1995 Calendar Year Dues

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CalEPPC NEWS
NEWSLETTER OF THE CALIFORNIA EXOTIC PEST PLANT COUNCIL
VOLUME 2 • NUMBER 3
SUMMER 94

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A California Department of Fish and Game employee shows an uprooted specimen of perennial pepperweed (Lepidium latifolium) at Grizzly Island Wildlife Area, Solano County. 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 weekly 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 Fall 1994 issue is due with the editor by October 15, 1994.

Publication on Exotics

California Plant Pest & Disease Report (Agricultural Pests or Potential) Write: Editor, CPPDR, State of California Dept. of Food & Agriculture, Analysis & Identification Branch, 1220 N Street, Room 340, Sacramento, CA 95817-0001

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Our membership continues to grow!

CalEPPC warmly welcomes the following people who have joined in July and August:

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Marguerite DiGiorgio

Louise Lacey

Andrea Pickart

Jerry Asher

Peter Forster

Karen Leon

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Upcoming Meetings

- September 28 - October 1, 1994 Sacramento, California
  CalEPPC Symposium '94 to be held at the Hyatt Regency Sacramento at Capitol Park. Registration: contact Sally Davis, 805.927.0881. Posters: contact Mike Parker at (w) 510.792.0222 or (h) 510.795.6766.

- October 17 - 22 1994 West Palm Beach, Florida
  1994 Natural Areas Conference to be held at the Palm Beach Gardens Marriott. The 21st annual conference will be hosted by the South Florida Water Management District. For information, contact Bill Heffernich at 407.687.6637.

- October 28 1994 Davis, California
  TNC, NPS, and several agencies will sponsor California Conference on Ecosystem Management in late October. For exact dates and more information, contact David Diaz, 415.705.1891.
What YOU Can Do to Prevent Pampasgrass From Taking Over The Environment

BY QUENTIN GRIFFITHS
Pampasgrass Working Group Chair

Pampasgrass is rapidly invading every known natural habitat along the coast, crowding out native vegetation, and threatening to transform the landscape from Oregon to Southern California.

The weed alien, better called Jubitaka, or Andean Grass (Cortaderia jubata) becomes a huge plant, and can be recognized by its feathery, pinkish or creamy plumes, and its razor-sharp, drooping grassy leaves. Each clump produces millions of minute seeds that are readily scattered by the wind, by children, or by thoughtless adults. After the plumes go to seed, the plants become shabby, highly flammable, tangled masses.

The true Pampasgrass (C. selloana), has more recently demonstrated here and 'down-under' the same weedy characteristics. Its flower plumes remain white (except for color varieties) and are about the same height as its leaves, whereas Jubitaka's plumes extend well above the leaves.

WHAT TO DO as an individual or volunteer group.
(Wear gloves, long sleeves, and long pants.)

1. Young Plants: Dig or pull them out, using a small Pulaski tool (mattock) if needed.

2. Plumes: Cut them well down the stalk, BEFORE they open in mid-July, and carefully put them in a paper bag and burn them in the fireplace, or place in sturdy plastic bags, tied securely, to be taken to the landfill.

3. Established Clumps (after removing plumes):
   A. Chop the clumps with a Pulaski tool and flat sharpened shovel, making sure to get all of the crown and root-ball. Rootlets can remain. A large chainsaw or weed eater with a rotary blade makes disposing of big plants more manageable. Tie the leaves in bundles for composting or other disposal.

   OR

   B. Spray the leaves completely with glyphosate (Roundup®) at the rate of 3 or 4 ounces of the concentrate per gallon of water. More dilute forms, such as Kleen-Up® can be used on small infestations in at least two applications. Spray in May or June when the leaves still contain moisture, and before the seed heads emerge. If working near water, substitute the aquatic herbicide Rodeo®. READ THE LABEL PRECAUTIONS of all herbicides and use the recommended dosage. Roundup® can cause skin irritation, so don’t spray in windy weather, and promptly wash areas not protected by clothing. A sticker-spreader additive will economize and enhance Roundup’s effectiveness.

   OR

   C. A bulldozer or backhoe may be justified to remove a sizable infestation, if there is no threat of erosion.

If you need assistance, please contact: Quentin Griffiths, Box 766, Inverness, CA 94937, 415.660.7295
Perennial Pepperweed: A Threat to Wildland Areas
BY JOEL TRUMBO
Environmental Specialist, California Department of Fish and Game

At 84,000 acres, the Suisun Marsh is the largest, contiguous estuarine marsh in the United States. Formed where the Pacific Ocean tides meet the Sacramento and San Joaquin Rivers, the marsh is home to almost 250,000 million wintering waterfowl, tule elk, and dozens of other native plant and animal species. The endangered salt marsh harvest mouse relies on the marsh for survival. Pepperweed contributes to the destruction of the salt marsh habitat of the harvest mouse, forcing the mouse to seek more distant food sources. Pepperweed does not disperse in the same manner as the harvest mouse, therefore it is harder for it to find new areas of the marsh to live in.

This prolific flowering gives perennial pepperweed its common nickname "tail whitetop." There are several reasons why perennial pepperweed has proven to be such a difficult species to control. First, like other invasive exotics, it is a consummate opportunist. Many have tried to burn or cultivate the weed out of existence, but the pepperweed is able to regenerate itself. Second, it produces large amounts of seed and reproduces asexually. Cultivation brings its long-lived seed up into the soil’s germination zone. Additionally, cultivation causes a proliferation of sexual transplants. Pepperweed also appears to be allelopathic. Other plants that germinate nearby are killed by a substance exuded by the plant roots. Finally, its waxy leaf surface repels many herbicides formulated for it.

The rapid spread of perennial pepperweed poses a significant threat to wildland areas throughout the western United States. Its ability to tolerate a wide variety of environmental conditions has made pepperweed a serious problem in regions with moderate climates like Suisun Marsh, and in harsh weather areas like the Modoc Plateau. Outside of California, pepperweed has proven to be a formidable foe for ranchers and natural resource managers along the Humboldt and lower Truckee Rivers in western Nevada.

