* remained unscored as native/exotic because of a lack of information on its genetic distribution and composition here.

Non-native *Phragmites australis* population surrounding a pond in Connecticut. *Photo by Adam Lambert.*

Native *P. australis* has been an important component of southwestern food webs for over 40,000 years (Hansen 1978), and was used for centuries by Native Americans for hunting, basketry and food. Larvae of the Yuma skipper butterfly (*Ochlodes yuma*) are obligate feeders on native *P. australis* through the Great Basin and into the Central Valley of California (Shiparo 2007).

In recent surveys in California, Nevada, Utah and Arizona, we found invasive populations in many desert wetlands, and associated with the canal systems that bring Colorado River water to cities and agriculture in southern California. Invasive populations are present in Imperial, Riverside, San Diego, San Luis Obispo, and Solano Counties (B. Blossey, personal comm.; A. Lambert, unpublished data). Many rivers, wetlands and desert springs and oases still have only native populations. However, in the southwestern part of the state, the canal systems may be facilitating the spread of invasive populations into these natural areas.

Chemical control efforts for this plant have been ongoing for years around the Salton Sea, a region where both native and invasive genotypes are present. However, these control efforts can impact non-target plants (Kay 1995), including native *P. australis* populations (A. Lambert, personal obs.). In Utah and Colorado, invasive populations have increased substantially in recent decades, with many subsequent control programs being initiated.

In the Sacramento River delta, invasive populations form mixed stands with *Arundo donax*. It is possible that in many areas where the two species co-occur, *A. donax* is suppressing the establishment and expansion of *P. australis*, and chemical and biological control of *A. donax* may open new habitats for *P. australis* invasion. Many native populations exist in springs and seeps in the Coastal Ranges of central and southern California, and their presence in systems like the Santa Clara and Salinas Rivers may indicate these habitats are suitable for invasive populations once they get a foothold.

The few remaining native *P. australis* populations are more susceptible to exotic insect herbivores than are exotic forms of *P. australis*—the vector for exotic insect introductions. For example, exotic aphids (*Hyalopterus pruni*) reach higher population densities on native genotypes relative to invasive genotypes (Lambert and Casagrande 2007). Aphid feeding damages leaf tissue, and causes fungal growth and mortality only in native plants. In preliminary surveys in the southwest, all invasive populations and some native populations that we identified had exotic aphids on them, with native plants showing the characteristic aphid damage. Invasive populations, which are resistant to aphid damage, may be facilitating the spread of these aphids onto native populations throughout the southwest. We are currently investigating the relative im-

Arundo/Phragmites Symposium

March 13 and 14, 2008
Anaheim, CA
www.wsweedscience.org

Giant reed (*Arundo donax*) and common reed (*Phragmites australis*) are major invasive plants of riparian and wetland ecosystems in the US. This symposium brings together experts from both coasts to present current knowledge on the biology, ecology, impacts, and management of both species. While common reed is principally thought to be a problem of the East Coast, invasive biotypes have been identified from California and Idaho. This will be an opportunity for weed workers in the west to learn first-hand about this potential new pest. Plan now to attend this important symposium! Register at *wsweed science.org*

portance of exotic aphid feeding and direct competition from non-native populations in the displacement of native populations.

There is also concern regarding potential impacts of biological control on native *P. australis* populations and their endemic fauna. The exotic genotype is the target of a biocontrol program being conducted by scientists at the University of Rhode Island and Cornell University (R. Casagrande, personal comm.). This is the first instance of genotype-specific biocontrol, and special care is being taken to ensure the safety of native genotypes.

We hope to raise awareness of these issues and pre-empt potential impacts of *P. australis* invasion on California ecosystems at the upcoming symposium [see sidebar].

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Weed Alert!

Carrichtera annua (Ward's weed) found in San Diego County

Jessie Vinje, Preserve Manager, Center for Natural Lands Management

Carrichtera annua was recently found growing in an open space preserve located in Carlsbad, CA. *C. annua* is an annual member of the mustard (*Brassicaceae*) family. This species was not previously known in San Diego and has only been documented as occurring in California in Monterey in 1979. Otherwise, it is a new species to North America (Andrew Sanders, UCR, pers. comm.).

