

CalEPPC NEWS

NEWSLETTER OF THE CALIFORNIA EXOTIC PEST PLANT COUNCIL

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Photo by Sally Davis

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Carpobrotus edulis, Hottentot fig or highway iceplant; one of the most pernicious invaders in California, dominating the coastal landscapes with its dense mats. See story page 4.

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.

Newsletter Submissions

Letters to the Editor, notices, articles of all types, volunteer workday schedules, photographs and line drawings are welcome and may be submitted directly to the editor at the address below. We invite you to utilize *CalEPPC NEWS* as a forum for describing your project, asking for help, or bringing new issues or developments to the forefront. Electronic submission is gratefully accepted in PC-formatted 3.5" or 5.25" disks for WordPerfect or Microsoft Word, or ASCII text files. Please enclose a letter quality hard copy with your disk. Copy for the Summer 1995 issue is due with the editor by July 15, 1995.

Proceedings of the *Arundo donax* Workshop

are now available for purchase. Please send a check or money order for \$15.00 for each copy, payable to Riverside County Park District. Mail to Paul Frandsen, P.O. Box 3507, Riverside, CA 92519-3507.

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President's Message

Think Globally, Act Locally

Carla Bossard, president

The catch phrase, "Think globally, act locally" is particularly appropriate regarding prevention and control of exotic pest plants. In the last few months I have received evidence in the realms of policy and publications of growing recognition at the national and international levels of the threat posed by exotic pest plants. The following are just a few examples:

- 1.) The introduction of the Federal Noxious Weed Control Improvement Act of 1995 by Senator Daniel Akako. Its purpose is the prevention of accidental or intentional importation of noxious weeds. Currently, action can only be taken by federal government agencies after a species has become a documented nuisance.
- 2.) The proposal by the Animal and Plant Health Inspection Service (APHIS) to expand the list of noxious weeds contained in the Federal Seed Act regulations to include seeds of all weeds listed in the Federal Noxious Weed Act regulations. This would prohibit import into this country of seed shipments containing seeds of noxious weeds which are listed in the Federal Noxious Weed Act regulations.
- 3.) The publication of the article, "Diversity Disappears in Florida," by Don Schmitz of Florida EPPC in *Newsweek Magazine*, March 13, 1995, which illustrated how exotic trees and plants can change a unique and irreplaceable ecosystem.
- 4.) The initiation of a program on invasive species at the International Institute for Biological Control and their publication of the booklet, "Using Biodiversity to Protect Biodiversity," which relates the important role biological control can play in controlling plants.

This growing global awareness is heartening because aspects of exotic pest control, such as prevention of introduction and biocontrol applications, as potential solutions can only be effective at national/international levels. However, in these times of federal budget cuts, too often money spent on prevention and early intervention on incipient problems is seen to conflict with cost cutting goals. In reality, the costs of prevention and early control of invasive plants through enforcement and research efforts save requisite investment of much larger sums of money at a later date.

CalEPPC has been active at the global level in several ways. CalEPPC comments on proposed regulations and legislation to federal agencies and government representatives, emphasizing the value of prevention versus later remedial efforts. The CalEPPC board appreciates the comments and contributions we receive from members on these issues. We need your continued input on national issues. Secondly, in April the CalEPPC biocontrol committee released its report, "which examines the value of maintaining and enhancing our nation's biocontrol capabilities. (The report will be published in the Summer '95 *CalEPPC News*.)" Additionally, CalEPPC is part of a cooperative effort of all EPPC groups in the United States to gain funding for an international conference and workshop on management and control of broom species.

This "global thinking" has not changed CalEPPC's main thrust of acting locally. The members of our weed working groups are very active in their efforts to remove tamarisk, arundo, yellow star thistle, pampas grass, brooms, German ivy, and other species that threaten California's wildland habitats. CalEPPC members are the backbone and hands of two large ongoing research projects on French broom and German ivy. Our database subcommittee has enlarged our computer access capabilities to facilitate computer dispersal of information on exotic pest plants. Our list, "*Exotic Pest Plants of Greatest Ecological Concern in California*" has been published and sent to managers throughout the state. The list is available to members and the public on request. (Please contact the editor).

The planning for Symposium '95, to be held at Asilomar October 6 - 8, 1995, has been completed by the program committee. The Symposium will feature speakers on the role of fire in weed ecology, wetland and riparian weeds, and sessions on individual weed species. Invitations will be mailed the first week of July.

It is doubly impressive to remember all these activities are done by volunteers who invest their time out of their concern for California's wildland ecosystems. The problems are still daunting, but CalEPPC members are thinking globally and acting locally to diminish the threat from exotic pest plant species.

Portrait of an Invader II: The Ecology and Management of *Carpobrotus edulis*

Marc E. Albert

Carpobrotus edulis (Hottentot fig, highway iceplant) is one of the most pernicious invaders in California, dominating many coastal landscapes with its dense mats. Along with its suspected hybrid derivatives, *C. edulis* coverage is both expanding and contracting these days: expanding as it continues to disperse and grow beyond currently invaded areas, and contracting as eradication efforts aimed at restoring native coastal vegetation continue. In this article I will summarize current understanding of the biology and ecology of *C. edulis* and discuss control techniques used in the management of this important weed species.

History of *Carpobrotus edulis* in California.

Carpobrotus edulis was first introduced to California in the early 1900's to be planted along railroad tracks in order to stabilize the soil. It soon became embraced as a favorite roadside plant by Caltrans who utilized it to line highways, including 1,000 acres between Santa Barbara and Santa Cruz. Additionally, it has been extensively planted in military areas as well as in home gardens. More recently, highway iceplant has fallen into disfavor for large scale plantings due to its intolerance to hard freezes and potentially high maintenance and pest control requirements.

Carpobrotus species, in the Fig-marigold family (Aizoaceae), are prostrate succulent perennials that grow from multiple axes, forming mats that spread radially. Most *Carpobrotus* species, including *C. edulis*, are native to South Africa where they have evolved in relatively dry, relatively nutrient poor coastal conditions. Like South Africa, California has a Mediterranean climate suitable for the establishment of iceplant species. Since escaping from original plantings, *C. edulis* has established in foredune, dune scrub, bluff scrub and coastal prairie communities (1), and is also known to be invading maritime chaparral (2). The impact *C. edulis* has on native plants is tremendous; it is on CalEPPC's List A-1; *Most Invasive Ildland Pest Plants - Widespread* (CalEPPC 1994) and is thought to pose a direct threat to six threatened or endangered plants (3).

Ecology of *Carpobrotus edulis*.

The success of *C. edulis* in California is generally due to its ability to tolerate a range of soil moisture and nutrient conditions, establish in the presence of inter and intraspecific competitors, grow rapidly, and utilize multiple seed dispersal vectors (4,5). Its effect on native plants relates most directly to its mat-forming habit as well as its ability to utilize and alter soil resources. Specifically, *C. edulis* is known to suppress both the growth of mature native shrubs (6) and the establishment of native seedlings (5). The

mechanisms for this interference are manifold, and include the ability of above-ground mats to utilize available light and space, as well as the ability of roots to utilize soil moisture. Additionally, *C. edulis* is known to lower the pH of soil, altering the ability of native plants to utilize soil nutrients (7).

The ability of non-native plants to establish in any community is dependent both on the physiological and ecological characteristics of the invading species, as well as the ecological characteristics of the community itself. In work assessing the mechanisms allowing invasion of *C. edulis* in dune scrub, stabilized backdune scrub, and coastal prairie, D'Antonio (5) showed that establishment, survivorship, and growth of *C. edulis* differ among these habitats. In the prairie, rodent disturbances that overturned the soil were required for establishment, as *C. edulis* seedlings were strongly affected by competition with grasses. Once the seedlings were established, however, growth was rapid and competition had little effect. In the dune scrub, establishment was limited by herbivory but not by soil disturbance. Survivorship was not effected by competition in this habitat, but growth was slow largely due to the harsh physical conditions in the dunes. In backdune scrub, intense seedling herbivory led to high mortality, but growth and survivorship of established individuals was moderate, and was largely unaffected by competition. In a management context, these results suggest that prairie areas are highly susceptible to the rapid spread of *C. edulis* and should be closely monitored. Additionally, since the further spread of *C. edulis* in dune habitats is controlled by generalist mammalian herbivores it is imperative to protect the remaining native dune communities that support these mammals.