While pepperweed’s rapid spread in wildland areas is obvious to even casual observers, the weed’s most serious impacts are much less apparent. As the weed spreads, it changes the natural disturbance regime to the benefit of non-native and introduced plants that require little or no disturbance to germinate. Pepperweed has the ability to change the natural vegetation and create new habitats that can support non-native plant species.

Unfortunately, perennial pepperweed’s spread into agricultural and wildland areas has not been restricted to the Suisun Marsh. It has invaded tens of thousands of acres throughout the western United States. Where it grows, no other plant species can make a stand, and most wildlife species fail to thrive. Growing almost 3 feet high, the weed leaves behind tall woody stems; the remnants of last season’s rapacious growth. But it isn’t what’s above ground that holds the greatest threat: pepperweed’s deep tap roots develop large, extensive root systems from which the root system begins in late winter. When pepperweed comes into early summer, it is during this season that large areas are covered with the weed’s heavy growth of white flowers.

Tamarisk Advancing in Baja California
BY MIKE KELLY
Friends of Los Peñasquitos Canyon Preserve, San Diego

My friends and I love camping in Baja California, Mexico, and often visit remote areas. Having hiked tamarisk in San Diego and elsewhere, I’ve been watching for it on the San Diego River for the last few years. Even with the extensive efforts of the San Diego River Conservancy not to spoil the view, the tamarisk continues to spread.

This ubiquitous weed can also be found inland, particularly in the Laguna Salada area, southwest of Mexicali. This “salty lake” is very similar to California’s Salton Sea; both were formed by overflows from the Colorado River. Tamarisk is the most common plant in the Laguna Salada, not surprising since it is salt tolerant.

Since the Laguna stretches more than 60 miles south through the heart of the peninsula, it is probably the seed source for the spread of this invasive weed into both year-round and ephemeral streams cascading down from the Sierra de Juarez into the Laguna. These streams support a rich diversity of plant and animal life, much of which is endemic to Baja, in a series of palm canyons. Unfortunately, tamarisk is appearing in more and more of these canyons. In the fall of 1993, we found tamarisk in the high valleys of the Sierra de Juarez, 4,500 feet above the Laguna Salada, where it is just beginning to appear in these upper drainages. Of course, it can be expected to continue to spread in these relatively high elevations.

In the spring of 1994, we found tamarisk in the upper stream of the Sierra de Juarez, some 10 miles above the Laguna Salada. Tamarisk is one of the invasive species that the U.S. Department of Agriculture is attempting to eradicate from the United States. The U.S. Forest Service and the U.S. Fish and Wildlife Service are working to control tamarisk in Baja California to prevent it from spreading into the United States. The U.S. government is hoping to eradicate tamarisk in Baja California before it spreads into the United States.

Editor’s Note: I can collaborate Mike’s gloomy testimony on the advance of tamarisk and Arundo donax into Baja California. In April and May of this year, I noticed that the invasive exotic population is almost half way down the peninsula a distance of over 500 miles. The tamarisk is still relatively immature in the streambeds of Baja, 5-10 feet tall. I noticed in my 1994 Baja journal that “…travelling through the Santa Teresa Valley [at K10], the only vegetation in some of the streambeds appears to be tamarisk. Where willow and cottonwood grow, tamarisk is invading. In 10 years the stream will be choked solid with tamarisk. What a shame that this beautiful stream, with its stately sycamore (now declining), will be soon filled with exotic tamarisk.”

Proceedings of the Arundo donax Workshop, held November 1993, in Ontario, CA 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 5307, Riverside, CA 92519-3507.
damaging to an ecosystem, and would leave such a system impaired, vulnerable to attack.

WHAT CAN BE DONE

The OTA report and articles like this one are part of a daunting consciousness of the problems invasive species pose. One of the most important things to do, painful though it may be, is to increase awareness. This is because problems with NIS exist on so many levels, involve so many actors, and are typically quite effective in biological, ecological, and social realms. In addition, because of the general lack of awareness and the overwhelming number of species that blanket recommendations have little practical value. Quick understanding and a massive, widespread response offer what hope there is in working with invasive species.

This is not to say that legislative involvement is of no use. Governments at the federal, state, county, and local levels need explicit policies in regard to the movement, sale, and propagation of alien species. The policies that are already in place - screening of imports at borders, for instance - need to be tightened considerably. The OTA report acknowledges that although some laws are on the books, the gaps in the legal net are more impressive.

It is in tackling the actual problems of present-day invading species that the questions get truly prickly. The basic approach is to try to root out, hunt them down, kill them, and make sure they don't come back. This is not always possible, and realistic workers often aim at simple containment. But as anyone who's volunteered under the Inspiring Flag of Habitat restoration, you spend a lot of time killing things. It can feel a bit like biological racism, "This doesn't belong here. It should stay in its own place." When the physical work begins, the issues become even more poignant. Squads of hunters fanning out to erase a population of feral pigs (as has been done with great success of some of California's Channel Islands, for instance) pits the habitat people against the animal rights people. And pigs are one thing, but what about deer? Wild goats? Or cats?

In the plant realm, the questions are usually mostly practical - how to kill, rather than if. The use of herbicides triggered one of the hottest discussions of the 1993 CalEPPC symposium. Many of the participants - invasive plant people - only a few years ago, fought the herbicide industry tools and nail, on principle. Now, it's just not a question of whether people just want better, safer chemicals. Not a universally adopted solution by any means, herbicides still present what one participant called "a cure better than the disease."

Biological control of invasive species offers seductive prospects for cleaning up ecological messes, but it's also very tricky, usually involving the importation of another (potentially invasive) species. The testing and cross-checking that must be done before releasing one species to eradicate a second make the process time-consuming and expensive.

There are always the manual methods - pulling weeds and chopping trees. Teams form constantly around the country to rid an area of this or that invader. If the work is slow, it's still social and satisfying to participants, and ultimately quite effective. Of course, the agrochemical and ecological people, few legislative or technological efforts can succeed.

