CalEPPC News

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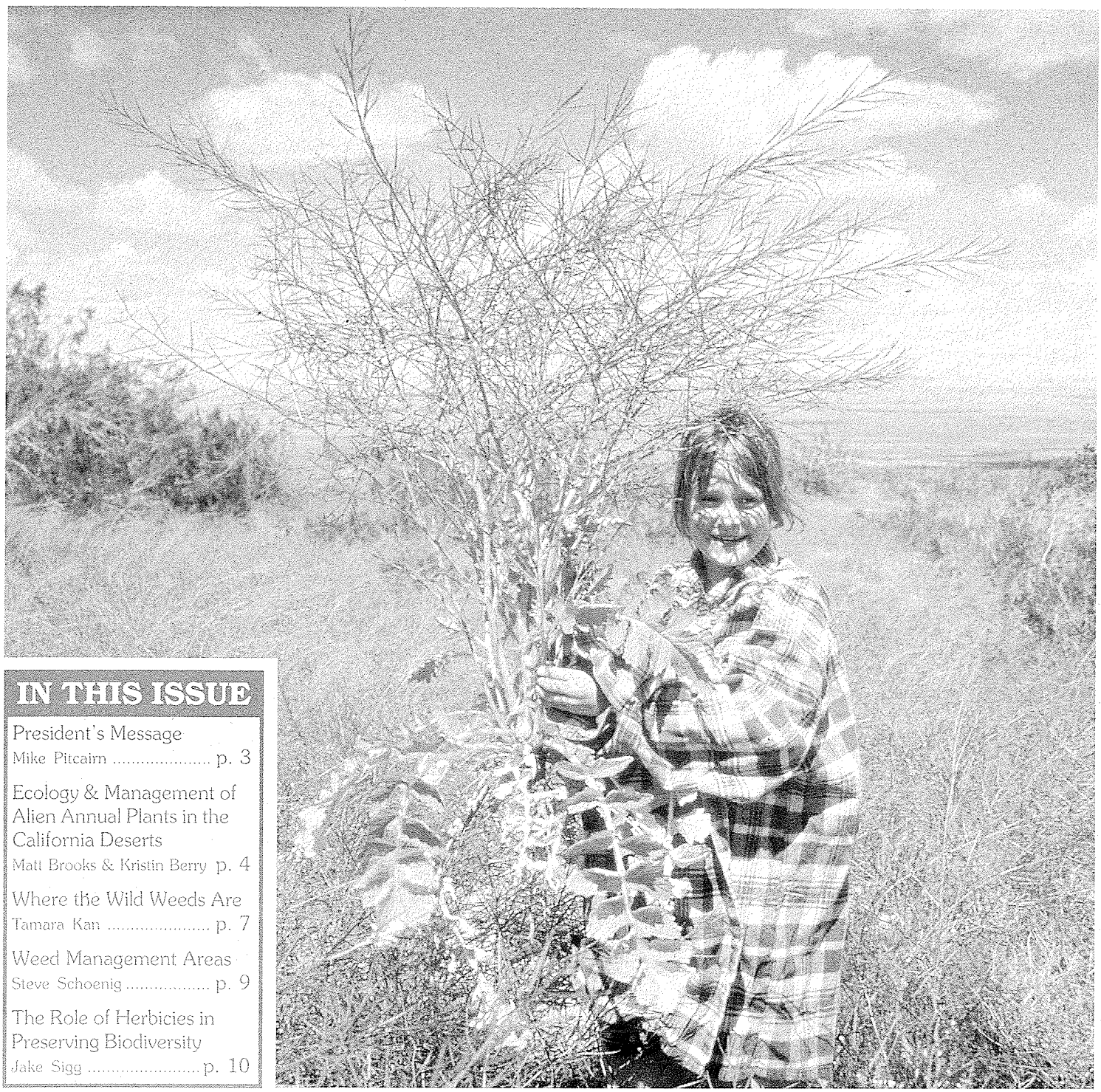

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Elizabeth Brooks holding huge *Brassica tournefortii*, Kramer Hills, San Bernardino. *Photo by Matt Brooks*

Who We Are

CalEPPC NEWS is published quarterly by the California Exotic Pest Plant Council, a non-profit organization. The objects of the organization are to:

- provide a focus for issues and concerns regarding exotic pest plants in California;
- facilitate communication and the exchange of information regarding all aspects of exotic pest plant control and management;
- provide a forum where all interested parties may participate in meetings and share in the benefits from the information generated by this council;
- promote public understanding regarding exotic pest plants and their control;
- serve as an advisory council regarding funding, research, management and control of exotic pest plants;
- facilitate action campaigns to monitor and control exotic pest plants in California; and
- review incipient and potential pest plant management problems and activities and provide relevant information to interested parties.

Please Note:

The California Exotic Pest Plant Council is a California 501(c)3 non-profit, public benefit corporation organized to provide a focus for issues and concerns regarding exotic pest plants in California, and is recognized under federal and state tax laws as a qualified donee for tax deducible charitable contributions.

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Submission Dates for CalEPPC News

If you would like to submit a news item, an article, a meeting announcement, or job opportunity for publication in the CalEPPC News, they must be received by the deadlines listed below. Editor reserves the right to edit all submissions. Send your text/disk/email to editor's address above.

Submission Dates:

Spring...	**April 15**	**Fall...**	**October 15**
Summer...	**July 15**	**Winter...**	**January 15**

The articles contained herein were contributed to the CalEPPC newsletter. These articles represent the opinions of the authors and do not necessarily reflect the views of CalEPPC. Although herbicide recommendations may have been reviewed in contributed articles, CalEPPC does not guarantee their accuracy with regard to efficiancy, safety, or legality.