Hybridization with *C. chilensis*.

The other species of *Carpobrotus* that is found in California, *C. chilensis* (sea fig), is distributed in the same coastal communities as *C. edulis*. It is not generally regarded as a threat to native plant communities, having been considered but not listed as a problematic weed species by CalEPPC (8). *C. chilensis* is currently thought to be unique to California (Nancy Vivrette, personal communication), although its origin is still disputed. The one study that examined the history of *C. chilensis* in California found that its pollen began showing up in lake sediments in the 1600's (9). The study is not definitive due to its limited scope (only one central California lake), but the authors suggested that *C. chilensis* was likely introduced in ship ballast from South Africa in the late 1500's. My work has shown that *C. chilensis* is widespread and found in low to moderate densities throughout coastal California habitats; a distribution consistent with that which would be expected of a

native or relatively long established naturalized species (1). I feel that the question of the origin of *C. chilensis* is still open; all that can be said at this point is that the form occurring in California is unique and is either native or naturalized.

Comparing *C. edulis* and *C. chilensis*, individuals of *C. edulis* have longer, more serrate leaves and larger fruits with more carpels. In addition, *C. edulis* produces yellow or pink flowers whereas *C. chilensis* produces rose-magenta to pink flowers. From a survey conducted in 49 sites throughout coastal California, I found that fully a third of *Carpobrotus* individuals do not fit classic descriptions of either extant species, suggesting that widespread hybridization is occurring. The morphological variation within the species complex is great, and many *Carpobrotus* populations resemble hybrid swarms, or amalgamations, of pure parental types, hybrids, and backcrossed individuals of different generation. The apparent backcrossing may not be occurring as often into *C. chilensis* as *C. edulis*, however, as the *C. edulis* and putative hybrid types are more variable than is *C. chilensis*. Putative hybrid individuals generally tend more toward *C. edulis* than *C. chilensis*.

Although both species can be found in coastal communities, there are differences in habitat associations between *C. edulis* and *C. chilensis*. Habitat associations of putative hybrids are in between those of the parental species but tend toward *C. edulis*. In my study, *C. chilensis* was found to be more evenly distributed across coastal environments than *C. edulis* or putative hybrids, being found more evenly across latitudes and community types, as well as among microsites as assessed by slope and aspect. The overall trend of *Carpobrotus* distribution among community types was that coverage of *C. edulis* and putative hybrids was much higher in dune scrub than in foredune, bluff scrub, or coastal prairie habitats, whereas *C. chilensis* was relatively more prevalent in foredunes and along bluff edges.

Hybridization and introgression (the transfer of genes between taxa via hybridization, followed by backcrossing into one or both parental taxa) within *Carpobrotus* in California could have important management implications. The genetic variation produced by these processes can serve as a means for adaptation to new environments. Hybridizing systems can also lead to the formation of hybrid-derived species. If the hybridization involves an invasive non-native species, introgressed individuals or derivative taxa may have characteristics beneficial for further invasion. This has occurred in the U.K., where the dominant native coastal marsh grass has been almost entirely replaced by a hybrid species (10). Another possible concern would be the loss of genetic integrity of the native taxa, either through being overtaken by the aggressive taxa and hybrids, or by repeated crossing resulting in fusion of the two taxa. However, since the origin of *C. chilensis* is unknown and it is suspected to

be non-native, these concerns will not likely play a major role in *Carpobrotus* management.

It would seem likely that *Carpobrotus* hybrids share many physiological and ecological characteristics with *C. edulis* that are associated with success as an invader. Preliminary support for this hypothesis is that the number of native species found growing within *Carpobrotus* clones was nearly twice as high for *C. chilensis* than for either *C. edulis* or putative hybrids, in my study. Also, hybrid types form large monocultural stands in several areas, just as does *C. edulis*. Clearly, much more needs to be understood about the ecology and genetics of this system before the long term consequences of hybridization can be predicted. There are several studies currently in progress on *Carpobrotus* hybridization, specifically examining phenotypic plasticity within the species complex, ecological characteristics of parental and hybrid types, and the molecular genetics and associated habitat associations within the system.

Management of *C. edulis*.

Considering the difficulty in distinguishing hybrid types from *C. edulis* individuals, and the apparent prevalence of hybrids, it is almost certain that land managers have both been planting and removing *Carpobrotus* hybrids for years. For the practical purposes of the conservation of native habitat, however, there is probably little reason to differentiate between *C. edulis* and *C. edulis*-like hybrids.

Control of *C. edulis* is usually limited to the physical removal of the mature plants or the application of Round-up® herbicide to mature plants, both of which can work well. Physical removal using manual labor remains the most commonly used method. Iceplant is a good weed to remove on community work days, as physically it is not exceedingly demanding and can be done by people of all ages. It is wise to alert workers, however, that their pants may be permanently stained if they will be kneeling in the iceplant!

A recent study sanctioned by Andrea Pickart, Nature Conservancy Area Ecologist for northern California, compared physical removal techniques (11). Manual removal was found to be thorough and effective, although very time consuming, and was recommended for small patches and for patches in sensitive habitat. The most efficient way to do the manual removal was the "carpet rolling" technique, in which the *Carpobrotus* mat is rolled up from one side by a few people as other workers sever the roots underneath with shovels. Bobcat removal with a brush rake attachment was also effective, and was recommended for large patches outside of sensitive habitat. This method required thorough follow-up to remove remnants. The study recommended that a modified Bobcat attachment resembling an upturned pitchfork with narrow tines be used to facilitate the easy lifting of the mats. The two other methods tested - covering in black plastic, and spot freezing of the clones - were not recommended, although the plastic covering could be reasonably used to kill *Carpobrotus* if the plants were to be left on site.

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Carpobrotus edulis continued

The spraying of large areas of iceplant with Round-up® herbicide has become prevalent, particularly in the California state parks. A combination of 2% glyphosate and 1% surfactant is generally effective, although 4% glyphosate has also been used. One thorough application generally works to kill most of the live material, but one or two follow-ups to eradicate resprouts is necessary. It has been recently discovered that the water used in the spraying may impact the effectiveness of the herbicide. In a Thomas Reed and Associates project done in coordination with Monterey District State Park Ecologist Ken Gray, it was found that when the relatively hard (more basic) groundwater from the town of Marina was used, the kill was less than when the more acidic water from the Carmel River was used. Adding acidifier to the hard water helped increase the kill.

The original field testing of Round-up® on *Carpobrotus* was done by Monsanto in 1985 at Asilomar. The beach and dune restoration at Asilomar has been one of the premier examples of the usefulness of Round-up® as part of a *Carpobrotus* eradication program. As in many other areas, the *Carpobrotus* distribution at Asilomar ranged from large monocultures to clones interspersed with native vegetation. In areas where natives were present, hand-pulling by court sentenced workers was used to remove *Carpobrotus* clones, whereas large *Carpobrotus* patches were sprayed. Asilomar Restoration Director Tom Moss recommends applying the herbicide in early to mid-winter when natives can be dormant. He also recommends that applicators should use their footprints, which remain in the thick mats of *Carpobrotus* for awhile, to assist in keeping their place as they spray large areas.