Although this piece has focused mostly on the US, and mostly on the consequences of invasive species for human problems, it has been seen from much broader perspectives. As invasive species move around the world, forcing less hardy natives to extinction, the world's gene pool is diminished. The full arguments for preserving biodiversity are outside the scope of this piece, and have already been made by several brilliant scientists, E O Wilson most notably. The point is that, with a reduced number of species, any system is more vulnerable to change - a climate change, for instance, or a change in the competition or atmosphere.

In grappling with invasive species, it's important to remember that the plants and animals have done nothing wrong; they're simply carrying out their biological imperatives, using humans and human folly to spread, as they have used other methods in the past. It is we humans who have meelized them most aggressively here, and as the plants and animals go silently to extinction, we must also face the drastic consequences.

Books:

NOTICE

The CalEPPC board is seeking to develop handouts on a series of species based on general ecology, possible control research projects, or other articles. We would like to publish these articles in the newsletter and copy them as handouts (i.e., gorse, Arundo, tamarisk, muskweeds, German ivy, weeds to purchase special equipment, etc.) The CalEPPC board requests volunteers to work on this issue.

already been attempted without success. Manual control methods generally only reduce the large affected area and pepperweed's rapid spread. Biological control options are presently nonexistent and the prospects for control using insect or disease organisms are doubtful. Perennial pepperweed belongs to the Cruciferae family which includes broccoli and cauliflower. Biological control organisms that would be effective on pepperweed may be just as happy living off of the weed's row crop cousins.

Chemical methods appeared to offer the greatest potential for an effective control program. Parameters were established in the early stages of the program. First, control, rather than eradication, would have to be the goal. Pepperweed's presence at the California Department of Fish and Game's Grizzly Island Wildlife Area located within the Suisun Marsh, was far too widespread to offer any real hope of total eradication. Additionally, the wildlife area is surrounded by a seemingly limitless seed source from nearby populations on prairie lands. The control program would have to focus on critical sites that needed to be protected (i.e. waterfowl nesting areas, or isolated patches within the pikeweed habitat of the salt marsh harvest mouse). Second, the herbicide products chosen would have to have minimal effect on non-target plants. Chemicals that would be used would have to be relatively non-persistent in the environment.

Herbicide trials have been conducted at the Grizzly Island Wildlife Area. Four commercial herbicide formulations: Garlon 3A® (triclopyr), Garlon 4® (triclopyr), Roundup® (glysophosate), and Telar® (chlorosaluron), were tested at the Grizzly Island facility during 1992 and 1993. All applications were made during the spring and summer.

While Roundup® provided modest control, the nonselective nature of the material created a bare ground situation that led to a vicious return of the pepperweed species. After that experience, it was quickly decided that a broad-spectrum compound would be a necessity. Using a selective compound would leave grass species, many of them natives, unharmed. This would provide some competition for the pepperweed after its inevitable post-treatment growth." Both of the Garlon® formulations provided good control. Broad-spectrum rates with minimal effects on grass species. Telar® (with a q/d 1/100 gallons non-toxic surfactant tank mix) provided excellent control with practically no effect on grass species. The Telar® plots were in a particularly thick growth of pepperweed. Thirteen months after treatment, the Telar® plots, even at the below-label rate of 0.25 oz/acre, were virtually free of pepperweed and were thick with beneficial grass species. The Grizzly Island plots were small squares surrounded by seemingly limitless source of reinfestation. While little doubt remains that Telar® kills pepperweed, the prospects for complete control at Grizzly Island, or at any other locations where this weed has taken over, are unknown. The treated plots will be expanded to 5 - 20 acres during 1994. Hopefully, the beneficial grasses will hold their own and prevent reinfestation.

The lesson to be learned from all of this should be apparent to all readers; the spread of perennial pepperweed is a serious threat to native vegetation and wildlife populations. Be on the lookout for this exotic invader and eradicate small populations before you've got "weehoe" anywhere you look.

Characteristics of Noxious Weeds: The Ultimate Biological Pollutant
Source: Univ. of CA

1. Native plant communities are often permanently changed.
2. Many wildlife species are adversely affected, both directly and indirectly.
3. Their appearance can be deceivingly attractive and desirable.
4. Only a few ounces of the pollutant can regenerate tons of itself in only months.
5. Their spread is predominately by almost invisible means; their seeds.
6. The pollutant is spread by wildlife, livestock, recreationalists, wind, water, vehicles, and other equipment.
7. The initial contamination and propagation are insidious, unnoticed by experts.
8. Increased erosion, increased fire hazard, and reduced water quality are a direct result of infestations.
10. The general public is largely unaware of the potential and actual damage attributable to the pollutants.
11. It has the ability to lie dormant and undetected underground for years, then reappear and spread.
12. The land manager's ability to manage for biodiversity and ecosystem health is thwarted and often totally blocked.
13. Threatened and endangered plants are especially vulnerable.
14. Contact can be toxic, painful, and injurious to humans.
15. The effects of the pollutant are often not apparent until the spread is already out of control.
Slow-Motion Explosion: The Explosive Spread of Exotic Species

By DAVID SCHNEIDER

Originally published in WHOLE EARTH REVIEW, SUMMER 1994

Given the sorts of problems facing the planet and its inhabitants these days, weeds might not seem like a big deal. Ozone depletion, global warming, over-population, toxic wastes, nuclear weapons - these are the big issues, collectively patent perhaps by the strange starvation or gunshot wounds to the body of the earth. By comparison, the movements of alien species of plants, animals, and microbes hardly seem worthy of notice. But they are much more like tooth decay: slow, and you wouldn’t notice, developing slowly over a long period of time. One day they emerge as a crisis - painful and expensive and potentially insoluble. Untreated, they threaten and then destroy entire ecosystems.

This is a non-native species, and what exactly makes it "invasive"?

Plants and animals are assumed to have a place of origin, a locus in which they fit as part of an ecological web. When a species wanders beyond the bounds of its original system and finds residence in another ecosystem, it is regarded as “non-native.”

If the second system is similar to the first, an alien species may adapt well to conditions in its new home; and compete successfully with the other species in the system for resources. In fact, non-native species often have a distinct advantage over natives, in that they don't have predators in the new system.