President's Message

Mike Pitcairn

There are several methods used in controlling exotic, invasive weeds. Usually no one method is used to control these plants; rather a combination of methods is required. How these methods are combined for a particular habitat is specified in an integrated weed management plan. One of these methods of weed control is biological control, where natural enemies of a weed (usually herbivorous insects or pathogens) are transported from the weed's area of origin and released in its new habitat. The abundance of several exotic weeds [e.g. Klamath weed (*Hypericum perforatum*), tansy ragwort (*Senecio jacobaea*), pucturevine (*Tribulus terrestris*), and musk thistle (*Carduus nutans*)] have been substantially reduced following introduction of their natural enemies. This activity is highly regulated for a natural enemy is not approved for introduction until it has gone under a series of host tests that serve to identify which host plants will likely be attacked after release. Only those natural enemies that have a high degree of host-specificity are approved for release. Also, two levels of approval are required for release of an exotic biological control agent. First, is the approval obtained by the United States Department of Agriculture (USDA) for introduction into North America. Second, is approval by the state into which the release will be made. It is not unusual for a natural enemy to be approved in one state but not another. Thus, even though some insects are currently approved for release elsewhere in the United States, these insects have not been approved for release in California. Examples include insects that have been released on leafy spurge and Dalmatian toadflax in Montana. Both of these plants are under eradication in California and approval for release of these insects has not been pursued here.

Recently, the California Department of Food and Agriculture's (CDFA) Biological Control Program produced a list of all exotic natural enemies approved for release as biological control agents in California. The list is presented in Table 1, page 6 which lists all weeds that have biological control agents approved for California. If you are aware of a biological control agent used on a weed in other states, but is not listed in Table 1, then that agent is not approved for use in California and is not available.

A total of 49 species of natural enemies have been imported into California and released against 22 species of weeds. Of the 49 species, 22 are well established in California and available for distribution and can be obtained by calling your County Agricultural Commissioner's office. However, before one considers use of a particular biological control agent, one should look at the other columns included in Table 1 which give preliminary information on its potential to control its host. Twelve species have limited distributions either because of the limited distribution of their host plant or because the biological control agent is still expanding its population. It should be noted that three species were recently released and their status is still in the initial release stage. On the other hand, eight species failed to establish and the status of two others is unknown.

The information provided in this table may be useful in other ways as well. In order to obtain approval for an integrated weed management plan on lands managed by Federal Agencies (e.g. BLM, Forest Service, US F&W), an Environmental Assessment (EA) may be required. EA's often require information regarding all available control methods, especially biological control methods.

Sometimes, a natural enemy will find its way to its host without the deliberate efforts of biological control workers. The natural enemies listed in Table 2 are the 26 insects that have been found on 19 weeds or host plants that were not part of an intentional release effort. These host associations were in some cases the result of native species attacking weeds closely allied to their native hosts (e.g. *Uresiphita reversalis* on French Broom), unknown introductions of insects from other parts of the world (e.g. *Aganopterix alstroemeriana* on poison hemlock), accidental introductions (e.g. *Chaetorellia succinea* on yellow starthistle) or natural spread of the biological control agent (e.g. *Urophora quadrifasciata*) from releases that occurred in other states (Washington and Oregon) or countries (Canada). In some cases these new associations resulted in variable degrees of fortuitous biological control in the weeds. Also listed in Table 2 are releases of an approved biological control agent on weeds closely related to their original target (e.g. *Bangasternus fausti* on squarrose knapweed). Other than the last case, none of the natural enemies in Table 2 have been approved as biological control agents and, thus, are not available for redistribution. These species are listed because they are common and appear to provide some impact on their host species.

Thank you for the great two years as President of CalEPPC and working with a wonderful Board of Directors.

Ecology and Management of Alien Annual Plants in the California Desert

by Matt Brooks and Kristin Berry

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Alien plants comprise a relatively small proportion of desert floras worldwide, and the deserts of California are no exception. Estimates of the proportion of alien plants range from 9 to 13%, compared to a global average of 16%. Although relatively few alien plants have invaded this region, the number is increasing and a select few now dominate many areas and negatively affect or threaten to affect ecosystem integrity.

The most studied alien plant species in the California deserts is the riparian perennial Tamarix spp., but riparian habitats comprise only 3% of the entire region and the remaining upland area is dominated by alien annual plants. Alien annuals often comprise 50-97% of the total annual plant biomass, and are present at virtually all sites. Thus, annuals are currently the most widespread and common alien plants in the California deserts.

Effects of Alien Annuals on Native Plants

Alien annuals can compete with native annual plants. Red brome, Mediterranean grass, cheatgrass, and red-stemmed filaree can all effectively compete with native annual plants for soil water and nitrogen. This competition leads to reduced density, biomass, and diversity of native annuals. Although it is unknown if an alien annual species could completely displace a native species, a previously common native annual grass, six-weeks fescue (*Vulpia octoflora*), became uncommon after the invasion of the ecologically similar Mediterranean grass during the middle 1900s.

Plant litter created by alien annual grasses decomposes more slowly than that of native annuals and accumulates during successive years. Alien grass litter can inhibit germination of native annuals by shading the soil, reducing the amount of water that reaches the soil, and suspending seeds above and out of contact with the soil. Experimental removal of alien grass litter increases density and diversity of native annuals.

Alien annuals can indirectly affect native plants by increasing the frequency of wildfires. Stems of alien annual grasses remain rooted and upright through the summer fire season and into successive years, whereas those of most native forbs crumble soon after they senesce. High frequency and cover of dead alien grasses facilitate the spread of fire in an otherwise fire-resistant landscape. Soil nutrient levels often increase after desert fires, thereby facilitating the reestablishment of alien annual grasses and promoting additional fires. Recurrent fire can convert high diversity native desertscrub into low diversity alien annual grassland.

