

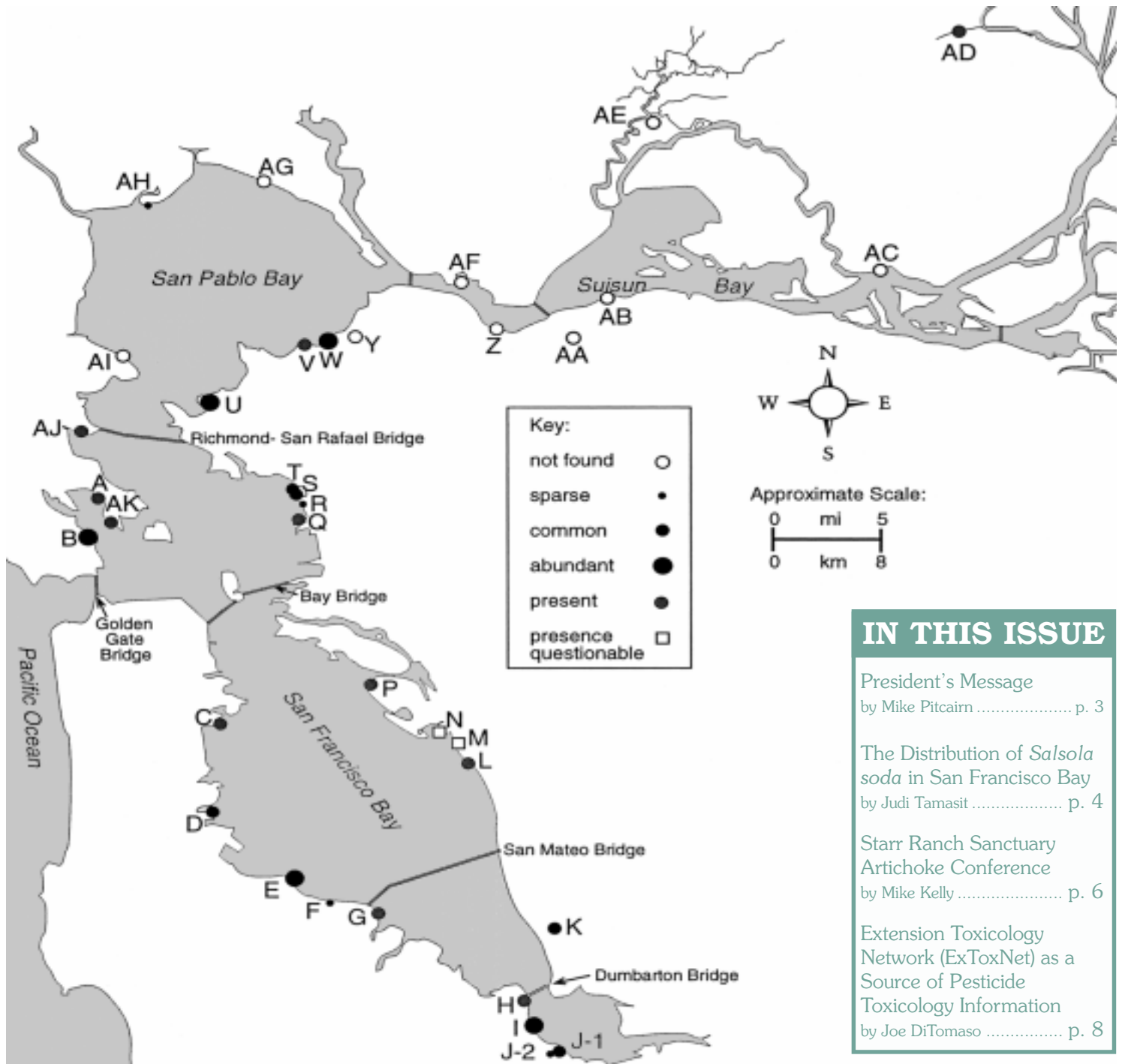


CalEPPC News

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Exotic Pest Plant Council

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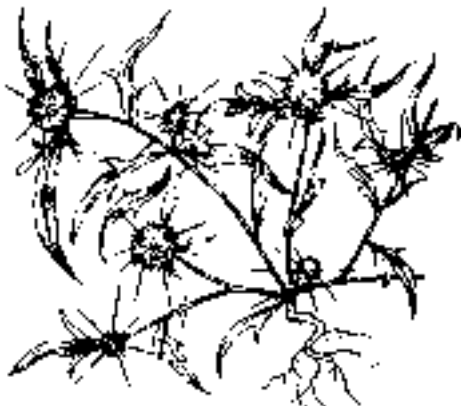
Locations and degree of presence of *Salsola soda* throughout San Francisco Bay.

Map designed by A. N. Cohen, 1989.

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 a qualified donee for tax deductible charitable contributions.