The theory runs that plants and animals not only evolve in a particular system, they coevolve in that system with other species. In an uncontained ecosystem, as elsewhere, there is no such thing as a free lunch; more importantly, in such a system, every species literally is another species’ lunch. When a species is introduced into a new system, however, there may not be any lunch eating it for a while. Without predation to keep it in check, the new species may multiply rapidly and overrun the locals.

Because ecology is complex and interconnected, the alien invader may spread to systems that are always obvious, nor are they predictable. Beyond changing the look and sounds of an area, alien species can fundamentally alter the supply of resources and the movement of the elements. Plants that drink a lot of water, like the Eurasian salt cedar or willow (Salix cinerea) which absorbs about 200 gallons per day, can seriously draw down the water table, eliminating ponds and streams, as well as the insects and animals that depend upon them. Such plants can bring up and deposit new sets of chemicals in the surface water, thus changing fundamentally its composition. The very shape of the land can be radically altered by new courses of erosion resulting from exotic vegetation. The established natural patterns of fire - its frequency and ferocity - are also redirected by the dominance of a new type of vegetation, as dramatically demonstrated by the role of the tropical eucalyptus in the Oakland Hills inferno of 1992.

Right now every American state in the contiguous forty-eight suffers a problem with invasive species of plants and animals. The discussion of “suffering” is from a purely human perspective at this point, and what it really means is that invasive species are costing people a lot of money - so much money, in fact, that the federal government has taken notice of the problem, and issued a report that states its Office of Technology Assessment (OTA). The report, Harmful Non-Indigenous Species in the United States, conservatively estimates that the US economy has lost billions of dollars.

Information is still sketchy, but it is widely agreed the costs will only rise. A worst-case scenario for fifteen potential high-impact non-native species (NIS) puts forth another $13 billion in future economic losses. The figures represent only a part of the total documented and possible costs - they do not include a large number of species known to be costly but for which little or no economic data were available, e.g., non-indigenous agricultural weeds. Nor do they account for intangible, non-market impacts.

Some non-native species are famous: the Africanized “killer bee” (Apis mellifera scutellata), now entering the US southwest; kudzu (Pueraria lobata), strangling hilly and hilly from Florida to Pennsylvania; the zebra mussel (Dreissena polymorpha), clogging waterways in and around the Great Lakes (and as a result of the great floods of 1993, the upper Mississippi River as well). Problems surrounding treatment of the “med-fly” (Mediterranean fruit fly, Ceratitis capitata) are even thought to have implications in a region’s economy.

Other alien species are less well known, but equally devastating. A ranching family in southern Oregon, for instance, abandoned a 10,000 acre spread recently because the land had become infested with leafy spurge (Euphorbia esula). A particularly vigorous weed - it can germinate from eight feet below the ground - leafy spurge can make cultivation of land impossible. It is noxious to livestock, and no one yet knows with certainty how to get rid of it. Some early results of experiments with biological control seem promising, but these will take some time to develop.

Invasive species are able to spread as well, where the business at hand is nothing but agriculture; they multiply, but preservation and creation, invasive species cost money. Everglades National Park spent $15,500 an acre eliminating Brazilian pepper (Schinus terebinthifolius) from a 60-acre site, and Malacca quinquenervia, an invasive Australian tree, is spraying there at an average of 41 acres per day.

The Bureau of Land Management estimates that it loses 2,300 acres per day to weeds on BLM land alone. In a real way, such invasions corrode the very reasons for having park lands.

Compounding the invasive species problem is the quality and quantity of information on the subject. The OTA report counts at least twenty federal agencies dealing with some part of the NIS problem. But at the federal level, and this was not well (all state level) communication between agencies is incomplete, and reaction is disorganized. For one thing, plants and animals do not recognize human-imposed borders or agency divisions. State standards for importation of species may vary widely, and enforcement of such laws as do exist is spotty at best.

In summary, no coordinated legislative response to the problem yet exists, and the governmental efforts that are in place are administered by a myriad of agencies and is classified the formation of grassroots (no pun intended) citizen’s groups lags behind. At this writing, only five or so states can boast groups like AEPP.

HISTORY

Given the current dismal state of affairs, one might reasonably ask how things got this way. Plant and animal species have traveled the globe from their beginnings, colonizing wherever they could, but it was not an easy business. Natural barriers isolated ecosystems from one another, and created highly specific local conditions. Currents of wind and water, the shifting of land masses, and vast cyclic migrations have for the most part of the world’s history been all the transportation there was for living forms. The advent of human beings has accelerated the process of invasion enormously and selectively.

As human beings have spread out over the planet, they’ve tended to take with them the plants and animals they knew and loved - principally, species of economic value. The current problems with invasive species in the US can be traced largely to their importation by European and Asian immigrants over the past 400 to 500 years. A particular set of weeds, the plattains (Plantago) were called "White Man’s Footstep" by Native Americans


because the weeds so directly followed habitation of land by Europeans.

Not all imports have been bad news: wheat, soybeans, and cattle are often cited as examples of successful species transplantation (although, when considering more than simple dollar amounts, the benevolence of their impact is highly questionable).

Sometimes a species brought in escapes its original confines - jumps the fence, so to speak, and multiplies. Pesky garden snails are a good example, established now in this country, and who had only curiosity on their minds in plate in mind. Starlings, a pervasive bird here, were supposedly brought to New York by an adventurous entrepreneur for a Shakespeare festival near the turn of the century. The legend is that the man wanted on hand all the birds the hard had mentioned. After the festival, by starlings took off and multiplied. In fact, several attempts to introduce the birds into the US were made, but the story is instructive; starlings now inhabit every part of the country and have forced native species out of their habitats.

It is the same with plants. An overwhelming number of species now considered to be dangerous noxious weeds have been available in seed catalogues, and continue to be. For instance, Scotch broom (Cytisus scoparius), runs rampant across the US, and is classified the formation of grassroots (no pun intended) citizen’s groups lags behind. At this writing, only five or so states can boast groups like AEPP.