Effects of Alien Annuals on Native Animals

Little is known about effects of aliens on native animals. With increasing diversity and biomass of alien annuals, food chains of native herbivores and omnivores and the composition and structure of vegetation in habitats are being altered. Potential negative effects include reduced availability of preferred food plants, loss or reduction of available nutrients and trace elements, and change in seasonal availability of plant foods. The desert tortoise, a threatened species in Mojave and Colorado deserts, provides one example of potential impacts. The tortoise is an herbivore and prefers native annual and herbaceous perennial plants to alien annual plants. For example, in the western Mojave Desert where alien grasses and forbs typically form over 50% of the available biomass of annual plants, native plants comprise 95% of the desert tortoise diet. The Mohave ground squirrel, a rare endemic species of the western and central Mojave deserts, may have similar forage preferences for native plants. The awns and spines of some alien plants pierce the guts and skin of domestic animals and may have similar deleterious effects on the health and survivorship of native animals.

Bromus rubens in a burned area, Opal Mountain, San Bernardino, California.

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Ecology & Management of Alien Annual Plants (cont'd)

Alien annual plants can alter the microstructure of desert habitats. Alien annual grasses such as Mediterranean grass can form dense mats in the beneath shrub and intershrub spaces, impeding the movements of small lizards and other animals, reducing availability of nest sites for birds, and altering ground temperatures. The often dense and persistent stands of bromes, mustards, and Russian thistles may have a similar effects. Several species of desert lizards depend on open environments for high speed travel, escaping predators, and finding prey items and mates. Increased annual plant cover in habitats invaded by aliens may limit the population sizes, health, and ultimately, the distribution of vertebrates.

"Changes in global climate may encourage the invasions of exotic annual species in the California deserts."

As mentioned above, alien plants contribute to increasing frequency and size of fires in the California deserts. These fires reduce shrub cover, change food availability for wildlife, and fragment habitat. For example, fires are reducing the quality of desert tortoise Critical Habitat. Desert tortoises require cover of shrubs for protection from temperature extremes and predators, and for burrows sites. About 70% of tortoise burrows are under the canopies of large shrubs, particularly creosote bushes. Alien-induced fires also reduce habitat structure in some desert plant communities. Joshua trees often die if burned, potentially diminishing habitat for wood rats, phainopeplas, kestrels, shrikes, cactus wrens, desert spiny lizards, and desert night lizards.

Future Trends

Changes in global climate may encourage the invasions of exotic annual species in the California deserts. Increased levels of atmospheric CO_2 have increased over 25% since pre-industrial times worldwide, and CO_2 concentrations in the atmosphere are expected to double before the end of the 21st century. Increased CO_2 is known to enhance production of rapidly-growing cool season species such as alien annual grasses and forbs.

Climatologists predict increased summer rainfall in the California deserts over the next century. Current periods of high rainfall promote the spread of alien annuals and the buildup of dead biomass that leads to increased fire frequency during subsequent years. The northern and western regions of the California deserts currently have little summer rainfall, and increased amounts during summer may open up these areas to invasion by warm season alien plants.

Deposition of atmospheric nitrogen from air pollutants can benefit alien plants, especially in the California deserts where low nutrient levels appear to be a major impediment to invasion. Even small increases in available nitrogen (3.2 g/m^2/yr) can increase density and biomass of aliens, and decrease density, biomass, and diversity of native annuals in the desert. Deposition rates of 4.5 g/m2/yr have been recorded in the Los Angeles basin, and are associated with high dominance of alien annual grasses and the loss of native shrub communities there. Although current deposition rates are undoubtedly much lower in the desert, future rates there will likely increase as human population and air pollution levels rise.

Management Needs

Land managers have limited control over some of the trends described above, but there is still much that they can do to manage alien plants.

Coordination among Land Managers. Weed management is most effective when efforts transcend jurisdictional boundaries to encompass entire ecoregions. Coordination is most effective at preventing new invasions, which is critical in the California deserts where the number of alien species is still relatively low.

Develop a List of Alien Species Already in the Region. A few land managers have begun to develop lists, but all should join in this effort to determine the extent of the alien plant problem and to identify hotspots of invasion.

Develop a List of Potential Invaders. The most reliable predictor of species invasiveness in the California desert appears to be invasiveness in similar habitats elsewhere. By assessing the invasiveness of plants in deserts worldwide and evaluating the patterns of world trade that may bring these species to the California deserts, we can compile a list of potential invaders. As incipient populations of these species are found, we will already know their potential for spread and thus their priority for control.

Continued page 6

Ecology & Management of Alien Annual Plants (cont'd)

Establish a Monitoring Program to Detect New Invaders. Monitoring may focus on hotspots for invasion, such as along roads, washes, or at the urban-wildland interface. Coordination among land managers is particularly important, because monitoring is useless if some managers fail to identify new invasions and allow them to become established in the region.

Develop Remote Sensing Techniques for Alien Annuals. Although these techniques may not be sensitive enough to reliably detect new invasions, they may be extremely useful in monitoring species that are already widespread or locally abundant.

Evaluate the Mechanisms of Plant Invasion. Much research is still needed to describe the characteristics that make species invasive and habitats invasible.

Evaluate Effects of Aliens on Threatened and Endangered Plants and Animals.
More research is essential to determine effects of aliens on threatened and endangered taxa, especially those living in threatened habitats or characteristic of wide-spread ecosystems, and to ensure that recovery efforts will be effective.

Evaluate Effects of Aliens on Ecosystem Integrity. If we are to understand ecosystem-level effects of aliens and develop appropriate management actions, then we need to step up ecosystem-level research, especially while some potentially alien-free sites still remain to serve as control sites.

Develop Methods to Control Alien Plants. Mechanical weeding or herbicide application are options for small infestations, and these may be the preferred methods to control incipient populations of new invaders. Biological control agents are the only feasible option for widespread alien plants, but very little bio-control research is conducted for alien annuals that infest wildland areas. In any case, land managers should carefully consider what species may replace any alien plant targeted for control, and if removal of an alien will result in positive ecological change.