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Vice-president	Greg Archbald	email: <greg_archbald@ggnpa.org>
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Ellie Wagner	email: <ewagner@trmx3.dot.ca.gov>
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Working Group Chairpersons

Arundo	Nelroy Jackson	909.279.7787	nejack@monsanto.com
Artichoke thistle	Mike Kelly	619.566.6489	mkellysd@aol.com
Brooms	Karen Haubensak		
Cape ivy	Greg Archbald	415.561.3034, x3425	greg_archbald@ggnpa.org
Cortaderial	Joe DiTomaso	530.754.8715	ditomaso@vegmail.ucdavis.edu
Euphorbia terracina	Jo Kitz	818.346.9675	mtnsrt@aol.com
Fennel	Jennifer Erskin	530.753.8193	jaerskine@ucdavis.edu
Lepidium	Joel Trumbo	916.358.2952	
Saltcedar	Bill Neill	281.287.5246	
Spartina	Steve Jones		
Veldtrass	Dave Chipping	805.528.0362	dchippin@calpoly.com
Volunteers	Pete Halloran		
Yellow starthistle	Mike Pitcairn	916.262.2049	mpitcairn@cdfa.ca.gov
Editor	Sally Davis	32912 Calle del Tesoro, San Juan Capistrano, CA 92675	ph: 949.487.5427 email: sallydavis@aol.com

CalEPPC's web site: <http://www.caleppc.org>

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 efficacy, safety, or legality.

President's Message

by Mike Pitcairn

Several interesting discussions have occurred during the last few CalEPPC board meetings concerning the topics to be presented at CalEPPC's Symposium '98 which will be held in Ontario, October 2-4, 1998. The discussions centered around what information would best serve our membership. I will try to summarize some of our conclusions, but first some background.

Some (not all) exotic plants are aggressive invaders that escape areas in which they were originally intended and invade native plant communities. Upon invasion, these exotic plants displace native flora and disrupt ecosystem function. They can change nutrient cycling and moisture regimes. They can change the frequency of fire or even introduce fire into areas it has not historically existed (e.g. the occurrence of exotic annuals in the Mojave Desert). The threat of these exotic species is so great that they need to be removed, eradicated, or at least controlled lest we lose the diversity of our native plant communities and the integrity of native ecosystems.

When CalEPPC was organized in the early 1990's, knowledge of the threat and damage caused by some exotic plant species was confined to a few experts, and methods for controlling these plants was sorely lacking. Since its inception, the goals of CalEPPC have been primarily educational and twofold: to get the word out about the threat of some exotic plants to native plant communities, and to provide information on how to eradicate or control them. For this, we have produced a plant list identifying the most invasive exotics; we have a newsletter providing information on plant biology and control

activities; and we put on an annual symposium where experts in plant biology and control methods present the most current information on these topics. Scientific studies and reports on the damage caused by

“The goals of CalEPPC have been primarily educational and twofold: to get the word out and to provide information...”

some exotic plants are being published annually and this information is passed on to you as it becomes available. Control methodology encompasses several different technologies: releasing living organisms with biological control; using controlled burns; coordinating crews who remove plants with chain saws and hand tools; and applying chemical herbicides. Information on control methodology is limited, but growing.

Control methodology is a very large and diverse topic and the CalEPPC board has discussed at length what information would best serve our members. Several views on many diverse aspects of plant control have been expressed in these discussions. Still, a consensus appears to occur on several points which I will do my best to summarize:

1) Control of an exotic pest plant must be considered in the larger context of the habitat and ecosystem where the control activity will take place. The goal of controlling exotic plants is not just removal of the target weed but also restora-

tion of native plant community. No progress is made if one plant is removed and another invasive exotic takes its place. Thus, exotic weed control must be incorporated in a weed management strategy that encourages the return of native species and prevents the reinvasion of exotics.

2) Safety is critical for all control methods. Some control methods risk damage to other plant species, others risk damage to the applicators. Chain saws should be used with appropriate protective gear and proper training. Herbicides are should be applied with appropriate equipment and protective clothing, etc. Organization and identification of duties are critical to reduce risk to volunteers in field crews.

3) The control methods used must be science-based and shown to be effective. There are so many weeds and so little time. Let's make the most of our efforts. This is not to say that experimenting with new methods or unique combinations of traditional methods should not be utilized, for they should. We do ask, however, that the methods used and results achieved be documented so that effectiveness can be evaluated.

4) While not all control methods are appropriate for all weeds and all situations, the choice of control method cannot be made before the habitat is examined and a control strategy is developed (see 1 above). CalEPPC will provide as much information as possible for all control methods. The final decision rests upon those responsible for the project.

The theme for Symposium '98 is **Working Smarter, Working Together**. This should be a very interesting and enlightening symposium. I hope to see all of you there. †

The Distribution of the Non-Native Plant *Salsola soda* in San Francisco Bay: Summary of a Thesis

by Judi Tamasi

I determined the distribution of a non-native plant, *Salsola soda*, throughout marshes in San Francisco Bay for my senior Environmental Sciences honors thesis at the University of California at Berkeley. Although some sightings of the plant in the Bay had been officially reported before my project, my paper is the first attempt to synthesize the data pertaining to past documentation with the data I collected regarding the locations where the plant is presently found. An analysis of my findings suggests that *S. soda* has the potential to alter native wetland ecosystems in San Francisco Bay.