The restoration of native communities that have been degraded by *C. edulis* is bolstered when eradication efforts are accompanied by the immediate establishment of native species. In areas with a large complement of nearby native seed sources, natural reseeding may serve this purpose. However, if the *Carpobrotus* cover is very high, and dead mats are left on site, it will be several years before the mats are decomposed sufficiently to allow seedlings to come up through them. In such cases, or when there is not a large local population of natives, the outplanting of natives is recommended. Both Ken Gray and Tom Moss report that dead iceplant mats can actually serve a useful purpose as a mulch for outplantings, preventing desiccation and holding the soil in place. Planting of species such as lizard tail (*Eriophyllum staechadifolium*), mock-heather (*Ericameria ericoides*), California sagebrush (*Artemisia californica*), and California poppy (*Eschscholzia californica*) directly into holes dug out of the *Carpobrotus* mat has been successfully done at Asilomar. Due to the acidifying effects of *C. edulis* in the soil, I would expect direct planting into *Carpobrotus*

mats to work better in sandy soils that would drain rapidly and thus not sustain the chemical effects of *Carpobrotus* presence. In addition, sandy areas with decaying *Carpobrotus* mats will become more loamy as the mats decay, thus holding more moisture and nutrients and allowing the invasion of species not normally found in such habitats. This phenomenon has been observed by Ken Gray at Marina State Beach, where New Zealand spinach (*Tetragonia tetragonioides*), ripgut grass (*Bromus diandrus*) and Bermuda buttercup (*Oxalis pes-caprae*) have been invading the dunes.

In most areas threatened by *C. edulis*, the goal of land managers is eradication, whether via the removal of all *C. edulis* from the site, or via killing all material in situ. In most cases this is a substantial task requiring either extensive human resources to do the removal or extensive material resources to mechanically remove or spray the plants. Depending upon the financial and administrative context, it is often best to design a several year management plan through which progress is monitored and follow-up maintenance to prevent reinvasion is performed.

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NOTICE

The CalEPPC board is seeking to develop handouts on a series of plant species based on general ecology, possible control research projects, where to purchase special equipment, etc. We would like to publish these articles in the newsletter and copy them as handouts (i.e., gorse, arundo, brooms, mustards). The CalEPPC board requests volunteers to work on this issue.

Two Publications Available on Exotic Species in Natural Areas

The Pacific Institute, a non-profit natural resources research group, has recently published two reports concerning non-indigenous species in aquatic, riparian and wetland habitats. Entitled "*Biological Invasions in California Wetlands: The Impacts and Control of Non-Indigenous Species in Natural Areas*" and "*Non-Indigenous Species in Wilderness Areas: The Status and Impacts of Livestock and Game Species in Designated Wilderness in California*," these reports are based on surveys of resource managers throughout the state. The lists of exotics can be useful in analyzing problems in different regions of California, and the text provides general and specific overviews of the nature of these problems.

You can request either or both from Tom Dudley, Pacific Institute, 1204 Preservation Park Way, Oakland, CA 94612, or they can be requested by phone or fax at 510.204.9138 or by e-mail to 'tdudley@violet.berkeley.edu.' Tom will gladly send either or both publications free-of-charge, although a \$3.00 'donation' would help defray his personal mailing costs.

CONTRIBUTING MEMBERS

CalEPPC is pleased to recognize 1995 financial contributions of \$100 or more from our institutional members.
Thank you for your generous sponsorship.

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CalEPPC would like to acknowledge the generosity of individual members who contributed \$50 or more in 1995.

John H. Anderson, Hedgerow Farms
Martha Blane, Martha Blane Associates
David Fross, Native Sons Wholesale Nursery
Ann Howald
Rosemary Jones
Antonina Karnaugh
Pat Bauer, CNPS DKY Chapter

Our membership continues to grow! CalEPPC welcomes the following people who joined February through June:

Steven Ahles	Rosemary Jones	Paul Reeberg
Harold Avery	Leif Joslyn	Katherine Rindlaub
Michael Baefsky	Tom Leslie	Emily Roberson
Brooks Bauer	Jenny Marr	Peter Slattery
Peter Brastow	Shirley Meneice	Margaret Stelmok
Andrew Cohen	Cheryl Miller	Georgia Stigall
Joe DiTomaso	Dylan Neubauer	Jerry Tilton
Mark Homrighausen	William Noble	Sally Walters
Loyd Hopper	David Quimayousie	Raymond White

California Exotic Pest Plant Council Electronic Resources

Steve Harris

Database Working Group Chair

In cooperation with the Institute for Global Communication (IGC) which operates EcoNet and supports our database, CalEPPC now offers world-wide communication with persons and organizations concerned with exotic pest plant control.

The following three electronic communication resources are available to anyone who has a computer, a modem, and an account with a computer network:

Computer conference --- plants.exotic ---

A collection of information on exotic pest plants is available on EcoNet in a conference area, "plants.exotic." Access to EcoNet and this specific conference is available to those who have an account with the IGC or one of its partner networks [e.g., GreenNet (UK), Pegasus Networks (Australia)]. You may also find access to one of these networks through local environmental organizations which often have accounts with the IGC.

Electronic mailing list --- Exotic-Plants ---

A mailing list is an electronic mail system that can distribute e-mail to groups of persons worldwide who have expressed common interests and have an access to a common computer network such as the Internet. For example; if you have access to Internet e-mail services, you may sign up onto the Exotic-Plants mailing list. Then if and had a question about a specific exotic pest species, or have documentation of successful or unsuccessful control work, you could send that information to a single e-mail address and it would be "instantly" shared with dozens, hundreds, thousands, of people throughout the world who have interests, experience, expertise, or other concerns related to your concerns. In the same manner you may respond to e-mail of any of those persons who shares their interests and expertise with the group.

Currently, about 50 persons and agencies from across the world has joined us on the mailing list. This includes persons from Australia, England, New Zealand, and from across the US and Canada.

To subscribe to "Exotic-Plants" electronic mailing list:

Send e-mail to: Majordomo@igc.apc.org with the message: subscribe Exotic-Plants

Gopher --- ceppc.gopher ---

Gopher is an Internet tool used to locate and review files from other computer systems throughout the world. CEPPC's collection of exotic pest plant information in the conference plants.exotic, and information shared on the mailing list, is available through the IGC's gopher list. This makes our information available to anyone in the world who has access to an Internet gopher server - including millions of persons who have computer accounts with universities, government agencies, or with private organizations and computer networks.

Link information:

Type=1+
Name=Exotic Pest Plant Database
Path=1/orgs/ceppc/ceppc_data
Host=gopher.igc.apc.org
Port=70
Admin=Gopher Admin +1 (415) 322-9069 <postmaster@igc.apc.org>
ModDate=Sat Jan21 23:25:08 1995 <19950121232508>
<URL:gopher://gopher.igc.apc.org:70/11/orgs/ceppc/ceppc_data>

Size	Language	Document Type
.0k	English (USA)	application/gopher-menu
.0k	English (USA)	application/gopher+ -menu
.0k	English (USA)	text/html

Or use:

<gopher://gopher.igc.apc.org:70/11/orgs/ceppc> as the URL to open from Mosaic to view the CEPPC Gopher.

Suggestions for Working with Volunteers

Prepared by members of the Working Group on Volunteerism

The CalEPPC working group members contributing to this article were: Jack Beigle (CNPS, SLO Chapter); Jo Kitz (Mountains Restoration Trust); Ken Moore (Semovirens Fund); Cece Sellgren (Channel Islands National Park); and Laura Stein (Catalina Island Conservancy).

Volunteers are a very vital part of most exotic plant control projects. The following suggestions are to provide information and ideas that will increase the involvement of volunteers in your group's exotic plant control projects.

PLANNING

Assign a person the specific task of coordinating volunteers for your projects.

Can this project be accomplished with one outing or is this going to take a series of outings? More can be accomplished with a series. Trained volunteers that return on subsequent outings are more efficient and can train and supervise others. A regular series can build a dedicated, trained, efficient, hard-working crew that works longer without burnout than a single day crew.