In Carlsbad, this plant was located on a southern-facing slope growing among open Diegan coastal sage scrub dominated by California sage (*Artemisia californica*). Associates included coast sunflower (*Encelia californica*), buckwheat (*Eriogonum fasciculatum*), lemonade berry (*Rhus integrifolia*), and tocalote (*Centaurea melitensis*). *C. annua* was growing on open clay lenses in the coastal sage scrub and underneath the shrubs. Thousands of plants were found, and they were in most cases out-competing the tocalote. The infestation was about a half acre in size and is located adjacent to a fallow agricultural field.

Seed pods and leaves. *Photo by Patrick McConnell.*

Flowers and leaves. *Photo by David Scott.*

C. annua can be easily distinguished from other members of the mustard family by its fruits and leaves. The fruits are proximally globose with a distal falcate oblong process on the distal portion and the opposite leaves are bipinately compound. The flower petals are pale yellowish and the sepals are hairy and lavender in color before the flower opens. The plant ranges in size from a few inches up to 1.5 feet in height and is few-to-many branched.

Studies performed in Australia, where this weed is a widespread problem in semi-arid areas, seem to indicate that it prefers calcareous soils and that it can produce up to 30,000 seeds per square meter per year (Ecological Society of Australia). This species also has two distinct seed banks—one in the soil, and one on the plant, since seeds remain in the pod on the plant without dropping onto the ground (Ecological Society of Australia). Ward's weed, as it is called in Australia, additionally is considered a highly flammable species (Friends of the Whyalla Conservation Park) and has a very dense cover in the Carlsbad location. It is also considered a serious threat in Australia to one or more vegetation formations (The Nature Conservancy).

Be on the lookout for this species and if you locate it, please report it to Cal-IPC, your county Weed Management Area, and your county agricultural commissioner.

Contact the author at jvinje@cnlm.org.

For more information:

The Ecological Society of Australia Incorporated. *www.ecolsoc.org.au/What%20we%20do/Prizes/documents/JuliaCookeESA2004.pdf*

Friends of the Whyalla Conservation Park. *www.fwcp.org/manage/backfeat.htm*

The Nature Conservancy Global Invasive Species Team. *http://tncweeds.ucdavis.edu/global/australia/ath.html*

Welcome to the first Cal-IPC student chapter!

Sara Jo Dickens and Heather Schneider, UC Riverside

Following the 2007 Cal-IPC Symposium in San Diego, many of the graduate students from Southern California left with a desire to take a more active role in the organization. Our motivation for increased involvement is not only to contribute to core Cal-IPC goals, but also to ensure future graduate student interest and participation.

Involving more graduate students in Cal-IPC is a topic of interest among board members and general members alike, particularly concerning how to increase graduate student participation in the 2008 Symposium.

In response to this growing interest, we recruited other graduate students at UC Riverside to create the first Cal-IPC student chapter. We have begun to lay the foundation for the chapter and are working with students and senior members of Cal-IPC to determine the most beneficial role for a chapter for both students and the organization in general. We hope to create a chapter that will provide the experiences students need for advancement in their careers so that they will be excited to join and participate in Cal-IPC activities.

The chapter intends to participate in the 2008 Symposium to assist in arranging student-targeted workshops, encouraging more student presentations, and networking to expand the chapter membership. Many attendees of the last symposium mentioned and applauded the presence of a large number of younger ecologists, and we are excited to respond with a Cal-IPC student chapter to help ensure the success of future young ecologists.

Kris Weathers, a graduate student at UCR, staffs a Cal-IPC student chapter booth at the Santa Rosa Plateau Ecological Preserve's Native Plant Sale. *Photo by Sara Jo Dickens.*

The student chapter aims to:

Act as a liaison between professional and student members of Cal-IPC

Assist with Symposium planning

Create and assist in community outreach programs to get Cal-IPC face time with the public

Aid in facilitating communication with other similar organizations such as CNPS

Help students network with professionals in weed ecology and biology

Facilitate mentorship arrangements in which students learn from professionals while assisting them with a project

In the meantime, the first action of the student chapter has been the creation of an outreach group. With the help of botany professor and advisor Dr. Milton McGiffin, UCR graduate students designed portable displays advertising the "Don't Plant a Pest" and PlantRight Campaigns. The students have attended native plant sales held at the UCR Botanic Garden, Rancho Santa Anna Botanic Garden, and the Santa Rosa Plateau Ecological Preserve. The response from sale patrons was positive and encouraging, and the display is being improved in response to requests for its presence at future events. We intend to increase our ability to reach locations far from the Riverside area by expanding the student chapter membership to other schools who may in turn take this campaign to their local botanic gardens.