Bibliography

Allen, E.B., P.E. Padgett, A. Bytnerowicz, R. Minnich. 1998. Nitrogen deposition effects on coastal sage vegetation of southern California. United States Department of Agriculture, Pacific Southwest Research Station, General Technical Report-164.

Beatley, J. C. 1966. Ecological status of introduced brome grasses (Brome spp.) in desert vegetation of southern Nevada. Ecology 47: 548-554

Brooks, M.L. 1998. Ecology of a Biological Invasion: Alien Annual Plants in the Mojave Desert. Dissertation, University of California, Riverside. 186 pp.

Brooks, M.L. in press a. *Schismus* spp., *Schismus arabicus* Nees and *Schismus barbatus* (L.) Thell., Mediterranean Grass (Split Grass). In C. Bossard M. Hoshovsky, and J. Randall eds. Noxious Wildland Weeds of California.

Brooks, M.L. in press b. *Bromus madritensis* subsp. *rubens* (L.) Husnot [*B. rubens* L.], Foxtail Chess (Red Brome). In C. Bossard M. Hoshovsky, and J. Randall eds. Noxious Wildland Weeds of California.

Hunter, R. 1991. *Bromus* invasions on the Nevada Test Site: present status of *B. rubens* and *B. tectorum* with notes on their relationship to disturbance and altitude. Great Basin Naturalist 51: 176-182.

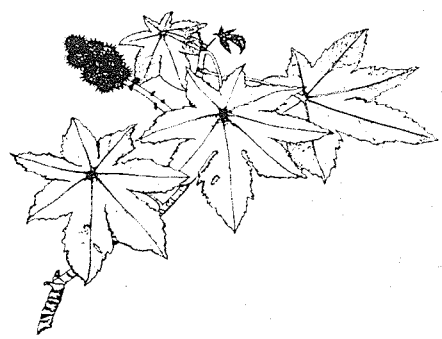
Jennings, W. B. 1993. Foraging ecology of the desert tortoise (*Gopherus agassizii*) in the western Mojave Desert. University of Texas at Arlington.
M.S. Thesis.

Kemp, P., and M.L. Brooks. 1998. Exotic Species of California Deserts. Fremontia 26:30-34.

Leitner, P. and B. M. Leitner. 1998. Coso grazing exclosure monitoring study. Mohave ground squirrel study, Coso Known Geothermal Resource Area. Major Findings, 1988-1996. Leitner and Leitner, 2 Parkway Court, Orinda, California 94563.

Melgoza, G. and R. S. Nowak. 1991. Competition between cheatgrass and two native species after fire: implications from observations and measurements of root distribution. Journal of Range Management 44:27-33.

Minnich, R.A., and A.C. Sanders. In press. *Brassica tournefortii* (Gouan.) Sahara mustard. In C. Bossard, M. Hoshovsky, and J. Randall eds. Noxious Wildland Weeds of California.



Where the Wild Weeds Are: The Value of a Rapid Assessment of Invasive Weeds

Tamara Kan

Introduction

In 1997 I conducted an assessment of the invasive weeds for the Midpeninsula Regional Open Space District (MROSD) in San Mateo and Santa Clara Counties which involved surveying over 35,000 acres (about 55 square miles) spread among 23 preserves. I undertook this daunting challenge, not knowing that when I finished I would feel a somewhat fanatical zeal for the value of this work, in particular for prioritizing weed control efforts. I am sharing the results of the weed survey to encourage other land managers to conduct similar assessments before implementing their own weed control programs.

Field Survey Methods

The equipment used was decidedly low-tech: pencil and paper, a trail map, and hiking boots. Notebook in hand, I chose a preserve, and began walking all the trails. Using the trail map, I drew in locations of the infestations by hand. I also wrote down observations about each infestation in the notebook. For example, when encountering a small infestation, it was usually easy to do a complete count. I estimated the size of larger infestations by simply pacing along the edge and translating the number of paces into feet.

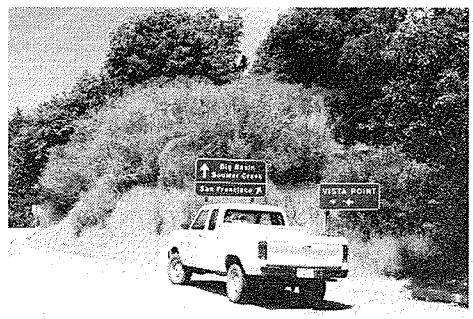
I purposely did not take detailed measurements. This would take too much time and the point was to make a rapid assessment that would be useful, not to collect scientifically rigorous data which would take much longer to complete. At the time I thought it was unnecessary to use a global positioning system (GPS) and that simply determining locations from the trail maps would be adequate. For the most part I have found this to be the case. In addition GPS does not work well in the steep canyons found on many of the preserves.

The terrain covered several habitats including oak woodland, mixed evergreen forest, chaparral, coastal scrub, riparian, and annual grassland. Communities dominated by trees and shrubs turned out to be the easiest to survey as nearly all the weeds of concern were restricted to trails, roads and obviously disturbed sites. In these communities I found that the vast majority of weeds had not penetrated into the less disturbed areas. Nevertheless, a few infestations were surely missed, such as English ivy which is spread by birds as well as by vegetative growth.