Plan a work project about two months in advance to provide time to get your announcement in various newsletters and newspapers. Plan the event to be educational and enjoyable as well as to get the work done. A couple of hours of work, followed by a picnic lunch and a field trip that shows the beauty and importance of the area that is being improved by this workday, mixes fun with the work. This helps to recruit future volunteers and doesn't burn them out on the first day.

Clear the event with the agency that manages the property you will be working on. Work with the ecologist or ranger in charge. Ask if there are any special requirements for volunteer groups. State Parks and some other agencies consider volunteers as unpaid employees and require volunteers to sign worker's compensation and volunteer forms. Other agencies require volunteers to sign a release of liability form prior to the start of the work. They are concerned about providing liability coverage in case of an accident. This is also for your protection. Non-profit organizations without paid employees are not required to provide worker's compensation insurance for volunteers.

If your outing requires the use of herbicides, notify the agency that manages the property and comply with the state and local requirements for trained and licensed people to apply or oversee the application.

SOURCES

Develop various sources for volunteers in your area. Contact local special interest groups. Try to find groups that have an interest in your project, such as the native plant society; garden clubs; botanic societies; etc. Branch out.

Contact the local Chamber of Commerce and request a list of local organizations: Elks, Moose, American Legion, Sierra Club, Audubon, church groups, etc., but don't limit yourself to these groups.

Contact the group president and ask for suggestions on the best way to work with his or her group. You want to fit in with their activities and not compete. After incorporating the president's suggestions, submit a short article to the president and request that it be forwarded to the newsletter editor inviting the group's members to attend your work party. They usually want material the first week of the month prior to the month of publication.

Other sources that can be productive are: local businesses that may want to improve their public image; boy scouts and girl scouts; high school service clubs; ecology clubs or outing clubs; college sororities and fraternities; college agricultural and horticultural departments; and camping and outing clubs. These young people will be the future leaders that will be leading work parties after we are all gone. Train them well!!

PUBLICITY

In your press release, make the outing sound like fun! Call it an "outing." A "work party" doesn't get as many people as an "outing." Give adequate information. What will volunteers do? When (date and time). Where to meet? What volunteers should bring (i.e., old clothes, hat, gloves, tools, sunscreen, lunch and lots of water). Also indicate when the event will end.

Make a list of local newspapers, radio and TV stations and cable companies that give free public service announcements. Call first and ask how much advance notice they require and get any special instructions. Most want the material concise, typed, double spaced, and in upper and lower case (not all capital letters). Include a name and telephone number where people can get additional information. Make it easy for people to attend.

Shortly before the event, call the papers as a follow-up to your press release. Stress "photo opportunities," and then plan some action shots. The newspapers love action shots.

GENERAL TIPS

Start small. Don't pull out all the stops on your first outing. Avoid getting more people than you can use, or they won't come back. Provide group leaders to train and supervise the new volunteers. Most of the time, you will get less people

than you anticipate.

If you will be working in a public area, prepare a sign explaining what you are doing and why. This can build public support for your project and may get you some additional volunteers.

The day of the outing, personally welcome all of the volunteers. Provide a clipboard, a sign-in sheet, and a pen for people to print their name, address and telephone number. This is important information in case of an accident, but, more important, it is the start of a list of volunteers that you can call for your next outing. Keep and build this list. The volunteers should also sign any required insurance and/or release forms.

Start the outing with a short talk covering what you will be doing that day and how it will improve the environment. Tell volunteers where they will be going and when they will get back. Discuss the importance of safety when carrying and working with sharp tools in a group. State how to use the tools for this project. Discuss restroom facilities and any special rules or cautions for this area: herbicides, steep slopes, poison oak, snakes, etc. Remind volunteers to bring along their lunch and water. Suggest that when they carry in a tool, they should also be sure to carry it back out.

You should provide extra water as people will forget to bring water. If you have the budget, provide cookies, fresh fruit, or other sweets at your lunch break. It makes volunteers feel welcomed and appreciated.

Take a good first aid kit and know how to use it. Include TECNU soap (and the instructions which come with it) for avoiding poison oak rash. TECNU can be used before or after contact with poison oak. (It is available at most drug stores).

During and at the end of the outing, be lavish and genuine in your thanks. Volunteers who feel welcomed, appreciated and wanted are the most likely ones to return again. A personal note or a "thank you" call to particularly helpful volunteers adds a very nice touch.

Give credit to volunteers in your newsletter, and if they came from another organization, prepare a short article of thanks for their newsletter.

If you have a series of outings, you may want to set up a special newsletter just for your volunteers. It could show the monthly schedule, progress toward your goal, and give special recognition.

Keep records of volunteer hours by person. Consider special perks or awards for a defined number of hours volunteered - a pin, hat, T-shirt, special discounts on merchandise, an article in the local newspaper, or a complimentary invitation to a special event that involves no work. You may want to develop the feeling of a special group that gets to do things the general public is not able to do.

These are a few suggestions for working with volunteers. Be creative and pragmatic.

Marin Supervisors Establish Policy Against Non-Natives!

Quentin Griffith

Pampas Grass Working Group Chair

Marin County Supervisors presented native plant lovers (and other people who are concerned with protecting the natural environment) with the ideal Valentine gift; the establishment of a policy to discourage the import, sale, or cultivation of five widespread and invasive non-native plants: Pampas grass (*Cortaderia selloana*), Andean grass (*Cortaderia jubata*), French broom (*Genista monspessulana*), Scotch broom (*Cytisus scoparius*), gorse (*Ulex europaeus*), and blue gum eucalyptus (*Eucalyptus globulus*).

Pampas grass and broom have invaded more and more natural landscapes in recent years, and not only on Marin's parklands where they threaten the survival of our native vegetation. They obstruct the growth of desirable plants on timber, agricultural land, and residential properties. Yet both of these non-native species are available to the unsuspecting public through some retail outlets. A resolution alone won't abolish the weeds, but the volunteer pampas grass and broom eradicators now have official policy to help them enlighten the uninformed.

The resolution was requested by Supervisor Gary Giacomini on the recommendation of the Marin Chapter of the California Native Plant Society and the California Exotic Pest Plant Council, with the support of 20 Marin nurseries which were contacted, as well as the Marin District State Parks, Marin Conservation League, Environmental Action Committee of West Marin, Tomales Bay Association, and Inverness Association.

In addition to the recommendations directed toward individual gardeners and businesses, the resolution urges the Public Works Department (which has been helpful to volunteer groups in hauling away the "slash" from working parties) to pursue the removal of these weeds along county right-of-way.

The Planning Department is encouraged to include in guidelines for subdivision development (both commercial and residential) and coastal permits the obligation to remove and to maintain the area free of existing exotic species plants, and the prohibition against their future use in landscaping.

The Marin County Agricultural Commissioner has indicated a willingness to serve as an information center, once control/eradication methods have been provided to him.

For more information, contact Quentin Griffiths, Box 766, Inverness, CA 94937, 510.235.6501 or Katie Martin, CNPS, 63 Durham Road, San Anselmo, CA 94960, 415.454.7985.

1995 CalEPPC Membership Form

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Join CalEPPC Today!

If you would like to join CalEPPC, please remit your calendar year 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 meeting, 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!

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Lepidium latifolium L. - The massed flowers illustrate the origin of the common name, tall whitetop.

Photo by Jim Young

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.

Newsletter Submissions

Letters to the Editor, notices, articles of all types, volunteer workday schedules, photographs and line drawings are welcome and may be submitted directly to the editor at the address below. We invite you to utilize *CalEPPC NEWS* as a forum for describing your project, asking for help, or bringing new issues or developments to the forefront. Electronic submission is gratefully accepted in PC-formatted 3.5" or 5.25" disks for WordPerfect or Microsoft Word, or ASCII text files. Please enclose a letter quality hard copy with your disk. Copy for the Spring 1995 issue is due with the editor by April 15, 1995.