An impressive range of unintentional, or accidental, vectors for species movement also exists. In the days before extruded PVC peanuts, excelsior, or even wadded-up newspaper, people often packed their possessions in plant matter. When a traveler later unpacked and tossed the padding out back to rot, durable seeds would be free to travel on. Seeds also traveled well in the hooves, hairs, hides and stomachs of large animals like horses and cattle, creatures that were themselves frequently transported long distances. Slowway rodents and reptiles found their way to US shores on ships that weren't disinfected, and spread out. With increased globalization of trade and transport today, the problem is even more serious.

But even with dozens of alien species running loose, an invasion is not a foregone conclusion. The pressures of competion can keep new species from reaching a population density capable of producing ecosystems that are delicately balanced, yet often (though not always) tough and resistant to intrusion. For a truly successful species invasion, a delicate ecosystem is best.

Clearing land for urban, suburban or agricultural development, harvesting large tracts of forest for timber, heavy and repetitive grazing, monocultural crop rotation, cumulative use of fertilizers and pesticides, the damming of streams, fire suppression - any one of these would qualify as
Slow-Motion Explosion: The Exponential Spread of Exotic Species

By DAVID SCHNEIDER

Originally published in WHOLE EARTH REVIEW, SUMMER 1994

Given the sorts of problems facing the planet and its inhabitants these days, weeds might not seem like a big deal. Ozone depletion, global warming, over-population, toxic wastes, nuclear weapons - these are the big issues, expected perhaps, but definitely, the sort of thing for which we shudder and hope the torch-wielding hordes of the Future will come to the rescue of the planet by burning the Earth. By comparison, the movements of alien species of plants, animals, and microbes hardly seem worthy of notice. But they are much more like tooth decay in your mouth - they cause no discomfort, developing slowly over a long period of time. One day they emerge as a crisis - painful and expensive and potentially insoluble. Untreated, they threaten and then destroy entire systems.

This is a non-native, non-indigenous species, and what exactly makes it "invasive"?

Plants and animals are assumed to have a place of origin, a locus in which they fit as part of an ecological web. When a species wanders beyond the bounds of its original system and finds residence in another ecosystem, it is regarded as "non-native." If the second system is similar to the first, an alien species may adapt well to conditions in its new home, and compete successfully with the native species for resources. In fact, non-native species often have a distinct advantage over natives, in that they don't have predators in the new system.

The theory runs that plants and animals not only evolve in a particular system, they coevolve in that system with other species. In an uncontained ecosystem, as elsewhere, there is no such thing as a free lunch; more importantly, in such a system, every species literally is another species' lunch. When a species is introduced into a new system, however, it may not be able eating it for a while. Without predation to keep it in check, the new species may multiply rapidly and overrun the locals.

Because ecology is complex and interconnected, the introduction of invasive species to a system can never be obvious, nor are they predictable. By changing the look and sounds of an area, alien species can fundamentally alter the supply of resources and the movement of the elements. Plants that drink a lot of water, like the Eucalyptus salt cedar or willow (Ulmus americana) which absorbs about 200 gallons per day, can seriously draw down the water table, eliminating ponds and streams, as well as the insects and animals that depend upon them. Such plants can bring up and deposit new sets of chemicals on the surface of the soil, thus fundamentally changing its composition. The very shape of the land can be radically altered by new courses of erosion resulting from exotic vegetation. The established natural pattems of fire - its frequency and ferocity - are also redirected by the dominance of a new type of vegetation, as dramatically demonstrated perhaps by the role of the eucalyptus in the Oakland Hills inferno of 1992.

Right now every American state in the contiguous forty-eight suffers a problem with invasive species of plants and animals. The discussion of "suffering" is from a purely human perspective at this point, and what it really means is that invasive species are costing people a lot of money - so much money, in fact, that the federal government has taken notice of the problem, and issued a report that identifies the Office of Technology Assessment (OTA). The report, "Non-Indigenous Species in the United States, conservatively estimates that the US economy has lost billions of dollars.

Information is still sketchy, but it is widely agreed the costs will only rise. A worst-case scenario for fifteen potential high-impact non-native species (NIS) puts forth another $134 billion in future economic losses. The figures represent only a part of the total documented and potential costs - they do not include a large number of species known to be costly but for which little or no economic data were available, e.g., non-native agricultural weeds. Nor do they account for intangible, non-market impacts.

Some non-native species are famous: the Africanized "killer bee" (Apis mellifera scutellata), now entering the US southwest, kidua (Pueraria lobata), strangling hill and dale from Florida to Pennsylvania; the zebra mussel (Dreissena polymorpha), clogging waterways in and around the Great Lakes (and as a result of the great floods of 1993, the upper Mississippi River as well). Problems surrounding treatment of the "med-fly" (Mediterranean fruit fly, Ceratitis capitata) are even thought to have implications for national trade policy.

Other alien species are less well known, but equally devastating. A ranching family in southern Oregon, for instance, abandoned a 10,000 acre spread recently because the land had become infested with leafy spurge (Euphorbia esula). A particularly vicious weed - it can germinate from eight feet below the ground - leafy spurge can make cultivation of land impossible. It is noxious to livestock, and no one yet knows with certainty how to get rid of it. Some early results of experiments with biological control seem promising, but these will take some time to develop.

One can treat the weeds as well, where the business at hand is nothing but eradication. But, by preservation and creation, invasive species cost money. Everglades National Park spent $15,500 an acre eliminating Brazilian pepper (Schinus terebenthifolius) from a 60-acre site, and Melaleuca quinquenervia, an invasive Australian tree, is spraying there at an average of 41 acres per day.

The Bureau of Land Management estimates that it loses 2,300 acres per day to weeds on BLM land alone. In a real way, such invasions corrode the very reasons for having park lands.

Compounding the invasive species problem is the quality and quantity of information on the subject. The OTA report counts at least twenty federal agencies dealing with some part of the NIS problem. But at the federal level, this is split among 20 bureaus, 18 programs, 10 states, and 18 agencies. State standards for importation of species may vary widely, and enforcement of such laws as do exist is spotty at best.

In summary, no coordinated legislative response to the problem yet exists, and the governmental efforts that are in place appear administered by units that are not designed to deal with this problem. The formation of grassroots (no pun intended) citizen's groups lags behind.

At this writing, only five or so states can boast groups like the EPPC.