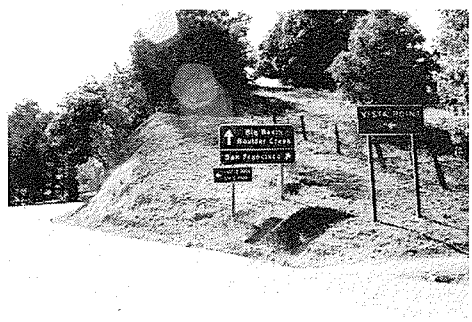
Grasslands were significantly more difficult to survey and map. The survey focused on non-grass weeds such as yellow starthistle and fennel. These weeds are not restricted to trails but are distributed throughout the grasslands, thus, surveying required traversing back and forth across the open grasslands as well as walking the roads and trails.

The invasive thistles were usually so widespread in the grasslands, it was more useful and feasible to estimate percent cover, than to map the individual populations. Realizing the difficulty of making accurate ocular estimates of percent cover, I soon switched to using cover classes. For example 0-1%, 1-10%, 10-30%, etc. Estimating cover classes over large areas was still quite difficult and it was important to have one person making all the observations to minimize individual bias.

In addition to noting the weed infestations, I mapped the larger native grass stands found within the predominantly non-native annual grasslands. Large stands of native grasses are relatively rare. Native grasses are important in their own right, as well as providing seed sources for restoration projects.



1997 before broom removal, Saratoga Ridge, MROSD lands



1999 after broom removal, Saratoga Ridge, MROSD lands

Results

After completing the field work, I used the field map and notes to produce a document with the following information for each of the 23 preserves:

- the locations and degree of infestation for the major weed species
- a list of recommended management actions
- detailed field notes
- a weed map utilizing a different color to represent each weed species.

The maps proved to be very helpful in portraying the entire weed situation of a preserve at a glance. But further distillation of the information was still required in order to limit brain overload

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Where the Wild Weeds Are (cont'd)

from examining 23 maps. So, I made a summary table ranking the degree of infestation for each weed species on each preserve. By examining the summary table and referring occasionally to the main document and maps, it was relatively simple to prioritize sites and develop a logical weed management plan.

Completing the entire project including field work, map making, and report writing took approximately 370 person hours (or about nine weeks, working 40 hours per week). The amount of time spent on any one preserve varied dramatically, depending on the preserve's size, degree of infestation, and habitat types. In general, preserves that were larger, had more weed species, larger infestations, and contained more grassland habitat, took the longest to survey.

Photo of arundo and pulgas on MROSD lands.

Implementation

Soon after the survey was completed a local chapter of CNPS expressed interest in working on a weed control project. The summary table quickly provided them with a high priority site of the aggressive Cape ivy.

Currently, MROSD staff are gradually addressing some of the other high priority weed sites on the preserves. The California Conservation Corps has been hired occasionally to address some of the larger infestations. Now that it is clear where the work lies, I am somewhat discouraged that other concerns regularly take priority over weed control. Currently, I am working on encouraging MROSD to fund a full- or part-time weed control position to implement the weed control plan. Using the summary table and weed maps for guidance, the weed problem could be greatly reduced on MROSD lands.

Discussion

Based on observations in the field and endless ruminations on the subject I developed the following criteria for prioritizing weed sites for control efforts. The number one priority was to eradicate the small, isolated populations of the most invasive species (this included species which were common on some areas of the preserve, but had one or more isolated small populations which could easily be locally eradicated to prevent further spread). This was clearly the most efficient use of time and required minimal use of resources for the greatest gain. Second, was to focus on the "leading edge" of larger infestations and work back toward the center. Again this prevents the species from spreading. This may seem obvious, but I have observed haphazard weed control efforts focused mainly on the largest infestations near parking lots because of the simple logistics, while the few outliers were ignored as not being a problem. The third priority was to focus on the most sensitive habitats. Eradicating a yellow starthistle infestation from a native grass stand should take priority over an infestation located in non-native grassland.

The value of the rapid assessment was in locating and mapping the small, isolated populations, the leading edge of the larger populations, and identifying sensitive habitats such as native grass stands.

Walking the trails I could sometimes pinpoint avoidable causes of local infestations. For example, young stands of French broom often occurred in bends of the trail where bulldozers had recently worked the soil. In these cases weed seeds were clearly spread by the MROSD's own trail maintenance equipment. In another case, the source of a grassland fennel infestation was a small roadside infestation on neighboring Caltrans property. The survey also showed where a particular species behaved most aggressively. For example, pampas grass was much more of a problem in the coastal preserves than in the more inland warmer preserves. In general, control efforts should focus first in areas where a species is most invasive.

Exotic broom and pulgas on MROSD

Finally, the survey provides a baseline assessment to measure the effectiveness of future control efforts. Alternatively, if no funding is available for weed control, repeating the survey in a few years will show the rate of spread. This will demonstrate the severity of the problem to those in charge of distributing funds for management!

I hope this article helps you design your own method of assessing and prioritizing weed control. If you have any questions or comments please write me at <tamaragil@worldnet.att.net>

Cooperative Weed Management Areas

Steve Schoenig

A Weed Management Area (WMA) is a local organization that brings together landowners and managers (private, city, county, state, and federal) in a county, multi-county, or other geographical area for the purpose of coordinating and combining action and expertise in combating common invasive weed species. The WMA functions under the authority of a mutually developed memorandum of understanding (MOU) and is subject to statutory and regulatory weed control requirements. A WMA may be voluntarily governed by a chairperson or a steering committee. To date, groups in California have been initiated by either the leadership of the County Agricultural Commissioner's Office or a Federal Agency employee. WMA's are unique because they attempt to address agricultural (regulatory) weeds and "wildland" weeds under one local umbrella of organization. It is hoped that participation will extend from all agencies and private organizations. WMA's have printed weed I.D./ control brochures, organized weed education events, written and obtained grants, coordinated demonstration plots, instituted joint eradication and mapping projects, as well as, many other creative and effective outreach and weed management projects.

For further information about WMA's in general see the California WMA website at http://www.cdfa.ca.gov/wma or contact Steve Schoenig at the California Department of Food and Agriculture, sschoenig@cdfa.ca.gov For information specific to a particular WMA, please contact names listed below.