Salsola soda is in the family Chenopodiaceae and is related to the well-known agricultural weed, Russian thistle (*Salsola tragus*). *S. soda* is a halophyte, found on mudflats and open areas of salt marshes. It is succulent, generally glabrous, and ranges in color from green to red to brown. *S. soda* is native to South Europe and its presence was first documented in San Francisco Bay in 1968 (Thomas, 1975).

From field visits primarily, as well as telephone interviews and library and herbaria searches during the 1994-1995 academic year, I concluded that *S. soda* is widely present throughout the geographical extremes of the Bay, excluding Suisun Bay (see map). This includes the north coast of San Pablo Bay at Tubbs Island, along the east shore at locations such as Berkeley Marina and Chevron Marsh, along the west shore at sites such as the bike path north of Sausalito and Coyote Point

County Recreation Area, and at the south end of San Francisco Bay at the Palo Alto Yacht Harbor. I did not find it at several locations I visited in the less salty waters of Suisun Bay, although two people did report finding it there (Preston, 1995, pers. comm.; Witham, 1995, pers. comm.).

A description of the environment in which *S. soda* is found can provide clues to how it arrived as well as clues to characteristics of the environment which favor its persistence. Several times I found *S. soda* at mouths of pipes, along riprap or along sloughs, suggesting that the plant may expand its distribution by means of water. The seeds or propagules can float and travel in water before they are deposited onshore and have the opportunity to establish elsewhere. In addition, I found the plant along roads and bike paths, indicating that tires play a role in dispersing the seeds. The seeds can be caught up in tires, travel some distance, then fall out at another location. Although I found *S. soda* along edges of water bodies, I also found it many times along levees, particularly in dry soil. In all cases, the presence of surrounding tidal marsh vegetation implied that the soil is saline. The results of a soil test I conducted confirmed this concept.

Some of my observations suggest that *S. soda* may have the potential to affect the integrity of our wetlands in San Francisco Bay. An outstanding example of its potential to establish and spread is

found at the crossing of Pinole Creek, the railroad tracks, and the adjacent wetland. At this location, *S. soda* was the dominant plant in large densities covering a large area along a dry levee. Here, *S. soda* may have altered the vegetative structure of the ecosystem, and perhaps influenced this ecosystem in other unknown ways. At several other sites, I observed *S. soda* in small densities over a large area or in a large density over a relatively small area. In addition, I noted the presence of the plant at locations where it was documented over twenty years ago, which is evidence of its ability to persist in an area.

The results of my telephone interviews were not entirely conclusive, yet they do suggest the possibility that *S. soda* may threaten San Francisco Bay marshes. On one hand, many of the people I interviewed, who have experience with San Francisco marshes, had not heard of the plant or did not think it posed any great problems. However, two people I interviewed thought *S. soda* had been problematic lately (Olson, 1995, pers. comm.) or that it shows promise to be a problem (Harteveldt, 1995, pers. comm.). I discussed untested suppositions regarding some possible impacts caused by *S. soda* with some people. These suppositions include *Salsola*:

- establishing in previously unvegetated areas, subsequently affecting the short-legged shorebirds by decreasing their visibility from predators (Baye, 1994, pers. comm.),
- replacing the native pickleweed and therefore transforming the landscape (Olson, 1995, pers. comm.), or

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Book Review: Assessment and Management of Plant Invasions

**Editors: J.O. Luken and J.W. Thieret, Springer-Verlag, New York, 1997,
Reviewed by Carl E. Bell**

This book is the latest of the Springer series on environmental management. It has some excellent information on the subject of invasive plants and should be a welcome addition to most libraries, if you can afford it. The book has 18 contributed papers, divided among four sections, covering a range of topics from the ecology of non-native plants and invasion, to case studies of successful management efforts. The first section on Human Perceptions includes three of the 18 papers. These papers, including one by our own John Randall, concern the ecology of invasive species and what impact they have on natural systems. Two of these papers (not the one written by John) ask us to

carefully define what is indigenous and non-indigenous and justify control measures. The concepts behind these papers are probably not likely to get a lot of sympathy from the majority of us, but they are designed to make you think. John's contribution, by the way, is a good general review of the process of defining weeds in natural areas.

The second section, Assessment of Ecological Interactions, consisting of seven papers, is devoted to basic principles of plant ecology as it relates to invasive species. As such, they are good reading as a review of ecology or a primer for those that need an education in ecology. The third section is a more practically oriented group of four papers on

Methods and Philosophy of Managing Exotics. The final section is Regulation and Advocacy, with four papers on organizing people and efforts against exotics.