It is our hope that students and Cal-IPC members alike will embrace this opportunity for the growth and expansion of the Cal-IPC community, thus paving the way for the next cohort of invasive species scientists.

Contact the authors at sdick002@student.ucr.edu.

CALL FOR PAPERS AND POSTERS

California Native Plant Society: 2009 Conservation Conference

January 17 - 19, 2009
Sacramento Convention Center

Submissions accepted March 1 to June 30, 2008

The CNPS 2009 Conservation Conference will bring together scientists, conservationists, students, public policy makers, local and regional planners, and land managers from all regions of the state and beyond to share the latest developments in conservation science and policy. We seek solutions-based papers and posters on: climate change and California's flora; rare plant conservation and restoration; mitigation and monitoring of impacts to plants and communities; invasive species; vegetation classification and mapping to promote native plant conservation; conservation genetics; achieving equal protection for plants; regional planning tools; land management; and basic conservation-related plant science. We also seek papers on plant conservation from regional and ecosystem-level perspectives, including Baja California. ***See www.cnps.org for details.***

Effects of water hyacinth shredding on water quality

*The following is a summary of "Mechanical shredding of water hyacinth (*Eichhornia crassipes*): Effects on water quality in the Sacramento-San Joaquin River Delta, California," by Greenfield, B. K.,* et al.*, published in* Estuaries and Coasts, *Vol. 30, No. 4.*

The Sacramento-San Joaquin River Delta provides water for millions of Californians and habitat for wildlife, including endangered and commercially important fish, and is a popular recreational playground for boating, fishing, and other water activities. Invasive aquatic plants threaten all of these ecological, economical and cultural functions. One of the worst plants is water hyacinth (*Eichhornia crassipes*), a beautiful, fast-growing menace that has invaded more than 50 countries. A recent study published in the journal *Estuaries and Coasts* found that using shredding to control water hyacinth will not cause long-term effects to water quality but might not effectively prevent regrowth of the plants.

Water hyacinth has been introduced throughout the world as an ornamental plant. Its large purple flowers remain popular with aquatic gardeners and it is readily available in stores and on the internet. Reputed to be one of the fastest-growing plants in the world, water hyacinth forms dense mats in waterways, restricting water flow and making areas uninhabitable for wildlife. Due to its severe impacts and potential for continued spread, water hyacinth has a rating of "High – Alert" in the Cal-IPC Inventory. Water hyacinth spreads to new areas attached to boats or as water supplies are moved, and the state of California has spent $45 million over the past 15 years to control it. Due to the large extent of infestations, aquatic herbicides have generally been the most cost-effective treatment option. However, recent court decisions have increased the permitting and monitoring requirements for applying aquatic herbicides, and the public often favors non-chemical treatment methods. Mechanical shredding is one of these.

As the name implies, shredding chops up hyacinth shoots and leaves using specialized equipment with names such as the Amphibious Terminator, the AquaPlant Terminator, and the Cookie Cutter. In contrast to harvesting, where plants are removed from the water mostly intact, shredding leaves chopped fragments in the water to decompose and costs less than harvesting. Researchers from the San Francisco Estuary Institute, California State University-East Bay, UC Berkeley, and UC Davis studied the effects of mechanical shredding at two sites in the Delta then used computer modeling to extrapolate their results to the entire Delta. Specifically, they asked how this method would affect levels of phosphorous, nitrogen, carbon, mercury, and dissolved oxygen in the water. While increased dissolved oxygen levels help fish and other wildlife, increased levels of the other elements cause problems for drinking water. Mercury is especially of concern because water hyacinth bioaccumulates mercury in its shoots and leaves, meaning the mercury becomes concentrated in the hyacinth and could be released into the water as shredded plants decay.

Mechanical shredding is being investigated as a control method for water hyacinth. *Photos by Julie Owen, Cal. Dept. of Boating and Waterways.*

Water quality monitoring showed that shredding produced noticeable short-term effects but that these decreased after the treatment ended. The overall effect on the Delta was predicted to be fairly small because water hyacinth covers only 1-10% of the Delta's total water surface in a given year. Effects on the local area near the shredding may depend on characteristics of the site itself, especially the amount of water flow it receives. Sites that received tidal currents will show less effect than areas where water remains stagnant for long periods. Shredding in the spring causes fewer effects on water quality because the plants are small early in the growing season.

One downside of shredding is that the many fragments of hyacinth left behind may regrow. Researchers found an increased rate of growth at their study sites after the shredding treatment. Therefore, they concluded that the method must be improved to reduce regrowth if the shredding is to be an effective control for water hyacinth in the long-term.