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Central Sierra Partnership Against Weeds
Calaveras & Tuolumne Counties, Marian Chambers (209) 533-5691
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Southern and Central Sierra Noxious Weed Alliance
Mariposa, Madera, & Fresno Counties, Joanna Clines (209) 297-0706 x 4938
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Big Sur Weed Management Area
Monterey County-Big Sur Coast, Jeff Kwasny (831) 385-5434
Santa Clara County
Eric Wylde (408) 299-2172
Alameda/Contra Costa Weed Mgmnt Area
Vince Guise (925) 646-5250
Marin Weed Management Area
Stacy Carlson (415) 499-6700
Trinity Weed Management Area
Trinity County, Jay Thesken (530) 623-1356
Humboldt Weed Management Area
Humboldt County, Lisa Hoover (707) 441-3612
Siskiyou Weed Management Area
Siskiyou County, Pat Griffin (530) 841-4025
Shasta Weed Management Area
Mary Pfeiffer (530) 224-4949
Mendocine/ Sonoma
Dave Bengston (530)-934-6501

First Releases of Saltcedar Biocontrol Agents

After many delays, releases have begun of an insect from China to help control the scourge of saltcedar. During early August, Dr. Ray Carruthers (Exotic & Invasive Research Unit, USDA Agricultural Research Service) released several tamarisk leaf beetles, *Diorhabda elongata*, at two sites in California (Owens Valley, Inyo County, and Fort Hunter Liggett Army Base in Monterey County).

At each of these sites, either 200 eggs or 400 adults were released into a large 12 x 20 x 6 foot field cage. These field cages protect the developing insects, prevent them from immediately dispersing, and allow scientists to monitor their development and impact on saltcedar. After one year, the cages will be removed, and the leaf beetles allowed to disperse to neighboring saltcedar.

The tamarisk leaf beetle was also released at two sites in Nevada (Humbolt River and Walker River). Additional releases are planned for another site in California (Yolo County) and in Texas, Colorado, Wyoming, and Utah.

13th Australian Weeds Conference to be held in Perth, Western Australia, Sept. 2002

To be put on the mailing list and receive registration brochures (when they are available), please register your interest with the conference organiser, present a paper or poster, or suggestions for workshop topics or field trips contact <convlink@wantree.com.au>. Please remember to include your contact details.

The Role of Herbicides in Preserving Biodiversity

Jake Sigg

No data exist for private land, but the Bureau of Land Management (BLM) estimates that the United States is losing 6,000 acres of public land *every day* to invasive non-native plants (4,600 acres a day in the west alone), rendering land economically useless and biologically impoverished. The technologies for weed containment haven't kept pace with the advent and spread of rampant exotics, which have mushroomed because of a mobile and burgeoning human population. The upward trend of weed invasions and spread will likely cause loss of biological diversity and landscape homogenization--biological sameness on a global scale--and at an ever-increasing rate. Apathy in the face of the weed threat may be more apparent than real; nevertheless, public awareness is well behind the curve. The need for education and changes in resource management is crucial.

In the frequently polarized debate over the use of herbicides in battling aggressive weeds, the subject of biodiversity is too often lost. Herbicides, per se, have become the focus of the debate. This is backwards--biological diversity should be front and center. This is the pivot on which the California Native Plant Society (CNPS) policy must turn. Does proper use of herbicides work for or against biodiversity? Herbicide critics usually isolate the subject. They neglect the differences between herbicides and fail to address the serious weed problem confronting the California flora. I am a proponent of judicious herbicide use, and favor their employment as a vital part of a weed management strategy.

"Our discomfort with chemicals began with revelations in Rachel Carson's *Silent Spring*..."

Our discomfort with chemicals began with revelations in Rachel Carson's *Silent Spring* in the 1960s. The use of chemicals as a quick fix for complex problems created a backlash, resulting in a regulatory climate that protects the public against many of the dangerous substances used indiscriminately in the past. Herbicides became entangled in the reaction to chemicals, but evidence is skimpy regarding negative effects of today's available non-restricted products when used according to label directions. Some people want to prohibit all herbicide use, but they don't address benefits nor the level of risk; those striving to preserve natural communities feel threatened by attempts to deprive them of an essential tool.

In an article, 'Killer Weeds' in the March-April 1997 *Audubon*, author Ted Williams excoriates those he calls chemophobes. The article epitomizes the frustration and anger felt by those stymied in their David-and-Goliath battle against overwhelming infestations. He cites a tragic case in Idaho's Craig Mountain Wildlife Management Area where a program of hand spot-spraying of yellow star thistle was stopped by a court injunction which resulted from a suit brought by the Northwest Coalition for Alternatives to Pesticides. The partnership between BLM and the U.S. Forest Service was successfully controlling the infestation; the injunction allowed the thistle to leap out of control, infesting tens of thousands of acres of priceless habitat that had previously supported a great diversity of wildlife such as bighorn sheep, grouse, elk, moose, deer, and wintering bald eagles--habitat that is for all practical purposes gone, possibly forever. In a similar situation, a frustrated Don Schmitz of Florida's Department of Environmental Protection fumes at those "who are unwilling to accept a short-term environmental insult to avoid a long-term ecological catastrophe". Weed warriors are keenly aware that once native biological communities have been displaced by weeds, they find it difficult or impossible to restore them; losing them sometimes means losing them forever--a needless deeply painful loss.

Our present technologies for countering invasive non-native weeds are rudimentary and few: control by biological agents, manual eradication, mechanized removal, fire, and herbicides. All have limitations; all are essential.