I found this book well written by a host of experts in this field. My only problem with this book is that I feel it is too diverse. Topics range from ecology, setting up EPPCs, how to define a species as non-indigenous (let alone as invasive), and dealing with politicians to start a control program. I felt there was a lack of focus in the book as it tried to be all things to all people. That, combined with the hefty price tag, will not make this book attractive to too many people although it has an abundance of good information. †

Congratulations to the Recipients of California BLM's "War on Weeds" Mini-grant!

Eight proposals were received and four were funded for a total of \$15,000. The proposals were all reviewed and ranked by signatory representatives of the Noxious Weed MOU that attended the last meeting of the California Interagency Noxious Weed Coordinating Committee. The recipients were:

California Native Plant Society	Special weed issue of Fremontia	\$8,100
East Sierra Weed Management Area	ID handbook, tamarisk video	\$5,000
Lassen County SWAT Team	Weed prevention flyer	\$1,400
Battle Creek Watershed Conservancy	Regional weed video	\$500

All of the recipients will be using the WOW grant award for educational activities, which was the primary focus for this year. Based upon comments by the participating agencies, Weed Management Areas (WMAs) will be the primary focus for next year (given Congressional funding). As part of a Weed Management Area, your agency or organization will be eligible for more funding opportunities than as an individual. Another source of funding for Weed Management Areas is the Fish and Wildlife Foundation's "Pulling Together" noxious weed initiative. This large funding source is available every fall, so start working on your WMA proposal now!

Contact Anne Knox (aknox@ca.blm.gov) to find out more about Weed Management Areas, the "Pulling Together" grant initiative, and how you can get involved. †

Starr Ranch Sanctuary Artichoke Conference

by Mike Kelly

The Biology and Control of Artichoke Thistle was the theme of a conference held June 12 at the Audubon Society's Starr Ranch Sanctuary. Sanctuary managers Sandy and Pete DeSimone organized the fruitful meeting. Participants could not have asked for a more beautiful setting than the 4,000 acre nature preserve, home to a wide diversity of habitats and species. The reason for the conference was highly visible in the grasslands, both native and exotic annual, where a heavy artichoke infestation is often seen to dominate the cover in many places.

Artichoke thistle (*Cynara cardunculus*) was once one of California's worst pest plants (Thomsen 1986), infesting hundreds of thousands of acres, especially in Southern California. Today it is still a major pest plant on rangeland and in open-space parklands and preserved lands, including Mission Trails Regional Park, Black Mountain Open Space Park, Gooden Ranch, Crystal Cove State Park, Starr Ranch Sanctuary, The Irvine Ranch and others. It is still common to see grasslands along Interstate 5 on the south coast infested with the weed. Vacant lots are commonly filled with it in places like Rancho Bernardo. (Much of the 'artichoke problem' was solved in the long-standing Southern California tradition of building a subdivision on top of it.)

Twelve speakers presented talks at the conference, roughly divided into three categories: basic biology and ecology, case histories of control efforts, and restoration of once infested lands. Tony Bomkamp of Glenn Lukos Associates described

a mitigation project his company carried out involving artichoke eradication. Bomkamp argued that choosing artichoke infested sites for mitigation projects only makes sense if they are adjacent to good quality native habitat where there are the propagules necessary for the restoration of native plants.

Peter Bowler underscored this point with a provocatively titled talk, *Artichoke as an Ecological Resource and its Utility as a Precursor to Restoration*. Bowler is well known for his work in salvaging coastal sage scrub species and using them in restorations (Bowler 1997a, 1997b, 1994, 1992). Bowler describe a project site where artichoke thistle was first successfully removed using the chemical herbicide glyphosate (Roundup®), then restored to native habitat with transplanted coastal sage species. Bowler made two important points: first, why remove the artichoke thistle if native replacements aren't already on site or ready to be brought in? In sites where large monocultures of artichoke are to be found, limiting oneself to simple eradication of the artichoke often opens the site to other weeds. Some of these other weeds are true strategy weeds and would be worse than the artichoke. He suggested choosing sites adjacent to existing native vegetation and working from there. He argued that the artichoke thistle actually creates good conditions for restoration in areas where it has formed monocultures and been established for long periods of time. In these sites, he has often found the ground beneath the artichoke to be have halos of relatively exotic seed-free soil. Additionally, dead arti-

choke plants act as a conduit to bring water deeper into the soil horizon, good for the native plants and seeds being planted.

Dawn Lawson and Lee Ann Naeue of the Southwest Division Naval Facility Engineering Command and Marine Corps Base Camp Pendleton described the successful 15-year effort to control artichoke thistle on Camp Pendleton. They used the herbicide Dicamba (Banvel®) and found it to be effective.

Dave Pryor from the California Department of Parks and Recreation at Crystal Cove State Park detailed

“Murder is creating a vacancy without nominating a successor.”