Proceedings of *Arundo donax* Workshop

are now available for purchase. Please send a check or money order for \$15.00 for each copy, payable to Riverside County Park District. Mail to Paul Frandsen, P.O. Box 3507, Riverside, CA 92519-3507.

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Weed Coordinator Task Force	John Randall, 916.684.6821

Vice president's Message

What's New

BY ANN HOWALD, VICE PRESIDENT

As we enter a new year, I want to welcome our new members and say thank you to **all** our members for supporting CalEPPC. Everyone on CalEPPC's board appreciates what each of you has contributed to our common goal of protecting California's magnificent wildlands from exotic pest plants.

First things first: You might be curious to know why this message is coming to you from your vice president, instead of from CalEPPC's new president, Carla Bossard. Although Carla is now on the mend, she was injured in a fall on the last day of a course she was teaching in Sumatra on tropical forest ecology. She underwent back surgery in mid-February and has begun a rehabilitation program. Her spirits are high and she is looking forward to assuming her duties as CalEPPC president as soon as she is able.

On February 18, 1995, CalEPPC member George Molnar hosted back-to-back meetings on two different, but related topics. Biocontrol of wildland weeds was discussed in the morning, followed by a discussion of the possibilities for cooperation between all of the state and regional EPPCs (California, Florida, Tennessee and the Pacific Northwest). The biocontrol discussion centered on developing a strategy for California and the Pacific Northwest to maintain adequate funding for biocontrol research and application. The need for such a strategy arises because President Clinton's proposed budget includes severe reductions in the USDA's biocontrol program which includes eliminating the Biocontrol of Weeds Lab in Albany, CA which has focused on star-thistle control in California and other western states. Dr. Ernest Delfosse, Director, USDA/APHIS, National Biological Control Institute, who attended the meeting, noted that federal support for biocontrol has been eroding since the 1960s in spite of major successes like the control of tansy ragwort (*Senecio jacobaea*). A decision was made to prepare an information packet for individuals and groups who want to request support for biocontrol from their legislators.

The discussion on how state and regional EPPCs could cooperate was viewed as preliminary, to be discussed at a later date, after input from our membership. Participants began by developing a set of goals and possible national actions that would be reviewed and commented upon by other state and regional EPPCs. One option has been presented to the CalEPPC board by Bob Doren, a founder of Florida EPPC; that of forming a new organization, a national EPPC, to promote national issues such as increased funding for research and control, new federal legislation, and development of educational materials. A formal national organization would require significant commitments of time and resources. A second option is for state and regional EPPCs to maintain close communication and cooperate informally on important issues, perhaps including an annual meeting with a few designated representatives to exchange viewpoints and discuss issues of national significance. CalEPPC's board wants to know what you think. Please send your comments about national cooperation to me or any other board member, or give one of us a call. (We're listed on page 2).

Looking ahead, our fourth annual meeting, CalEPPC Symposium '95, will be held the weekend of October 6-8 at the Asilomar Conference Center in Pacific Grove on the Monterey Peninsula. The program committee is planning an exciting array of speakers who will focus on wetland and riparian exotic weeds, the role of fire in weed ecology, and concurrent sessions on individual exotic weed species. The Asilomar Conference Center's rustic buildings, some of which were designed by famed architect Julia Morgan, are set in a native Monterey pine forest adjacent to restored coastal dunes that once were nearly overwhelmed by iceplant. Please mark your calendar and join us for another provocative and enlightening symposium! Registration materials will be mailed mid-spring.

Lepidium latifolium L. in California

BY JAMES A. YOUNG and CHARLES TURNER

Range Scientist and Botanist, USDA Agricultural Research Service
Reno, NV and Albany, CA

Perennial pepperweed (*Lepidium latifolium* L.) is a serious perennial weed that has been accidentally introduced to wetlands and riparian areas in California. It is a threat to the ecology of such areas because it is such a competitive species that it forms nearly mono-specific communities that greatly impact species diversity. The tangled, semi-woody aerial portion of this weed persist for several seasons, physically changing the nature of the infested area for such uses as waterfowl nesting habitat. The weed is a major threat to irrigated agriculture.

It is unfortunate that this weed is widely known by the common name, tall whitetop as another noxious weed member of the mustard family, *Cardaria draba* (L.) Desv., is recognized as whitetop. Because both species produce masses of white, mustard-like flowers, it is obvious where the similar names were derived. The Weed Science Society of America uses the common name perennial pepperweed for *Lepidium latifolium*, and hoarycress for *Cardaria draba*, but common usage is much too widespread to avoid confusion with the names. Adding to the confusion is the very diverse nature of whitetop, or hoarycress, where several distinct subspecies are recognized.



Key causal identification characteristics are: 1) dense colonies of leafy stemmed plants occurring in circles from 3 to 6 feet in diameter; 2) massed leafy stems commonly from 2 to 3 feet in height, but occasionally to 6 feet; 3) masses of white mustard-like flowers; 4) masses of small, ovate, russet seed pods; and 5) masses of light tan stalks that weather a light gray, over-wintering into the next season.

Botanically, perennial pepperweed is distinguished by the upper cauline leaves not clasping the stem, the stigma exceeding the flower in length, erect stems, lack of tip on the fruit, white flower color, and the presence of vigorous rhizomes. Even botanical keys often refer to the occurrence of the weed in colonies. As with many successful weeds, perennial pepperweed is a phenotypically plastic species that, at least initially, appears as scattered diminutive leafy stems in meadows.

Habitat

Perennial pepperweed is very well adapted to soils with accumulations of soluble salts. It is not restricted to salty soils, and it has become established from coastal marshes to inland desert sinks. It does not survive prolonged flooding during the growing season, but can completely dominate wetlands, from the edge of standing water to quite dry upland areas. It is an occasional roadside species under very arid conditions.



Description

California has about 15 native and 5 exotic species of *Lepidium*. Perennial pepperweed is a robust perennial that often occurs in massed colonies once it is well established.

Records of the California Department of Food and Agriculture indicate perennial pepperweed has been reported from all counties except Del Norte, Humboldt, and Imperial. It occurs in all western states except Arizona. In his classical paper on alien plants in California, Robbins suggested the weed was first introduced to Yolo County as an accidental contaminant of sugar beet seeds.

Control Measures

Perennial pepperweed is a very difficult species to suppress because of: 1) the nature of the habitats where it occurs; 2) the resistance of the species to herbicide applications; and 3) most importantly, the occurrence of creeping root stocks. Mechanical control measures often end in disaster because even very small root segments will produce vigorous new plants.

The Agricultural Research Service, USDA, is investigating the feasibility of mounting a biological control program for this pest. Both the Agricultural Research Service, USDA, and the Fish and Wildlife Service, USDI, have active research programs under way in cooperation with a broad spectrum of individuals and agencies interested in suppressing this pest. Funding for research programs for biological control and biological suppression technologies for exotic perennial weeds of wildlands is extremely limited. If you think it should be given a higher priority, contact Dr. Robert Reginato, Area Director, USDA, Agricultural Research Service, Pacific West Area, 800 Buchanan Street, Albany, CA 94710.

Sanitation

Perennial pepperweed still has a rather restricted distribution in California. The best control of this pest is to avoid infestation. Make sure seed sources are free of the pest, especially seeds of native plants from wetlands. Mechanical earth movers, especially track-laying equipment, are suspected as a major cause of spread of this weed. Clean soil from such equipment before it is transported.

VOLUNTEERS WANTED!!

Regional representatives are needed to serve on the CalEPPCNEWS Committee. The board is looking to the committee members to solicit articles on exotic pest plants or other items for publication (e.g., announcements, meetings, volunteer workdays, etc.), and to assist the editor in any manner deemed appropriate, including the willingness to assume the duties of guest editor on occasion.