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The Role of Herbicides (cont'd)

Options

1. Classical biological control offers the greatest, and perhaps only, hope for some plants and the single best means of reducing need for herbicides. A successful example of classical biocontrol is provided by Klamath weed, (*Hypericum perforatum*), which was devastating rangelands in northern California and Oregon in the 1940s but which has been reduced to insignificant levels by the introduction of a predatory beetle which feeds exclusively on Klamath weed. On the downside, biocontrol is not feasible for some plants--such as those closely related to agricultural crops, or those which are attacked only by generalist predators which feed on a wide range of host plants. Developing a biological control agent is initially expensive and time-consuming, and there is no guarantee of success. Up to now it has been inadequately funded but there are now hopeful signs that this may change.

2. Manual eradication can achieve inspiring results in localized areas--exemplars are the stewardship programs of the Golden Gate National Recreation Area in the San Francisco Bay Area and the Wildlands Restoration Team in the Santa Cruz Mountains. With increasing popularity of site-stewardship programs, use of this technique can be greatly enlarged. The value of this multi-dimensional approach to weed control cannot be overstated. Still, the fact of millions of acres of overrun wildland in California reveals the limitations of site-stewardship as a solution to either the California or the global problem.

3. With the paucity of available techniques, is it any wonder that careful use of herbicides has found acceptance by thoughtful people? This article addresses herbicide use only for the control of wildland weeds which are threatening biological diversity and does not address non-ecological uses such as increasing timber production. There are many examples of indigenous plant communities being saved at the last minute and restored to native stock by an integrated management program in which herbicides played a necessary role.

Even highly motivated volunteers have not attempted to save the state- and federally-listed endangered fountain thistle, (*Cirsium fontinale* ssp. *fontinale*) --endemic to a small area on the San Francisco peninsula--because of its labor-intensive demands. At the request of CNPS, the California Department of Transportation and the San Francisco Water Department initiated a program of cutting and painting the invading pampas grass with glyphosate to prevent the thistle being overwhelmed in its serpentine seep habitat; this appears to be a success story in the making. Rich grassland/wildflower areas in and around San Francisco--tiny but precious--are there today because herbicides provided crucial support to volunteers teetering on the brink of demoralization in the face of advancing fronts of fennel (*Foeniculum vulgare*), pampas grass (*Cortaderia jubata*), and French broom (*Genista monspessulana*) perceived as invincible.

An email appeal to activists for other successful examples where employment of herbicides played a crucial role resulted in an overnight torrent: saltcedar (*Tamarix* spp.) eradication projects in Afton Canyon near San Bernardino, The Nature Conservancy's Dos Palmas Reserve, and Lake Mead National Recreation Area; Cape ivy (*Delairea odorata*), artichoke thistle (*Cynara cardunculus*), eucalyptus (*Eucalyptus* spp.), and many other weedy species in Los Peñasquitos Canyon Preserve in San Diego; castor bean (*Ricinus communis*), pampas grass, myoporum (*Myoporum laetum*) et al in Newport Beach, in Big Sycamore Canyon (Point Mugu State Park), Leo Carrillo State Park, Liberty Canyon and Malibu Lagoon (Malibu Creek State Park); Team Arundo's Santa Ana River restoration; pampas grass on Milagra Ridge in the Golden Gate National Recreation Area near San Francisco; ice plant (*Carpobrotus edulis*) at Asilomar State Park, the Marina dunes, and the Marine Lab at Bodega Head in Marin County.

Plainly, many of those who value biodiversity seriously enough to donate a large part of their lives to an effort to preserve it consider herbicides indispensable. Aside from cost-effectiveness and time-saving, employment of herbicides has the considerable advantage of not creating soil disturbance, which activates the weed-seed bank and favors weeds over natives. In the cited instance of Bodega Head, a project ongoing since 1985, dune natives were being buried under thick carpets of ice plant. Managers sprayed the ice plant, which

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The Role of Herbicides (cont'd)

decayed slowly over a long period. Native plants returned on their own without human help. A similar case is in process in the Marina dunes, managed by the state parks department. This is an efficient and ecologically sound method which should be employed more often. Manual eradication of infestations better managed by the judicious use of herbicides is poor use of limited resources.

A Rational Dialogue

Difficulty in attaining rational dialogue is partly embedded in language. The word "toxic" can be defined in many ways. In addition to bearing a wide variety of meanings it also carries heavy emotional freight. It has meaning only in relation to something else: oxygen is lethal to some organisms but essential to others. Salt, chlorine, and aspirin can be toxic to humans at high dosages but are willingly ingested in proper amounts. Modern herbicides have been improved in recent years and are cleverly designed to work in various highly specific ways to interfere with the functioning of a specific target; they may or may not be detrimental to organisms not targeted. It would be constructive to look at what is going on without attaching emotional labels to what may be a harmless process.

The first issue of an herbicide policy is safety--to humans, soil microorganisms, wildlife, and ecosystems. There are many chemicals on the market for controlling vegetation. As a practical matter when we talk of controlling wildland weeds in California, we are referring primarily to two chemical compounds: glyphosate and triclopyr, usually marketed under the trade names of Roundup Pro/Rodeo and Garlon/Pathfinder II, respectively. The Environmental Protection Agency (EPA) classes herbicides and all pesticides according to four groups, with those considered dangerous enough to be restricted placed in Classes I and II, and graduating downward to Classes III and IV, which are non-restricted, bear only a Caution label, and which may be purchased retail. Glyphosate and triclopyr are in Class III.

"All herbicides are required to undergo rigorous testing to become registered in the U.S."