For more information:

Greenfield, B. K., G. S. Siemering, J. C. Andrews, M. Ryan, S. P. Andrews, Jr., and D. F. Spencer. 2007. Mechanical shredding of water hyacinth (*Eichhornia crassipes*): Effects on water quality in the Sacramento-San Joaquin River Delta, California. *Estuaries and Coasts* 30(4): 627-640. (Abstract available at http://erf.org/cesn/vol30n4r3.html)

"Don't Plant a Pest!: Aquatic Plants in California" brochure. Call 510-843-3902 or email info@cal-ipc.org to request a copy.

Thank You for Supporting our Work!

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Richard & Rhoda Goldman Fund
Support for advocacy

True North Foundation
Support for general operations

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Correction: In our last issue, Carolyn Martus' raffle donation should have been attributed to the San Diego CNPS chapter.

In Memory of Ed Schoenig

Patti, Richard, and Shanna Kirschner (Kalamazoo, MI), **Steve Schoenig, Carol Hillhouse, and family** (Davis)

Cape-ivy Donations

Nancy Brownfield (East Bay Regional Park District, Oakland), **Darlene Chirman** (Chirman Biological Consulting, Santa Barbara), **CNPS Santa Clara Valley Chapter**, **Karen Lowerison** (San Luis Obispo Co. Dept. of Agriculture), **Halli Mason** (CNPS, LA Santa Monica Mountains Chapter), **Barbara and Roland Pitschel** (Bernal Hilltop Native Grassland Restoration Project, San Francisco), **Jake Sigg** (CNPS, San Francisco), **Lynn Webb** (CDFFP, Fort Bragg)

Welcome, New Members!

Dorothy Abeyta (San Jose), **Francis Bozzolo** (CSU San Diego), **James Caldwell** (San Francisco), **Heidi Davis** (Encinitas), **Andrew Fulks** (Putah Creek Reserve, Davis), **Scott Godfrey** (Down Home Garden & Yard, Missoula, MT), **Tom Hayduk** (Envicom Corporation, Agoura Hills), **Jenny McGee** (Chambers Group, Irvine), **Aliana Summers** (Irvine), **Jeannete Taylor** (San Luis Obispo), **Juan Valencia** (Hayward)

Always wanted to do something about invasives in nurseries?

Here's your chance!

The Cal-IPC Speakers Bureau is gearing up to make PlantRight presentations to garden clubs throughout the state. The PlantRight Campaign (see www.plantright.org) provides information on landscaping alternatives and a strong partnership with industry. Sharing your knowledge of wildland weeds with horticultural opinion leaders in your community can make a big difference in raising awareness! We will provide you with presentation materials and match you with a local garden club. Help make this historic campaign a success. ***Contact us at info@cal-ipc.org or (510) 843-3902.***

Readings & Resources

Know of a resource your fellow weed workers should know about? Please contact info@cal-ipc.org.

Grasslands Book

California Grasslands, Ecology and Management, edited by Mark R. Stromberg, Jeffrey, D. Corbin, and Carla M. D'Antonio, is a new sourcebook for grassland science and management. *www.ucpress.edu/books/pages/10891.html*

Definitions

The national Invasive Species Advisory Committee (ISAC), which serves the National Invasive Species Council, produced a white paper on invasive species definitions—11 pages worth. *www.invasivespeciesinfo.gov/docs/council/isacdef.pdf*

E-Learning

The US Fish & Wildlife Service have developed an e-learning website aimed at engaging volunteers and the public in invasive plant issues and management. Designed for National Wildlife Refuge volunteers and Friends groups, the website provides science-based, introductory information that is suitable for anyone interested in learning about invasive plants. *www.fws.gov/invasives/volunteersTrainingModule/index.html*

Planning Guide

A wide-ranging team of experts has released the second volume of the California Watershed Assessment Manual. Volume I detailed the process for watershed assessment, from organizing the stakeholder process through scientific evaluations, to reporting conditions and developing watershed management plans. Volume II provides the watershed community with guidance on ways to include information on water quality, benthic macroinvertebrates, periphyton, fire ecology, and river processes, all of this in the context of environmental indicators and conceptual models. *http://cwam.ucdavis.edu*

Master Gardener Guide

The UC Integrated Pest Management Program has published a "Pest Note" to clarify how invasive plants differ from common garden and agricultural weeds, to describe the occurrence and impact of invasvies in California, to discuss how invasives can be spread through sales or movement of ornamental plants, and to identify approaches for managing invasive plants. *www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74139.html*

Ken Moore, a core instructor for Cal-IPC Field Courses, discusses effective scything techniques at the Monterey War on Weeds conference in November.