HISTORY

Given the current dismal state of affairs, one might reasonably ask how things got this way. Plant and animal species, indeed, have been moving the globe from their beginnings, colonizing wherever they thought they could, but it was not an easy business. Natural barriers isolated ecosystems from one another, and created highly specific local conditions. Currents of wind and water, the shifting of land masses, and vast cyclic migrations have for the most of the world's history been all the transportation there was for living forms. The advent of human beings has accelerated the process of invasion enormously and selectively.

As humans themselves have spread out over the planet they've been forced to take with them the plants and animals they knew and loved - principally, species of economic value. The current problems with invasive species in the US can be traced largely to their importation by European and Asian immigrants over the past 400 to 500 years. A particular set of weeds, the plants (Plantago) were called "White Man's Footstep" by Native Americans.


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Not all imports have been bad news: wheat, soybeans, and cattle are often cited as examples of successful species transplantation (although, when considering more than simple dollar amounts, the benevolence of their impact is highly questionable). Sometimes a species brought in escapes its original confines - jumps the fence, so to speak, and multiplies. Pesky garden snails are a good example, established thoroughly in this country, but who had only curiosity behind their fast plans in mind. Starlings, a pervasive bird here, were, supposedly brought to New York by an adventurous entrepreneur for a Shakespeare festival near the turn of the century. The legend is that the man wanted on hand all the birds the hard had mention. After the festival, by starlings took off and multiplied. In fact, several attempts to introduce the birds into the US were made, but the story is instructive, starlings now inhabit every part of the country and have forest native species out of their habitat.

It is the same with plants. An overwhelming number of species now considered to be dangerous noxious weeds have been available in seed catalogues, and continue to be. For instance, Scotch broom (Cytisus scoparius), runs rampant in Oregon and is classified as noxious weed. Concerned folks as one of the most important wildland weeds to control, yet you can still buy it cheaply at almost any nursery.

An impressive range of unintentional, or accidental, vectors for species movement also exists. In the days before extruded PVC peanuts, excelsior, or even wadded-up newspaper, people often packed their possessions in plant matter. When a traveler later unpacked and tossed the packing out back to rot, durable seeds would be free to travel on. Seeds also travel well in the hooves, hair, hides and stomachs of large animals like horses and cattle, creatures that were themselves frequently transported long distances. Slowoway rodents and reptiles found their way to US coasts on ships, and disembarked and spread out. With increased globalization of trade and transport today, the problem is even more serious.

But even with dozens of alien species running loose, an invasion is not a foregone conclusion. The pressures of competition and predators are there to keep the planet in balance. Natural conditions produce ecosystems that are delicately balanced, yet often (though not always) tough and resistant to invasion. For a truly successful species invasion, a delicate ecosystem is best.

Clearing land for urban, suburban or agricultural development, harvesting large tracts of forest for timber, heavy and repetetive grazing, monocultural crop rotation, cumulative use of fertilizers and pesticides, the damming of streams, fire suppression - any of these would qualify as
damage an ecosystem, and would leave such a system impaired, vulnerable to attack.

WHAT CAN BE DONE

The OTA report and articles like this one are part of a daunting consciousness of the problems invasive species pose. One of the most important things to do, painful though it may be, is to increase awareness. This is because problems with Nuis exist on so many levels, involve so many alliances, and ultimately quite effective cooperation. The public and local people, few legislative or technological efforts can succeed.

Although this piece has focused mostly on the US, and mostly on the consequences of invasive species for urban wildlife agencies, it should be seen from a much broader perspective. As invasive species move around the world, forcing less hardy natives to extinction, the world’s gene pool is diminished. The full arguments for preserving biodiversity are outside the scope of this piece, and have already been made by several brilliant scientists, E. O. Wilson most notably. The point is that, with a reduced number of species, any system is more vulnerable to change - a climate change, for instance, or a change in the competitive atmosphere. In grappling with invasive species, it’s important to remember that the plants and animals have done nothing wrong; they’re simply carrying out their biological imperatives, using humans and human folly to spread, as they have used other methods in the past. It is we humans who have meddled most aggressively here, and as the plants and animals go silently to extinction, we must also face the drastic consequences.

Books:

NOTICE

The CalEPPC board is seeking to develop handouts on a series of species based on general ecology, possible control research projects, or other articles. We would like to publish these articles in the newsletter and copy them as handouts (i.e., gorse, Ambrosia, tamarisk, mustard, German Ivy, var. to purchase special equipment, etc). The CalEPPC board requests volunteers to work on this issue.

already been attempted without success. Manual control methods have been found to be expensive and quite effective. Biological control organisms are present in native ecosystems and are less effective. Perennial weeds, such as the Roefera family which includes broom and catalfower, are particularly long-lived. Biological control organisms would be expected to be effective on pepperweed may be just as happy living off the weed’s row crop cousins. Chemical weed control appeared to offer the greatest potential for effective control programs. Postemergent parameters were established in the early stages of the program. First, control, rather than eradication, would have to be the goal. Pepperweed’s presence at the California Department of Fish and Game’s Grizzly Island Wildlife Area is located within the Suisun Marsh, was far too widespread to offer any real hope of total eradication. Additionally, the wildlife area is surrounded by a seemingly limitless seed source from nearby populations on prairie lands. The control program would have to focus on critical sites that needed to be protected (i.e. waterfowl nesting areas, or isolated patches within the pikelweed habitat of the salt marsh harvest mouse). Second, the herbicide products chosen would have to have minimal effects on nontarget vegetation. Products which would be used would have to be relatively non-persistent in the environment.

Herbicide trials have been conducted at the Grizzly Island Wildlife Area. Four commercial herbicide formulations: Garlon 3A® (triclopyr), Garlon 4® (triclopyr), Roundup® (glyphosate), and Telar® (cholofosufluron), were tested at the Grizzly Island facility during 1992 and 1993. All applications were made during the spring and summer.