Ambrose Pierce

effective control efforts in the park. He noted that a change in administration had resulted in a lack of follow-up for a period, during which the artichoke thistle enjoyed a resurgence. He emphasized the need for consistent control year after year. Roundup® was the herbicide of choice for the park. Trisha Smith discussed The Nature Conservancy's partnership with the Irvine Company on the Irvine Preserve where hundreds of acres of artichoke control are involved.

Mike Kelly, president of the Friends of Los Peñasquitos Canyon Preserve in San Diego described a successful control effort in that preserve and shared new informa-

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tion on the existence of a biocontrol agent for the artichoke thistle.

Scientific presentations revealed some interesting information. Ted St. John, a well-known expert on mycorrhizae from Tree of Life Nursery in San Juan Capistrano spoke of preliminary work indicating that artichoke thistle is at least facultatively mycorrhizal, meaning that promoting mycorrhizae, an effective technique with some ruderal weeds, would probably not be effective with this plant.

Amanda Boose and Ginger White from UC Riverside reported early results from research they are doing on behalf of Starr Ranch Sanctuary. They have been investigating the basic physiology and phenology of the weed, using research plots at the university. Germination experiments confirmed observations made by Pepper (1996) on the breadth and discontinuous germination of artichoke seed. The seed can germinate under a wide variety of conditions and over a prolonged period of time. Experiments revealed a startling fact, that the plant is setting up a tap root right after the cotyledon stage and before the rosette stage. Cut it and it resprouts even at this early stage. Cutting the plant at the 6th leaf and 11th leaf stage failed to kill it. In each case the plant resprouted. Cutting at the rosette stage delayed bolting, but didn't kill the plant. The plants resprouted and still bolted, albeit a bit later. Experimenting on the underground tuberous parts of the plant revealed that even a tiny portion of the root system left in the ground can resprout into a plant. This shouldn't be too surprising since its close cousin, the commercial artichoke (*Cynara scolymus*), is propagated in this manner, through root division. Participants are eagerly awaiting the publication of these and other experiments.

Finally, Sandy DeSimone described an ambitious research into

the possibility of mechanical control of the artichoke through mowing. Starr Ranch is experimenting with different mowing strategies in an effort to determine if it is possible to 'starve the roots.' The three-year experiment hopes to answer the question of whether an effective alternative to the use of herbicide exists for the control of *Cynara cardunculus*. DeSimone will be reporting on this work at next October's CalEPPC Symposium in Ontario.

A big thanks to the DeSimones for hosting and organizing this stimulating and informative meeting at the Starr Ranch Sanctuary. ♣

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Plan to attend CalEPPC Symposium '98

Mark your calendars to reserve the weekend of October 2-4, 1998 for CalEPPC Symposium '98, **Working Smarter, Working Together**, at the Hilton in Ontario, California. Full day and short-day field trips will tour local restoration sites. The invitations for CalEPPC Symposium '98 were mailed in August. The symposium has been awarded 2 hours of educational credits for "laws and regs" and 7 hours of approved credits for in the "other" category by DPR.

Posters addressing all areas of exotic pest plant control in wildland ecosystems of California will be displayed in the symposium break area. You and your colleagues are invited to display your poster regarding research, control methods, tools, or other related topics. Informal presentations by poster authors are invited but not required. Please call Barbara Leitner at (510) 253-8300, email: leitner@jong.com. ♣

Extension Toxicology Network (ExToxNet) as an Excellent Source of Pesticide Toxicology Information

by Joseph M. DiTomaso, University of California, Davis

Many claims are made concerning the hazard or safety of herbicides in the environment. Unfortunately, the bulk of this information is primarily accessible to the general public through newspaper articles which are often inaccurate, or literature provided by groups with specific agendas. It is often difficult to find truly unbiased information on the effect of pesticides on animal health, water quality, food safety, and other environmental issues. I have spent numerous hours tracking down medical papers cited in newspaper articles or other materials only to find that the conclusions were misinterpreted by journalists. Of equal importance, background information on pesticide toxicology and risk assessment are difficult to find. In most cases, toxicological manuscripts are so complex, it is nearly impossible for an untrained reader to understand the information.

Is there an unbiased, accessible, and understandable source of information on pesticide toxicology? Where does one go to learn about the potential for pesticides to act as endocrine disrupters or carcinogens, or to understand the toxicity of inert ingredients in herbicide formulations? Fortunately, most of these questions can be answered on one web site I recently discovered while browsing the Internet. It is called ExToxNet, which is an acronym for Extension Toxicology Network. This is a collaborative effort among environmental toxicologists from the University of California, Davis; Oregon State University; Michigan

State University; Cornell University; and the University of Idaho. It is located at the URL address: <<http://ace.orst.edu/info/extoxnet/>>.

The major objective of ExToxNet is to provide clear, science-based summaries of the most recent literature on pesticide toxicology. This information is presented in the form of *Toxicological Issues of Concern* (TICs), toxicology fact sheets, *Pesticide Information Profiles* (PIPs), and *Toxicology Information Briefs* (TIBs). Controversial issues are discussed and both sides of a particular view are considered. In addition to providing an electronic form of information on pesticide toxicological issues, the goals of ExToxNet are also to stimulate dialog on toxicology issues and respond to requests for information.