Please write or call the editor, Sally Davis at P.O. Box 1045, Cambria, CA 93428, 805.927.7187.

A New Invasive?

BY MICHAEL O'BRIEN

L.A. City Planning Department

Since early 1993, I have watched some mysterious seedlings growing in the cracks of the stonework at the L.A. County Music Center. Although they looked like what I feared they were, only three occurrences do not a new trend make. Imagine my surprise, then, when I recently discovered a new seedling growing in the mortar joints of the granite facing on City Hall. No question then - I knew what it was. As if I needed further evidence, I later found a dozen seedlings growing in a recently renovated planting area a block away. The culprit? *Ficus rubiginosa* var. *australis*, known in the trade as "Ficus Florida."

Upon further exploration - imagine someone in a suit rummaging through planting areas in downtown L.A. - I came upon a vigorous colony of some five dozen seedlings of *Ficus microcarpa nitida* (complete with thrips), called *Ficus nitida* or sometimes *Ficus retusa* in the trade. You know this one as the ubiquitous street tree everywhere frost is not a problem.

Evidently, the wasp pollinator(s) of at least some species of *Ficus* arrived in the L.A. area, probably sometime in 1992. To date, I am familiar only with fig seedlings in the L.A. Civic Center area, although there is an unconfirmed report of a seedling in Pacific Palisades. And, so far, only these two taxa appear to be fertile, although we should watch out for *Ficus microcarpa*, *Ficus macrophylla*, *Ficus benjamina*, and *Ficus pumila*, the other four most common fig taxa in the L.A. area.

Checking with the National Biological Survey, I found that in Florida, both *Ficus microcarpa* and *Ficus benjamina* have recently become feral. There are not yet any reports of seedling figs from other states. In L.A., these fig seeds evidently need fairly constant moisture to germinate. The walls with seedlings stay damp most of the year, and the in-ground seedlings appear only in recently renovated, and hence, well-irrigated landscapes. Thus, arid Southern California should, on the whole, have no fear of being overrun with stranglers.

However, we should keep a watchful eye on our riparian areas. Although of small extent, they are of great importance to the native biota. Since the small figs are eaten and carried by birds, even areas far from exotic vegetation may not be safe from the genus *Ficus*.

For more information, or to report suspected fig seedlings, contact Michael O'Brien at 213.485.3864.

Yellow Bush Lupine

BY LINDA MILLER

Restoration Manager, TNC Lanphere-Christensen Dunes Preserve

(Reprinted from *Dunesberry: Friends of the Dunes*, Vol XIII No. 4, Winter 1994)

Yellow bush lupine (*Lupinus arboreus*), also known as bush lupine or tree lupine, is a big, beautiful shrub with fragrant yellow flowers. This lovely plant from the legume family also happens to be one of the greatest threats to native dune plants in Humboldt County. Although lupine is native to California, probably from the Sacramento River and Bay Area south, it is not native to Humboldt County.

Lupine was introduced to the North Spit in 1908 to stabilize shifting sands and to protect the fog signal station (near the present Coast Guard Station) from sand burial and damage. Seeds were collected from the Presidio in San Francisco and planted near the signal station.

In 1917, the U.S. Army Corps of Engineers were repairing the jetty, hauling rocks by train from a quarry in Trinidad. Five women were hired by the Corps to spread lupine seed along the railway to stabilize the sand and keep it from covering the tracks. By that year, lupine plants were well established at the fog signal station where the women collected seeds.

Lupine was subsequently planted at Clam Beach to stabilize the sand dunes, and has since spread aggressively throughout the sand dunes of Humboldt County. Based on historical aerial photographs, the extent of lupine on the North Spit was estimated to be 244 acres in 1939, which increased to 531 acres by 1984. This represents a rate of spread of 6.4 acres per year. Recent aerial photographs of unrestored North Spit dunes indicate that there was a significant increase in bush lupine between 1988 and 1994.

What makes lupine such a successful invader and undesirable plant on the dunes of Humboldt Bay? Lupine is very well adapted to the harsh dune environment. The large shrub possesses a stout tap root which reaches down deep to obtain moisture in an otherwise dry environment. The roots have nodules which house nitrogen-fixing bacteria. These bacteria convert unusable atmospheric nitrogen to a form which is usable by the plant. This symbiotic relationship between bacteria and plant gives the lupine a significant advantage over many native dune plants which are otherwise adapted to low nitrogen levels.

Once lupine become established on the dunes, it changes the environment to one which is more hospitable to other plants - including other non-natives. This large shrub creates a new microclimate by providing shade and moisture in an otherwise exposed, arid environment. Studies conducted by

the Menzies' Wallflower Research Program have shown that other invaders, including exotic annual grasses and forbs (edible plants that are not grasses), encouraged by this new lupine "microclimate" are responsible for subsequent changes in soil chemistry. These annual grasses and forbs are often found growing at the base of well-established lupines, adding organic matter to the soil through decaying fibrous roots. The nitrate level is elevated in the soil due to accumulated duff and invading herbaceous plants. Ammonium salts are more likely to be present because of nitrogen-fixing bacteria on the mature lupine roots.

This new environment may be agreeable to weedy native plants and invasive non-natives, but the altered situation makes it difficult for many native dune plants to survive because of increased competition for resources. A great deal of native dune mat has been lost to this invasive lupine dune community, threatening the survival of endangered plants which depend on the dune mat for habitat. A study conducted by a local botanist in 1985 established that populations of Humboldt Bay wallflower (*Erysimum menziesii* ssp. *eurekaense*) declined as a result of lupine encroachment. The wallflower, as well as beach layia (*Layia carnosa*), are federally listed as endangered species.

Restoration techniques for lupine-degraded dunes differ according to the level of invasion. These techniques were developed by The Nature Conservancy (TNC) under the Menzies' Wallflower Research Program. On dunes where lupine has recently invaded, removal of seedlings is adequate to restore the native dune mat as long as other invasive plants are not present. In areas where lupine has become established, and other invasive grasses and forbs are present, removal of mature bush lupine should be supplemented with removal of the duff layer, existing grasses and non-native forbs.

At the Lanphere-Christensen Dunes Preserve, lupines have been removed for 20 years on an annual basis at the Lupine Bash by loyal Friends of the Preserve and California Native Plant Society volunteers. Both volunteers and the Sheriff's Work Alternative Program (SWAP) participants have been removing lupine from Manila Beach and Lanphere-Christensen Dunes Preserve annually since 1992.

The duff removal treatment was conducted on an experimental scale in the Fall of 1994 through a cost-share agreement between The Nature Conservancy and the Bureau of Land Management (BLM). This technique was applied at the BLM Endangered Plant Protection Area at the Samoa Dunes National Recreation Area.

Lupine Removal by Heavy Equipment

BY KAREN THEISS

Karen Theiss and Associates, McKinleyville, CA

(Reprinted from *Dunesberry: Friends of the Dunes*, Vol XIII No. 4, Winter 1994)

Yellow bush lupine (*Lupinus arboreus*), an aggressive, introduced species, has invaded much of the north coastal dunes, outcompeting native dune mat species. Lupine has stabilized some areas so thoroughly that they no longer provide suitable habitat for native species.

Labor-intensive manual removal has been the primary management technique used to control bush lupine. In 1990, a project was initiated to determine whether heavy equipment could provide a more cost-effective alternative in heavily infested areas. The project compared different methods of removal, ease of access and operation, labor requirements, debris generation, and debris handling.

The secondary goal was to monitor the recruitment of lupine, as well as native and exotic plants, in subplots within each treatment plot. The experiment was undertaken at the 80-acre Eureka Dunes Protected Area owned by the City of Eureka and managed by The Nature Conservancy (TNC).