While Roundup® provided modest control, the nonselective nature of the material created a bare ground situation that led to a vicious return of the problem species. After that experience, it was quickly decided that a broad-spectrum compound would be a necessity. A selective compound would leave grass species, many of them natives, unharmed. This would provide some competition for the pepperweed after its inevitable postemergent applications. Both of the Garlon® formulations provided good control of pepperweed, with minimal effects on grass species. Telar® (with a 1 q/100 gallons non-ionic surfactant tank mix) provided excellent control with practically no effect on grass species. The Telar® plots were in a particularly thick growth of pepperweed. Thirteen months after treatment, the Telar® plots, even at the below-label rate of 0.25 oz/acre, were virtually free of pepperweed and were thick with beneficial grass species. The Grizzly Island plots were small squares surrounded by seemingly limitless source of reinfection. While little doubt remains that Telar® kills pepperweed, the prospects for complete control at Grizzly Island, or at any other locales where this weed has taken over, are unknown. The treated plots will be expanded to 5 - 30 acres during 1994. Hopefully, the beneficial grasses will hold their own and prevent reinfection.

The lesson to be learned from all of this should be apparent to all readers; the spread of perennial pepperweed is a serious threat to native vegetation and wildlife populations. Be on the lookout for this exotic invader and eradicate small populations before you get "whipped" anywhere you look.

Characteristics of Noxious Weeds:
The Ultimate Biological Pollutant
Source: USDA
1. Native plant communities are often permanently changed.
2. Many wildlife species are adversely affected, both directly and indirectly.
3. Their appearance can be deceivingly attractive and desirable.
4. Only a few ounces of the pollutant can regenerate tons of itself in only months.
5. Their spread is predominately by almost invisible means; their seeds.
6. The pollutant is spread by wildlife, livestock, recreationists, wind, water, vehicles, and other equipment.
7. The initial contamination and propagation are inconspicuous, noticed only by experts.
8. Increased erosion, increased fire hazard, and reduced water quality are a direct result of infestations.
10. The general public is largely unaware of the potential and actual damage attributable to the pollutant.
11. It has the ability to lie dormant and undetected underground for years, then reappear and spread.
12. The land manager's ability to manage for biodiversity and ecosystem health is thwarted and often totally blocked.
13. Threatened and endangered species are especially vulnerable.
14. Contact can be toxic, painful, and injurious to humans.
15. The effects of the pollutant are often not apparent until the spread is already out of control.
Perennial Pepperweed: A Threat to Wildland Areas
BY JOEL TRUMBO
Environmental Specialist, California Department of Fish and Game

At 84,000 acres, the Suisun Marsh is the largest, contiguous eucalyptus marsh in the United States. Formed where the Pacific Ocean tides meet the Sacramento and San Joaquin Rivers, the marsh is home to almost 250,000 wintering waterfowl, tule elk, and dozens of other native plant and animal species. The endangered salt marsh harvest mouse, a rodent whose habitat is limited to the Suisun Marsh, is a prime candidate for reappearing. As many as 20 species of eucalyptus, including the tall whitegum, grow in the marsh. The tall whitegum, Lepidium latifolium, grows to heights of over 50 feet and provides a habitat for a variety of birds and mammals. The marsh is also home to a variety of fish and invertebrates, including the California killifish, which is listed as a threatened species.

Tamarisk Advancing in Baja California
BY MIKE KELLY
Friends of Los Peñasquitos Canyon Preserve, San Diego

My friends and I love camping in Baja California, Mexico, and often visit remote areas. While I love the rugged terrain and the beauty of the landscape, I have noticed that the tamarisk, a fast-growing shrub, is spreading rapidly in the region. Tamarisk is an invasive plant species that was introduced to the United States from Europe and has since spread to many other parts of the world. In Baja California, the tamarisk is displacing native vegetation and can cause significant ecological damage. I hope that steps can be taken to control the spread of tamarisk and protect the unique ecosystems of Baja California.

Editor's Note: I can collaborate Mike's gloomy testimony on the advance of tamarisk and Arundo into Baja California. In April and May of this year, I noticed that the invasive species population is almost half-way down the peninsula - a distance of over 300 miles. The tamarisk is still relatively immature in the streamtimes of Baja, 5-10 feet tall. I noticed in 1994 Baja journal that "...travelling through the Santa Teresa Valley (at K, 65), the only vegetation in some areas of the stream appears to be tamarisk. With and without tamarisk growing,tamarisk is invading. In 10 years the stream will be choked with tamarisk. What a shame that this beautiful stream, with its stately sycamores (now declining), will soon be filled with exotic tamarisk.

Proceedings of the Arundo donax Workshop, held November 1993, in Ontario, CA 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 5357, Riverside, CA 92519-3507.
Pampasgrass is rapidly invading every known natural habitat along the coast, crowding out native vegetation, and threatening to transform the landscape from Oregon to Southern California.

As the weed enters, better called Jubata, or Andean Grass (Cortaderia jubata) becomes a huge plant, and can be recognized by its feathery, pinkish or creamy plumes, and its razor-sharp, drooping grassy leaves. Each clump produces millions of minute seeds that are readily scattered by the wind, by children, or by thoughtless adults. After the plumes go to seed, the plants become shabby, highly flammable, tangled masses.

The true Pampasgrass (C. sillamii), has more recently demonstrated here and "down-under" the same weakly characteristics. Its flower plumes remain white (except for color varieties) and are about the same height as its leaves, whereas Jubata's plumes extend well above the leaves.

**WHAT TO DO** as an individual or volunteer group.

(Wear gloves, long sleeves, and long pants.)

1. **Young Plants:** Dig or pull them out, using a small Pulaski tool (mattock) if needed.

2. **Plumes:** Cut them well down the stalk, BEFORE they open in mid-July, and carefully put them in a paper bag and burn them in the fireplace, or place in sturdy plastic bags, tied securely, to be taken to the landfill.

3. **Established Clumps** (after removing plumes):
   - A. Chop the clumps with a Pulaski tool and flat sharpened shovel, making sure to get all of the crown and rootball. Rootlets can remain. A large chainsaw or weedcutter with a rotary blade makes disposing of big plants more manageable. Tie the leaves in bundles for composting or other disposal.
   - OR
   - B. Spray the leaves completely with glyphosate (Roundup®) at the rate of 3 or 4 ounces of the concentrate per gallon of water. More dilute forms, such as Kleen-Up® can be used on small infestations in at least two applications. Spray in May or June when the leaves still contain moisture, and before the seed heads emerge. If working near water, substitute the aquatic herbicide Rodeo®. READ THE LABEL PRECAUTIONS of all herbicides and use the recommended dosage. Roundup® can cause skin irritation, so don't spray in windy weather, and promptly wash areas not protected by clothing. A sticker-spreader additive will economize and enhance Roundup's effectiveness.
   - OR
   - C. A bulldozer or backhoe may be justified to remove a sizable infestation, if there is no threat of erosion.