Although pesticide toxicology is a major component of the web site, many other issues are also covered, including the use of chlorine in water, multiple chemical sensitivity among some individuals, *E. coli* outbreaks, domoic acid, *Bacillus thuringiensis*, diet and cancer, household hazardous waste, indoor air quality, and many other important topics. For most of us concerned with potential herbicide hazards in wildland environments, the site also focuses on how pesticides affect people and the environment. Within this section, toxicologists address questions on pesticide exposure, environmental fate, inert ingredients, gardening and pesticides, endocrine disrupters, and pesticides in drinking water. Each section provides a general overview,

as well as specific information on various herbicides. For example, under the topic of pesticide exposure, there is a discussion on how exposure occurs, the routes of pesticide penetration, precautions which should be taken to limit exposure, properties of pesticides important to persistence and mobility, effects of exposure on health risk, and protection of pets to pesticide exposure. As a further convenience, most topics contain links to additional information on other sites. Similar detail is provided for issues concerning environmental fate of herbicides, including movement in air, soil and water, and aspects related to pesticide breakdown and fate in the environment, and in areas where pesticides are applied indoors.

Recently, I spent some time searching through the library to find information on endocrine disrupters, particularly with respect to herbicides. After being thoroughly frustrated, I contacted the ExToxNet site. In addition to presenting an excellent discussion of the endocrine system (including a diagram), the site also provides several pages of information on chemicals that cause endocrine disruption, both natural and synthetic, and the relationship these compounds have to cancer. It also summarizes the evidence implicating environmental contaminants as endocrine disrupters in humans and wildlife.

Perhaps the most important aspect of ExToxNet is the detailed toxicological information available

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ExToxNet (Cont'd)

when conducting a search for a specific herbicide. Each mention of a selected herbicide is listed and can be readily displayed. In addition, a list of published citations can also be obtained for any herbicide. For example, a search of triclopyr (Garlon 3A, 4 and pathfinder II) yielded 378 published citations on various aspects of its toxicology. Many of these references are EPA publications describing the original studies used in the registration process. The site also contains a *Pesticide Information Profile* (PIP) of each herbicide registered for use in the United States. Within these profiles are included the registration status, a short description of the herbicide use, and a more detailed discussion of the toxicological and ecological effects, and environmental fate of the compound. Under the category *toxicological effects* there is a short summarization of acute and chronic toxicology, reproductive effects, teratogenic, mutagenic, and carcinogenic effects, organ toxicity, and the fate of the compound in animals and humans. Ecological effects consider the toxicity of each compound to birds, aquatic organisms, and other pertinent species (i.e., bees). The section on environmental fate covers herbicide breakdown in soil, groundwater, surface water, and in plants. There is also a list of physical properties for the active ingredients and exposure guidelines, such as the Maximum Contamination Level (MCL).

In summary, I find the ExToxNet web site to be the most easily accessible and comprehensive source of information on pesticide toxicology currently available. I encourage CalEPPC members to utilize this site to obtain information specific to their situation or find answers to toxicology questions of concern to themselves, their peers, or the general public with which they interact. ♣

Salsola (cont'd)

- occupying an unfilled niche, thus causing little harm or influence to the ecosystem and its components (Baye, 1994, pers. comm.).

My study determined the distribution of *S. soda* in San Francisco Bay and described the environment in which it is found. Because *S. soda* is widespread in the Bay and it appears to display the potential to impact the ecosystem, I advise that further studies be conducted on the possible impacts of this plant. Also, land managers should note the presence of *S. soda* and monitor the spread of the plant over time. I recommend that this research be conducted before official eradication measures are taken.

Note: If anyone would like to comment on this summary or receive a copy of the seventeen page report, please contact the author, Judi Tamasi, 5819 Lawton Avenue, Oakland, CA 94618.

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More on Fort Ord's November "War on Weeds" Symposium

The goal of the War on Weeds program on former Fort Ord's 28,000 acres are to identify the greatest threat noxious weed species, prevent their further spread, and to eventually achieve total eradication. At the second annual War on Weeds Symposium to be held in November, weed eradication specialists, conservation association members, biologists, volunteers, and cooperating agencies at Fort Ord will share each others successes and failures in combating weeds, as well as discuss methods to develop regional collaborative teams to attack the problem.

A field trip is planned to enable participants to view Fort Ord's cooperative weed eradication projects and the rare habitats that are to be preserved.