Funding was provided by a The Nature Conservancy and a Federal Coastal Resources Energy Assistance Grant to the Natural Resources Division of the Humboldt County Department of Public Works.

Seven test plots were set up in the westerly portion of the Eureka Dunes Protected Area. Baseline data was gathered before lupine removal. The test plots were subjected to the following treatments:

- Removal of vegetation by brush rake attached to a crawler;
- Removal of vegetation by brush rake attached to a crawler, and subsequent removal of the duff layer by plough blade or bucket;
- Removal of only lupine by chokers attached to a bucket on a rubber-tired loader;
- Control plots

Two different brush rakes were tested. Three-inch tine spacing was more effective than seven-inch tine spacing because shrubs of differing sizes could be removed simultaneously. A plough blade was more efficient in the removal and sidecasting of the duff layer than was a bucket.

Removal of lupine by the use of chokers was the most time-consuming method tested, and was least disruptive to the substrate. The crawler was more maneuverable than the loader for all clearing operations other than choker pull; both pieces of equipment were **very disruptive** to the substrate because of the number of passes required to remove vegetation.

Following treatment, each test plot was subdivided into 18 subplots for the purpose of monitoring plant recruitment.

One-third of the subplots received no secondary treatment (control), one-third were covered with weed mat for one year following equipment treatment, and one-third were covered with weed mat for two years following equipment treatment. Monitoring of vegetation was conducted semi-annually from 1990 through 1993. No further weeding was conducted on any of the subplots.

Use of the seven-inch tine brush rake followed by duff removal with a plough blade had the lowest lupine recruitment following treatment, while the choker pull had the highest lupine recruitment. The use of weed mat following treatment was very effective in suppressing lupine establishment in all treatment plots. The brush rake and plough blade treatment showed very low lupine recruitment, regardless of secondary treatment. Monitoring data indicate that the brush rake and plough blade treatment has the highest potential for natural colonization by native dune mat species.

The establishment of native and exotic species was quite variable among the treatment plots, and in some cases was influenced by neighboring invasive vegetation, specifically dune tansy (*Tanacetum camphoratum*) and iceplant (*Carpobrotus edulis*).

The results of this study demonstrate that restoration of lupine-dominated coastal dunes can be efficiently and economically accomplished by the use of heavy equipment. Equipment should only be used in heavily infested areas due to the amount of disturbance to vegetation. The combined use of a closely-spaced brush rake followed by removal of the top six inches of duff/seed bank with a plough blade is effective in dramatically reducing lupine recruitment and in providing a suitable habitat for colonization of native mat species.

Colonization potential would be enhanced by weeding of invasive and/or undesirable species during the first year or two after treatment. Education of all personnel involved as to the goals of the restoration project is critical to its success.

Yellow bush lupine (*Lupinus arboreus*)
Member of the Legume Family (Fabaceae)
Native Range - Sonoma County to Ventura
County, naturalized further; Habitat - dunes,
coastal bluffs, and scrub lands; Height - 2 to
9 feet; Flowers - March to June, yellow,
sweet smelling, pea flowers

Musings of a Seed Sack Reader

BY DENNIS ISAACSON

Field Operations Manager for the Commodity Inspection Division, Oregon Dept. of Agriculture
(Reprinted from Summer 1994 *PNW-EPPC Newsletter*)

Exotic pest plant species are unintentionally spread in many ways, but one of the most common means of their introduction into new areas is as contaminants in seed. If we want to insure that when we buy and use seed we're not providing exotics an avenue into new areas, we need to insure that the seed we use is of high quality, free of unwanted hitchhiking species.

So what can we do to prevent our use of seed being the source of unwanted species? What are some of the keys to getting good seed that meets our needs? There aren't any quick and simple answers to questions like these, but there are a few guidelines which could help. Among these are:

- Any seed used should be tested for quality
- Familiarity with some fundamental elements of state and federal laws covering sales of seed is helpful (if not fun!)
- **Purchase in advance**, if possible
- Be very careful when buying **small quantities or uncommon types of seed**.

Seed Quality

There are two primary determinants of seed quality: **purity** and **germination**. Tests for each of these quality factors are routinely conducted. With exotic pest plant species, we are concerned mainly with **purity**. There is a lot of stuff in any seed lot that is not the seed of the species being tested. Chaff, dirt, and smut balls are examples of materials called "inert matter." Seed of "other crops" may be found in test samples, as might "weed seed." Each of these categories are calculated as percentages of the lot and are reported on a label attached to each container (usually bags). There are special requirements related to weed seed, and noxious weed seeds must be identified. There are two points about tests for quality that potential buyers should keep in mind: 1) **testing must be done to provide information included on labels, and labels are to be attached to each container**; and 2) **it is not unreasonable to require testing prior to use of the seed**.

Depending upon where the seed under consideration for use has been produced, a purchaser might be wise to request a (purity) test specifying "All States Noxious Weed." Seed technologists then sort test samples looking for, and identifying, any species of weed on noxious weed seed lists of any of the states in the U.S.

Bottom Line: The main aspect of seed quality we're

concerned with in making sure that we don't bring in unwanted invaders is purity, and we read the label and request tests if we are concerned about the origin of the seed.

A practical **purity** example: this past year there was an abundance of foreign-grown wheatgrass seed on the market. This seed sold at a discount of about 20% off the price of domestically-produced wheatgrass. Some very ugly weeds grow in the countries where this seed was produced, and requesting a test for such a lot **would not only be reasonable, but necessary**.

Laws

If there were but one thing to know about state and federal seed laws, it would be that each container of seed shall bear a label that has a lot of information on it. Of course, as with any law or regulation, there are lots of caveats, whereases, and exceptions, but as a general rule, your seed is supposed to have a label on it (even if it is lawn mix from K-Mart!). The information on the label can make you an informed purchaser of seed. The label will indicate the kind and variety of seed in the container; where it was grown; what is its identifying lot number; the percentage by weight of other crop seed, inert matter, and weed seed; the **kind and number per pound of noxious weed seed**; the germination percentage; name and address of the seller; ..and so on. You get the idea. **If there is no label, don't accept the seed.**

Bottom Line: Lots of us read the labels on grocery food items. There is no reason we shouldn't do so on seed sacks, too.

Purchase in Advance

If I'm going to re-seed my lawn, I'll probably wait until the last minute to head off to my favorite discount retailer to get the seed I want. Since I live in the Willamette Valley, there's a very good chance that what I buy will have been produced in my backyard, so to speak, because the Willamette Valley is where most of the lawn seed sold in this area originates. The species of exotic pest plants that might be in the container(s) I buy probably are not going to be much different from those that are already in my yard.

This is not necessarily so if I'm to seed a roadside, a burn, a rehabilitation project, or an erosion control project.

In these situations, I will be shopping for non-lawn varieties that are not produced anywhere near where they are to be used. I might be offered seed from Israel, Canada, Montana, or Argentina. If I'm to buy something from someplace that might be likened to weed heaven, I want to have time to test the seed before I use it. And I want to have time to return the seed, and purchase and test another lot in case what I received the first time doesn't meet my expectations. I can't do this unless I **purchase in advance**.

Small Quantities and Uncommon Types

Seed is purchased from dealers who make a living selling lots of seed (pun intended). Seed lots are big - some as large as 55,000 pounds. Dealers don't make a living on two-bag sales. Two-bag buyers tend not to form lasting relationships with their dealers. Customer service and customer loyalty just don't figure into this picture. There may not be much one can do about this, but it does seem as if pooling purchases with other units could be considered. If you know of other seed users, it would be wise to try to pool purchases. You may be able to find a better price, and the service on a larger order shouldn't be any worse than what you'd expect on a small order.