If you need assistance, please contact: Quentin Griffis, Box 766, Inverness, CA 94917, 415.660.7225

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**Global Change**

John Randall, president

Global Change. For many, the mention of this subject brings to mind increasing CO2 concentrations, alteration of the climate worldwide with an emphasis on warming trends; decreasing stratospheric ozone levels and resultant increases in ultraviolet radiation at the earth's surface. Few of us think about the impacts of invasions by non-native plants and animals in this context. But biological invasions have had, and will likely continue to have, greater impacts on the world's biota than any of these other factors for the next several decades and more. We may be all too aware of the ravages of yellow starthistle, tumbleweed, and pampasgrass in California, but there are also North American muskrats in central and western Europe, South American golden snails ravaging rice crops from the Philippines to Malaysia, and Australia eucalypts and acacias running rampant in South Africa's velds.

**Biological Invasions as Global Change** was the theme of a meeting organized by the Aspen Global Change Institute which I attended in late August. Not surprisingly, many of the people there remarked that they had been heavily influenced by Charles Elton's 1958 book, *The Ecology of Invasions by Animals and Plants*. Elton laid out the issue neatly in his first chapter, stating "...we are living in a period of the world's history when the mingling of thousands of kinds of organisms from different parts of the world is setting up extremely discordant situations in nature...the larger ecological explosions can...be traced to a breakdown in the isolation of the continents and islands built up during the early and middle parts of the Tertiary period." Others had noted the magnitude and nature of these changes as early as the mid-1800s. Charles Darwin commented on the spectacles of hundreds of square miles of the pampa of Argentina and Chile rendered impenetrable to horse or human by an invasion of wild artichoke or *Cynara de C忖ello*. Likewise, Frederick Law Olmstead laid a report on the need for protection of Yosemite in 1865, noting that, unless actions were taken, its vegetation would likely be pushed out by common weeds from Europe, as had happened in the Eastern States.

Clearly we have been in the midst of a vast, biological upheaval since regular contact was established between the Old and New Worlds; upheaval involving the movement and mixing of species that has not occurred on earth for tens, perhaps hundreds of millions of years. The upheaval continues, and its end is not in sight. It is clear, however, that there have been, and will be 'winners' and 'losers.' Some species have spread and become established over vast areas following their introduction by humans, while others have been struck down by competitors, predators, parasites, or diseases introduced by humans. The list of losses brought on in this way is long, and, frankly, depressing. But it is not a reason to give up hope.

The consensus at the Global Change meeting is that there is much we can do, both to control invasions that have already occurred, and to slow the rate of new invasions. All of the nearly 30 participants expressed enthusiasm for the work of groups such as CalEPPC, and the hope that we continue to expand and multiply. The group was unified in the conviction that the most effective way to put a brake on this upheaval will be to work to prevent the entry of new invaders and to implement programs designed to identify and quickly eliminate infestations by new species before they become widespread. This will clearly require cooperation and participation from a public that has become aware of the threats posed by invasions. For this reason, the importance of education and of well designed, high-profile control projects was stressed.

But of course, we hope to do more, and so we encourage you to join in our work. Write a brief description of your studies, control project, education program, or efforts to change policies for the better, and submit it to our newsletter editor, Sally Davis. If you not currently involved in a project, please accept our invitation to join one of our working groups or form one of your own. We won't be able to completely stop the global changes brought on by invasions, but we may be able to slow the rate of those changes, and save many of the species and landscapes that mean so much to us.

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Who We Are

CalEPPC NEWS is published quarterly by the California Exotic Pest Plant Council, a nonprofit 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 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 workshop 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 Fall 1994 issue is due with the editor by October 15, 1994.

Publication on Exotics

California Plant Pest & Disease Report (Agricultural Pests or Potential)
Write: Editor, CPPDR, State of California Dept. of Food & Agriculture, Analysis & Identification Branch, 1220 N Street, Room 540, Sacramento, CA 94271-0001

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Symposium '94 poster session: Michael Parker, 510.792.0222

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Our membership continues to grow!

CalEPPC warmly welcomes the following people who have joined in July and August:

David Anne
Jerry Asher
Kim Baensch
Patricia Bauer
David Bayer
Eva Begley
Martha Blake
Jon Ad Blum
Michael C. Boyd II
Daniel Bylin
Marie Campbell
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Tom Stewart
Mark Stromberg
Sherry Teresa
Craig Thomsen
Ron Unger
Jane Valarius
Susan Weis
Barbara Williams
David L. Wilson
M. H. Wolfe

Upcoming Meetings

- September 28 - October 1, 1994 Sacramento, California
  CalEPPC Symposium '94 to be held at the Hyatt Regency Sacramento at Capitol Park. Registration: contact Sally Davis, 805.927.0881. Posters: contact Mike Parker at (w) 510.792.0222 or (h) 510.795.6766.
- October 17 - 22 1994 West Palm Beach, Florida
  1994 Natural Areas Conference to be held at the Palm Beach Gardens Marriott. The 21st annual conference will be hosted by the South Florida Water Management District. For information, contact Bill Hefferich at 407.687.6837.
- October 28 -1994 Davis, California
  TNC, NPS, and several agencies will sponsor California Conference on Ecosystem Management in late October. For exact dates and more information, contact David Diaz, 415.705.1891.
1995 Calendar Year Dues

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CalEPPC Membership
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448 Belo Street
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If you would like to join CalEPPC, please remit your 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 welcome!

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A California Department of Fish and Game employee shows an uprooted specimen of perennial pepperweed (Lepidium latifolium) at Grizzly Island Wildlife Area, Solano County. See story, Page 4.