Quotable

"Millions of Americans care not only for their pet cats but for the stray cats who live out their lives outdoors, many on lands adjacent to wildlife refuges. These Americans are deeply concerned about the impact this bill could have on cats."

From a letter from the Humane Society and others to Sen. Barbara Boxer, Chair of the Committee on Environment and Public Works, regarding H.R. 767, the Refuge Ecology Protection, Assistance, and Immediate Response (REPAIR) Act, which would fund invasive species control on National Wildlife Refuges.

"Even though many of [these invasive species] have been around for years, we have never had a coordinated system in place to attack the problem, a system that threads together the issues of public outreach, funding and legislation needs, and research."

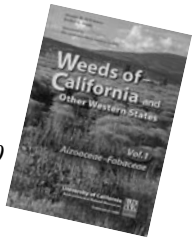
Commissioner Pete Grannis, of the newly created invasive species office of the New York State Dept. of Environmental Conservation, from "New Office Fights Exotic Species in N.Y.", Associated Press, 12/27/07.

Publications Available from Cal-IPC

Order at www.cal-ipc.org or call (510) 843-3902

CA tax and shipping costs will be added.

Weeds of California and Other Western States (two volumes)



Joseph DiTomaso and Evelyn Healy
UC Agriculture & Natural Resources, 2006
Identification guide to 750 weed species, with 3000 color photos. Detailed descriptions of morphology and biology. Includes a CD-ROM with all photos. **$103.00**

Aquatic and Riparian Weeds of the West

Joseph DiTomaso and Evelyn Healy
UC Agriculture & Natural Resources, 2003
Comprehensive identification guide to the West's riparian weeds. Photos, identification keys. 440 pp. **$40.00**

Grass and Grass-like Weeds of California

Joseph M. DiTomaso. California Weeds, 2004
Menu-driven CD-ROM identification guide to more than 200 invasive grasses and native perennials used in restoration. Requires Windows 95 or higher, 650 MB free hard-drive space. **$30.00**

Broadleaf Weeds of California

Joseph M. DiTomaso. California Weeds, 2006
Expert computer-based identification guide to 722 broadleaf weeds of California. Requires Windows 95 or higher. **$37.00**
Buy both CD-ROMs for **$60.00**

Don't Plant a Pest! brochures

Wildland-safe alternatives to invasive plants sold at nurseries. 14 panels. Choose: San Francisco Bay Area, Southern California, Central Coast, Central Valley, Aquatic Plants in California, or Trees in California. Central Valley and new Aquatic Plants of California are ***free****. Otherwise,* **$22.99**/100 brochures [up to 10 free]

Biological Pollution brochure

Describes ecological and economic impacts of invasive plants in California for a general audience. Tri-fold. **$12.00**/100 brochures [up to 10 free]

Invasive Plants of California's Wildlands

Carla C. Bossard, John M. Randall and Marc C. Hoshovsky, Eds. University of California Press, 2000
Biology and control information on 70 of the state's worst wildand weeds. Maps, photos, illustrations. 360 pp. **$25.00**

The Weed Workers' Handbook

Cal-IPC and The Watershed Project, 2004
Biology and control information on 25 SF Bay Area wildland weeds, plus background on organizing local projects. Illustrations. 120 pp. **$8.00**

California Invasive Plant Inventory

Cal-IPC, 2006
Summarizes the impacts, potential for spread, and distribution of more than 200 non-native plants that invade wildlands in California. 39 pp. Currently out of print. Online pdf at www.cal-ipc.org.

The Use of Fire as a Tool for Controlling Invasive Plants

Joseph M. DiTomaso and Douglas W. Johnson, Eds., 2006
Captures current state of knowledge on the use of fire to manage invasive plants in wildlands. 49 pp. **$5.00**

Yellow Starthistle Management Guide

Joseph M. DiTomaso, Guy B. Kyser, and Michael J. Pitcairn, 2006.
Comprehensive overview of treatment methods for yellow starthistle. Approx. 78 pp. **$5.00**