Uncommon types of seed can have a greater potential to be a source of unwanted plant pest introductions than common ones. A broker/dealer may have to shop around a long time to find a source of uncommon seed types, and finding a source can become secondary to concerns about quality. As an example, suppose for some reason we specify that we want to buy certified Agram Chewings fescue for a seeding job. In 1993, there was no reported certified production for Agram in the U.S. As a dealer, then, I would start looking for Agram of any year of production, and production from anywhere. By specifying Agram Chewings fescue, I could be putting a dealer through a lot of work finding inferior production just to fill my order - and finding it might be more important than its quality. While Agram may have desirable characteristics, there are more than 30 available varieties of Chewings fescue, and it may be best to specify options for several varieties.

Read the Seed Sacks

Naive buyers, in a big hurry to buy small amounts of seed, could be considered as potential dispersal agents for exotic pest plant species. Knowing about seed quality and seed laws, arranging purchases well in advance, and buying in larger amounts are some of the things we can do to reduce the chances of introducing unwanted invaders.

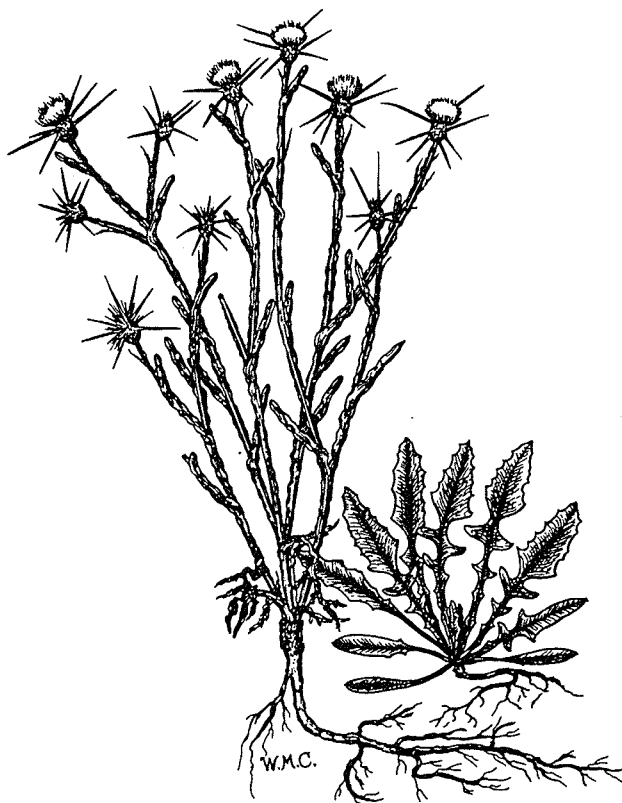


A New and Timely Publication from the BLM: *Noxious Weed Strategy for Oregon/Washington*

The Bureau of Land Management in Oregon and Washington has released a *Noxious Weed Strategy for Oregon/Washington* which provides direction and a framework for implementing a noxious weed management program. The strategy explains the scope and resource impacts of noxious weeds and proposes a course of action to deal with the situation on BLM administered lands in Oregon and Washington.

The purpose of the strategy is to facilitate restoration and maintenance of desirable plant communities and healthy ecosystems. Several goals and recommendations are presented to conduct an effective integrated noxious weed management program.

Individuals who would like to receive a copy of the document may write Bob Bolton, USDI Bureau of Land Management Lakeview Office, P.O. Box 151, Lakeview, OR 97630, or you may call him at 503.947.6161.



Effects of *Arundo donax* on Water Resources

BY MARK E. IVERSON

City of Riverside Water Reclamation Plant
(Reprinted from *Arundo donax Proceedings*, November 1993)

Standing on the banks above the Santa Ana River, looking across a sea of *Arundo donax*, it is easy to understand how arundo effects the riparian habitat of the river. The thick, high-growing cane chokes out all other plant life. The growth is so dense that neither man nor small animal can pass through. And anyone who has seen television coverage, or witnessed first-hand burning of arundo understands the danger it presents to people and animals who live near the river. But what is not as easy to understand is how arundo effects water resources.

Every year, arundo growing along the Santa Ana River evaporates an estimated 56,200 acre-feet of water - 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.

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. You can visit almost any stream or river in southern or northern California and find arundo growing in abundance. This is particularly true along the Santa Ana River.

Not only does arundo out compete native plants, it uses about three times as much water as they do. There are no specific studies on the evapotranspiration rates of arundo. Horticulture experts, however, estimate arundo evaporates water at approximately the same rate as rice. This means that every acre of arundo uses 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 the other streams and rivers in Southern California, are natural groundwater recharge basins. Water in the rivers migrate down through the river beds and into the groundwater aquifers. 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 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 acre per year, a total of 56,200 acre-feet of water per year 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 available for drinking water supplies.

Effects on the Quality of Water Resources

Being a giant reed grass, arundo provides little shade along the banks of the river. Native vegetation normally overhangs the river, providing shade that keeps the temperature of the water down. Arundo provides no significant amount of shade; 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 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. The increase in algae growth also reduces the clarity of the water. Arundo therefore degrades the quality of water resources as well as the quantity.

While it is easy to attach a dollar amount to show the effects of arundo on the **quantity** of water resources, it is more difficult to do so for how it effects the **quality** of water resources. 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.

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 those who don't visit the river are also 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 arundo is therefore important from the standpoint of both the quality and quantity of water resources.



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Our membership continues to grow!
CalEPPC warmly welcomes the following people who joined November through February:

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If you would like to join CalEPPC, please remit your calendar year 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 meeting, 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!

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Upcoming Meetings

- **MARCH 9, 1995, SACRAMENTO, CA**

California Biological Pest Control Conference will be held Thursday, March 9, 1995 at the Beverly Garland Hotel, 1780 Tribute Road, Sacramento, CA. For information please call: Anna Anderson or Dave Wilson at 916.741.7500.

- **MARCH 13-16, 1995, SACRAMENTO, CA**

The Western Society of Weed Science (WSWS) will be held at the Red Lion Inn, Sacramento, CA. For information, contact Wanda Graves, 510.790.1252

- **MARCH 16-17, 1995, SACRAMENTO, CA**

The Western Aquatic Plant Management Society will meet at the Red Lion Inn, Sacramento. Contact Nate Dechoretz at 916.654.0768 for more information.

- **APRIL 17-21, 1995 (EARTH WEEK), PORTLAND, OR**

Eighth Conference on Research and Resource Management in Parks and on Public Lands will be held in Portland, Oregon.. This premier interdisciplinary conference on protected lands will focus on the theme, *Sustainable Society and Protected Areas, Challenges and Issues for the Perpetuation of Cultural and Natural Resources*. To register, contact The George Wright Society at P.O. Box 65, Hancock MI 49930-0065, FAX 906.487.9405.

- **APRIL 24-27, 1995, BOZEMAN, MT**

The Western Society of Weed Science will hold its *Noxious Weed Management Short Course* in Bozemen, Montana. Please contact Celestine Duncan, 406.443.1469. The course will cover weed identification, biological control methods, herbicides, computer use in weed science, noxious weed management on range and pasture, weed inventories and planning, safe handling of pesticides, and use of application equipment.

- **OCTOBER 6-8, 1995, PACIFIC GROVE, CA**

Reserve Columbus Day weekend for CalEPPCs annual conference. By popular demand, the California Exotic Pest Plant Council will hold *CalEPPC Symposium '95* at the Asilomar Conference Center in Pacific Grove, California. Registration material will be mailed in May.

California Exotic Pest Plant Council

CalEPPCNEWS

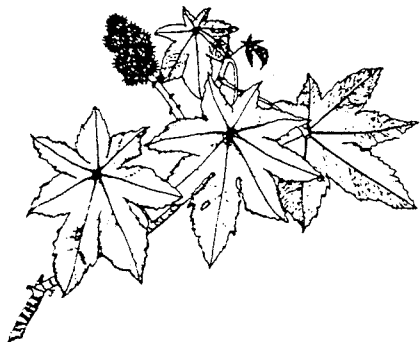
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