Plan to attend in November 1998. Call Bruce Delgado for more information at 408.394.8314. ♣

ERRATA

In the Spring 1998 edition of CalEPPC News, Vol. 6 No. 2, the botanical name of Cape ivy (formerly known as German ivy) was misspelled. The correct spelling is: *Delairea odorata*. ♣

Effects of *Arundo donax* on Water Resources

by Mark E. Iverson, P.E., City of Riverside, Water Reclamation Plant

Every year, giant cane (*Arundo donax*) evaporates an estimated 56,200 acre-feet of water along the Santa Ana River; enough water to serve a population of about 280,000 people. If this amount of untreated water was purchased from the Metropolitan Water District (MWD), it would cost approximately \$18,000,000 at the current cost for untreated drinking water. There is, therefore, a cost that can be easily associated with *Arundo* and its effects on water resources. A successful *Arundo* removal program could ultimately cut the evapotranspiration by two-thirds. This would save an estimated 37,500 acre-feet per year of water worth approximately \$12,000,000.

It is easy to attach a dollar amount to how *Arundo* affects the quantity of water resources, but it is difficult to do so for how it affects the quality of water resources. Being a giant grass, *Arundo* provides little shade along the river. This causes the water temperatures to increase, which in turn changes the water chemistry of the river. The net result is water quality that is less suited for fish and other aquatic life. *Arundo*, therefore, affects the water resources of the Santa Ana River in ways that are both tangible and intangible to man.

Effects on the Quantity of Water Resources

Arundo is a non-native plant that was imported to Southern California from the Mediterranean by the early Spanish settlers. Over the years the *Arundo* population has increased to the point where it out-competes all other native plant species in riparian habitats. And it uses about three times as much water as they do. There are no specific studies on the evapotranspiration rate of *Arundo*.

Horticulture experts estimate *Arundo* evaporates water at approximately the same rate as rice. In short, every acre of *Arundo* consumes about 5.62 acre-feet of water per year. Native species use only about two-thirds this amount; 1.87 acre-feet per year. The water lost to evapotranspiration is water that would otherwise be available for groundwater recharge and ultimately drinking water supplies.

The Santa Ana River and other streams and rivers in Southern California are natural groundwater recharge basins. Were it not for the numerous wastewater discharges along the Santa Ana River, it would be almost, if not completely, dry except during the short rainy season. Only a small portion of the runoff from the heavy winter rains reaches the groundwater aquifers; most of it runs off quickly and is ultimately discharged to the ocean. But nearly all of the water that flows in the river during the dry season either percolates into the groundwater aquifer or is lost to evaporation.

There are an estimated 10,000 acres of *Arundo* along the Santa Ana River. Using the estimated evapotranspiration rate of 5.62 acre-feet per year, a total of 56,200 acre-feet per year of water is being consumed by the *Arundo*. If the *Arundo* was completely replaced with native vegetation, the annual water consumption of the plants would be only about 18,700 acre-feet per year. To put this in perspective of beneficial use, one acre-foot of water is enough to serve a family of five for one year. The savings in water consumption would therefore be enough to serve a population of around 190,000 people. The water saved by reducing evapotranspiration will naturally recharge the groundwater aquifers and be avail-

able for drinking water supplies.

Effects on the Quality of Water Resources

Native vegetation normally overhangs the river, providing shade that keeps the temperature of the banks and the water down. Being a giant reed grass, *Arundo* provides little shade along the banks of the river; consequently the water in the river is exposed to more sunlight. This increases the water temperature and changes the chemistry of the water.

With increased sunlight comes increased photosynthesis activity. Warmer water, in conjunction with more sunlight, promotes algae growth which tends to raise the pH of the water. The increase in algae growth also reduces the clarity of the water. The Santa Ana River, being a wastewater-effluent dominated stream, is high in ammonia nitrogen concentration. The high pH of the water shifts the equilibrium of ammonia from the ionized to the un-ionized form. Un-ionized ammonia is more toxic to fish and other aquatic life.

People benefit either directly or indirectly from a healthy river habitat. Those people who fish, swim and otherwise visit the river for recreation benefit directly from better water quality. But even those who don't visit are affected. How, and to what monetary extent, is difficult to determine. Suffice it to say that ultimately we are all affected by our natural environment and water resources are a key factor in environmental quality. Removal of the *Arundo* is therefore important from the standpoint of both the quality and quantity of water resources. †

CalEPPC New Members

CalEPPC would like to welcome the following individual and institutional members who have joined CalEPPC in the months from June 1998 through August 1998:

Debra Ayres
Cameron Barrows
Michael Bostwick
Alicia Doran
Suzanne Ebright

Joshua Fodor
Josephine Guardino
Evelyn Healy
Cheryl Ingersoll
Brewer International

Helen Johnson
Eveline Leon Martin
Craig Martz
Steve Schoenig
Adrian Wolf

Harmful Non-Indigenous Species in the United States, U.S. Congress, Office of Technology Assessment, OTA-f-565, September 1993, is now available on the Web. It is the most complete treatment on the issue of invasive species. The URL is: http://www.wws.princeton.edu/~ota/disk1/1993/9325_n.html

Cape ivy Collections

In conjunction with the South Africa field surveys of Cape ivy (*Delairea odorata*), Dave Headrick, Cal Poly Crop Science, San Luis Obispo is examining samples of Cape ivy for existing insect infestation. Dave's graduate students are conducting monthly studies in the San Luis Obispo area and would appreciate one-kilo samples from various locations along the coast of California ranging from Fort Bragg to the Mexican border. Adequate collections have already been made from San Francisco, San Bruno Mountain, southern Marin County and San Luis Obispo County.