The Wildland Weed Calendar

California Council of Land Trusts Annual Conference

Feb. 4-6, 2008
Sacramento, CA
www.calandtrusts.org

Weed Science Society of America Annual Conference

February 4-7, 2008
Chicago, IL
www.wssa.net

CNGA Workshop: Livestock Grazing on Vernal Pool Landscapes

February 8, 2008
Santa Rosa, CA
www.cnga.org/action/events.php

National Invasive Weeds Awareness Week

February 24-29, 2008
Washington, DC

Weed workers from across the U.S. come to the Capitol to discuss invasive plant policy with federal agencies and Congress.
www.nawma.org/niwaw/niwaw_index.htm

Bay-Friendly Landscaping & Gardening Conference

February 29, 2008
UC Berkeley
www.BayFriendly.org

Salmonid Restoration Conference—Central Valley Salmon & Steelhead: Restoration in the California Heartland

March 5-8, 2008
Lodi, CA
www.calsalmon.org

Western Society of Weed Science Annual Conference

March 11-13, 2008

plus special Arundo & Phragmites Symposium

March 13-14, 2008
Anaheim, CA
www.wsweedscience.org

California Invasive Weeds Day at the Capitol

March 12, 2008
Sacramento, CA

Join weed workers from around the state to visit legislators in support of WMA funding and other issues. Co-sponsored by Cal-IPC. We encourage all members to consider attending—the event has grown stronger every year.
www.cal-ipc.org/policy/state/ciwad.php

North American Wildlife and Natural Resources Conference

March 25 to 29, 2008
Phoenix, AZ

Includes sessions on invasives organized by the National Military Fish & Wildlife Association and the Association of Fish & Wildlife Agencies
www.wildlifemanagementinstitute.org/nawnrc/index.htm

People-Powered Projects: The National Cooperative Weed Management Area (CWMA) Conference

April 15-17, 2008
Reno, NV

Representatives from all 50 states will gather to focus on CWMA funding and logistics, working with volunteers, EDRR, outreach, and state and national initiatives.
www.weedcenter.org

CNGA Field Day at Hedgerow Farms

April 18, 2008
Winters, CA
www.cnga.org

California Native Grasslands Association Annual Conference—Conserving California's Grasslands: Policies and Practices

May 1-3, 2008
Santa Rosa, CA
www.cnga.org/action/conference.php

Bringing Back the Natives Garden Tour

Sunday, May 4, 2007
East Bay, San Fransico Bay Area
www.bringingbackthenatives.net

Bay Area Open Space Council Annual Conference

May 21, 2008
San Francisco
http://openspacecouncil.org

Weeds Across Borders Biennial Conference

May 27-30, 2008
Banff, Alberta, Canada
www.nawma.org

Global Climate Change and Your Backyard

May 30-31, 2008
UC Davis
http://ccuh.ucdavis.edu

California Invasive Weeds Awareness Week

July 21-27, 2008
Statewide
A great time to meet with your legislators, show off your weed management projects, or conduct outreach campaigns.
www.cal-ipc.org/policy/state/ciwaw.php

SERCAL Annual Conference—Restoration's Bigger Picture: Linking Local Restoration with Regional and Global Issues

August 13-16, 2008
Santa Rosa, CA
www.sercal.org/2008_conference.htm

Know of an event your fellow weed workers should hear about? Please contact us at info@cal-ipc.org.

Cal-IPC Membership Form

We're working to protect California's wildlands from invasive plants—join us!

Cal-IPC's effectiveness comes from a strong membership that includes scientists, land managers, policy makers, and concerned citizens. Please complete this form and mail with check or credit card number. Additional donations support our projects. We are a 501(c)(3) non-profit organization, and donations beyond regular membership rates are tax deductible. **Join or donate online at www.cal-ipc.org.**

2008 Individual Membership

- ☐ **Regular** **$35**
- ☐ Family $60
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- ☐ Joint Cal-IPC/CNGA $70
- ☐ Cal-IPC/SERCAL/CNGA $100
- ☐ Student/Volunteer $15

2008 Institutional Membership

- ☐ Regular $150
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(info online at cal-ipc.org)

Mail this form with check (payable to "Cal-IPC") or credit card info to Cal-IPC, 1442-A Walnut Street #462, Berkeley, CA 94709, or...

Fax form with credit card info to (510) 217-3500, or...

Phone us at 510/843-3902 with contact and credit card info.

☐ Check here if you would prefer to receive the *Cal-IPC News* as a link to a pdf file online rather than a paper copy.

☐ Occasionally, we share our members' addresses with like-minded organizations. Check here if you ***do not*** want your information shared.

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