All herbicides, including surfactants (which aid herbicide adherence and penetration) and inert ingredients, are required to undergo rigorous testing to become registered in the United States. These tests typically include animal toxicity (carcinogenicity, teratogenicity, acute toxicity), effects on non-target organisms, and mode of degradation in the environment. These are extensive tests that take years to complete. It takes chemical companies seven to ten years and forty to eighty million dollars to satisfy EPA requirements and bring a new active ingredient to the market. California requires further tests that take an additional year or more to complete. This costs a company more money and delays the review and registration process in California. EPA and the California Department of Pesticide Regulation (CDPR) examine all test results carried out by the manufacturer and have full audit authority over the results. There is not enough money in the EPA and CDPR budgets to do independent testing, but their ability to look into company records and to conduct on-site inspections keeps companies fairly honest. The research regarding safety of non-restricted herbicides is accepted by the World Health Organization.

Many people distrust assurances on herbicides by agencies or corporations. However, faulty data generated for EPA on chemical safety are easily detected if they are inaccurate, misleading, or incomplete, and there are critics ready to pounce on this highly visible issue. EPA, the manufacturer, and the testing scientists have too much at stake to risk falsifying data or methodology. Non-profit organizations attempting to eliminate or reduce chemical use have zeroed in on herbicides and have succeeded in creating anxiety among some people. However, credible studies documenting negative effects have not been forthcoming. Studies reported in, for example, the *Journal of Pesticide Reform*, are not subjected to peer review by disinterested scientists. Popularized articles are widely read and believed by readers. This pseudoscientific reporting accounts for most of the controversy

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The Role of Herbicides (cont'd)

surrounding the subject and it places another obstacle to the formidable job of preserving biodiversity.

Classes III and IV herbicides have been in use for a long time by millions of people, including home gardeners, who may purchase them at their local nursery or hardware store. As a professional gardener in San Francisco's parks and botanic garden, I used glyphosate-formulated herbicides intensively over a period of twenty years. Specific areas were repeatedly and effectively treated without diminution in soil productivity or indication of negative effects, including to the applicator. Herbicide use vastly increased my productivity. It would have been impossible to maintain these areas in an acceptable manner without spraying. Modern wage rates prohibit manual eradication of weeds on the scale required in our public parks and open spaces, to say nothing of natural resource management, where resource preservation is the primary concern. There is a long history of safe and economical maintenance using herbicides. In the face of this experience, wouldn't we have evidence by this time of negative or harmful effects? It is up to critics to identify and substantiate need for further studies.

Species extinction and loss of biodiversity are becoming weekly stories in the media. Indifference to the rending of nature's fabric while we deny ourselves a useful and apparently safe weapon is beyond understanding. It is misleading to say that herbicides should be used only as a last resort. On the scale of the larger landscape, we already passed the last resort stage. Critics would enhance their credibility if they devoted more thought to ways to preserve the miraculous diversity of life we have inherited. To date we have been poor stewards of this gift.

Letter from the Editor

In February 1992, I attended an exploratory meeting in the Bay Area where it was suggested a group similar to Florida's Exotic Pest Plant Council be organized in California. Greg Archbald, George Molnar, John Randall, Carla Bossard, Jack Beigle, Dave Chipping and many others joined in efforts to organize a larger meeting to be held on the Central Coast. On October 9-10, 1992 the first ***CalEPPC Symposium*** was held at the Inn in Morro Bay. Some people were turned away as the capacity was limited to 150 participants. Looking over that program I see that many of the speakers at that first meeting continue to be active supporters of CalEPPC: Carla D'Antonio, Carla Bossard, John Randall, Bill Neill, Dave Boyd, Nelroy Jackson, Dave Chipping, Mike Evans, and Greg Archbald. The Saturday meeting was devoted to projects and goals. A Steering Committee was formed, and when the question was raised, I blithely volunteered to be editor of the newsletter. Little did I realize what the position entailed or how profoundly my life would be changed.

CalEPPC News Volume 1, Number 1 was published the Winter of 1993. By the time Volume 7 Number 1 went to press, I had moved from Pismo Beach, to Cambria, to Sacramento, to Trabuco Canyon, and finally to San Juan Capistrano where I have resided for the past year. The newsletter has evolved from the cut and paste method to entirely electronic in nature.

After almost eight years it is time for me to pass the editorship on to another. Melanie Howe has graciously volunteered to become editor of the CalEPPC News. Mel will certainly need your support. Please submit articles, meeting announcements or other appropriate news items to Mel by email (at the present) to: mkellysd@aol.com. You may contact her at: 5700 Baltimore Drive, No. 195, La Mesa, CA 91942. (619) 463.3364.

I am very proud to be a part of this organization, and I'm very glad I raised my hand so many years ago.

Sally Davis

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CalEPPC would like to welcome the following individual and institutional members who have joined CalEPPC in the months from July through December, 1999:

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If you would like to join CalEPPC, please remit your calendar dues using the form provided below. All members will receive the CalEPPC newsletter, be eligible to join CalEPPC working groups, be invited to the annual symposium and participate in selecting future board members. Your personal involvement and financial support are the keys to success. Additional contributions by present members are welcomed!

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** Students, please include current registration and/or class schedule*

Calendar of Events

January 27 - 29 **2000 Annual Conference TWS: Field Biology in the New Century: Changing Roles of the Public and Private Sector**, Riverside. Sponsored by the Western Section of the Wildlife Society. Contact Mike Morrison, <mailto:wildmlm@worldnet.att.net>

February 12-18 **Society for Range Management 53rd Annual meeting: 2000 Trails to Boise**, Boise, Idaho. <mailto:shardegr@nwrc.ars.pn.usbr.gov>

February 15 **Sources of Elements Over Long-Term Soil Development in the Hawaiian Islands**, Lecture by Peter Vitousek, Stanford University. Contact Willie Lee (650) 329-4781, <mailto:lee@andreas.wr.usgs.gov>

December 5-7 **Protecting Watersheds Using Integrated Noxious Weed Management**. Interagency Noxious Weed Symposium, Oregon State University, Corvallis, Oregon. Contact Sherry Kudna or Tim Butler (503) 986-4621, <tbutler@oda.state.or.us>

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