Please send your one-kilo sample in a tightly-closed plastic bag, detailing habitat location, aspect, and date of collection to: Dave Headrick, Crop Science Department, Cal Poly State University, San Luis Obispo, CA 93407

Avoid shipments arriving on Friday; plan to have shipments arrive earlier in the week. Call Dave Headrick to let him know when a shipment is due to arrive by calling 805.756.5382 or email:

dheadric@polymail.calpoly.edu ♣

Letters to the Editor

In the last CalEPPC News (Vol. 6 No. 2), Mike Forbert published a very nice paper on the control of Cape ivy. However, there are a few items which should be clarified to prevent improper use of herbicides. First, it was noted that 18% Roundup concentration and Brush-B-Gon could be used to control Cape ivy. These are homeowner recommendations that would never be used by professional applications. This was implied but not directly stated. Professional applicators would use Roundup Pro, with a higher concentration than 18%, or triclopyr formulated as Garlon 3A or 4. Most importantly, tank mixing any Roundup formulation with a fertilizer is "off-label." Glyphosate, the active ingredient of Roundup, may precipitate out in a salt solution, particularly when high concentrations of calcium or magnesium are present. This is typical in many fertilizer formulations. Applying fertilizers in a separate treatment is a better option.

Joe DiTomaso

WEB SITE NOTICE

Vegetation Maps Online Checklist

A Checklist of Online Vegetation and Plant Distribution Maps has been compiled by Claire Englander (University Herbarium, University of California, Berkeley) and Phil Hoehn (Branner Earth Sciences Library and Map Collections, Stanford University) and is available at: <http://www-sul.stanford.edu/depts/branner/vegmaps.htm>

The list is arranged by area (world or continent, then subdivided by region or country name, and when necessary subdivided by smaller areas). The map (or atlas) titles are "hotlinked." All titles showing vegetation distribution (e.g., forested areas, vegetation types, maps of individual family, genus or species distribution) were included. The compilers quickly learned that few maps are easily found via Internet search engines using the term "maps". Rather, they are pages within a website, and oftentimes a page within a chapter of an electronic paper.

The compilers hope users will find the checklist useful, and news of additional sites or about any URLs no longer working. Phil Hoehn, Map Bibliographer Branner Earth Sciences Library & Map Collections, Stanford University, Stanford, CA 94305-2210 email: phoehn@sulmail.stanford.edu ♣

1999 CalEPPC Membership Form

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 key to success. Additional contributions by present members are welcomed!

<input type="checkbox"/> Status	Individual	Institutional
<input type="checkbox"/> Retired/Student*	\$15.00	N/A
<input type="checkbox"/> Regular	\$25.00	\$100.00
<input type="checkbox"/> Contributing	\$50.00	\$250.00
<input type="checkbox"/> Sustaining	\$250.00	\$1000.00
<input type="checkbox"/> Lifetime	\$1000.00	N/A

Name _____

Affiliation _____

Address _____

City/State/Zip _____

Office Phone _____

Home Phone _____

Fax _____

email _____

Please make your check payable to **CalEPPC** and mail with this application form to:

CalEPPC Membership
 c/o Sally Davis
 32912 Calle del Tesoro
 San Juan Capistrano, CA 92675-4427

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



Calendar of Events

- September 22-26 **5th Annual Conference of the Wildlife Society**, Buffalo, NY. Contact: 301.896.9770; email: <www.wildlife.org/index.html>
- September 27 - 30 **7th Workshop on Oak Physiology & Growth Problems in Oak Plantings**, South lake Tahoe, CA. Sponsored by the Integrated Hardwood Range Management Program. Contact: Joni Rippee, 510.643.5429; fax 510.643.5438; email: <rippee@nature.berkeley.edu>
- September 28 - 30 **1998 Society for Ecological Restoration International Conference**, Austin, TX. Contact; 608.262.9547; email: <www.phil.unt.edu/ser>
- October 1 - Jan 15 **Watershed Management: A Distributed Learning Course Over the Internet**. Sponsored by the Institute for Resources 7 Environment & Continuing Studies, University of British Columbia, Canada. Contact Professor H. Schreier: email: <star@unixg.ubc.ca> Web sites: <<http://www.cstudies.ubc.ca/dipcert/watersh1.htm>> <<http://rmes.cstudies.ubc.ca>>
- October 2 -4 **Working Together, Working Smarter: CalEPPC Symposium '98**, Ontario, CA. Sponsored by the California Exotic Pest Plant Council. Contact: Sally Davis, 949.487.5427; email: <sallydavis@aol.com>



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31872 Joshua Drive, #25D
 Trabuco Canyon, CA 92679-3112

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