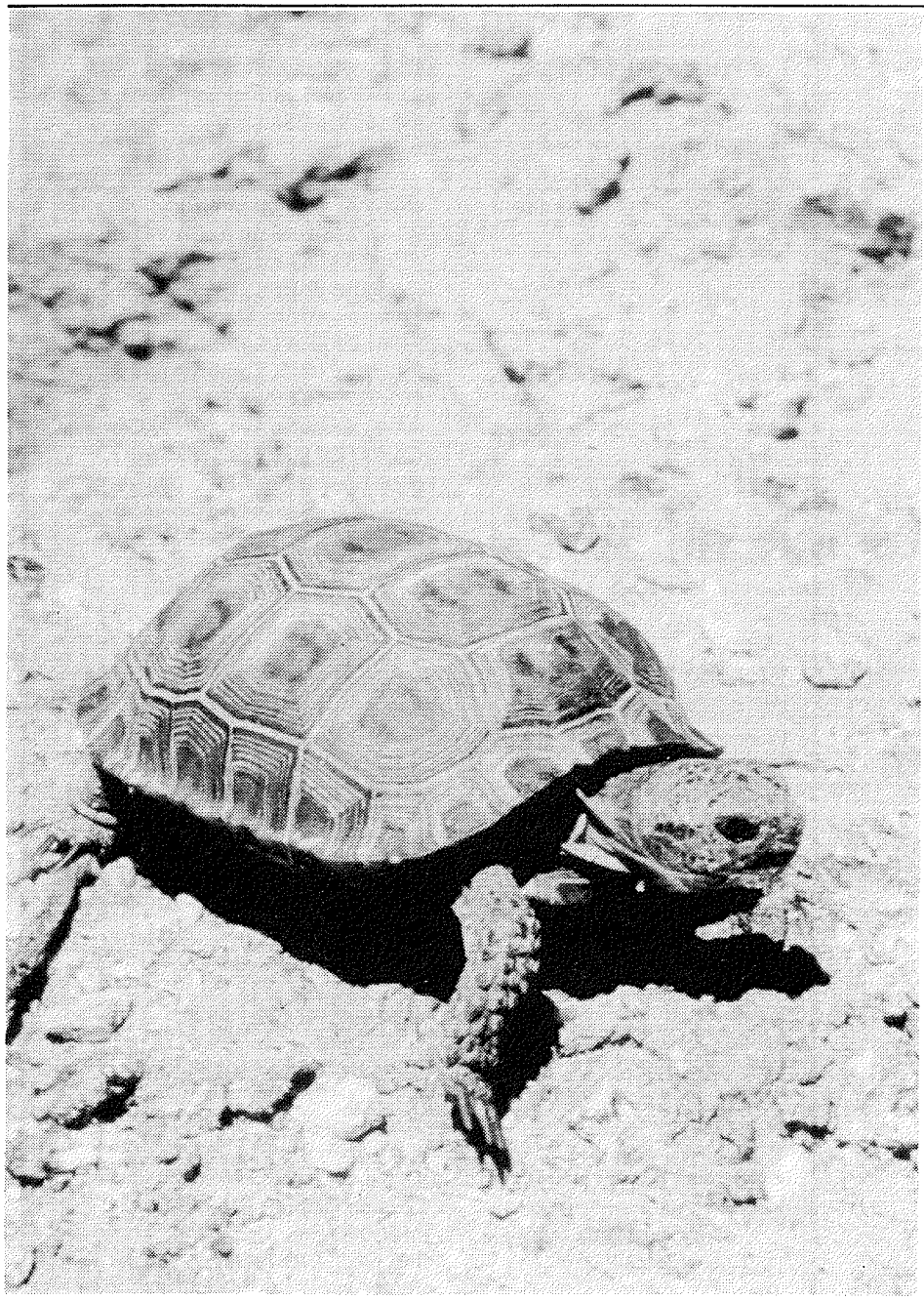
CalEPPC NEWS

NEWSLETTER OF THE CALIFORNIA EXOTIC PEST PLANT COUNCIL

VOLUME 3 • NUMBER 3 SUMMER 95



INSIDE

The herbivorous desert tortoise may be negatively affected by the proliferation of exotic pest plant species that are nutritionally inferior to native forbs. Introduced exotic plants such as Bromus and Schismus also promote frequent fires in desert tortoise habitat.
See story page 4.
Photo by Jeff Lovich

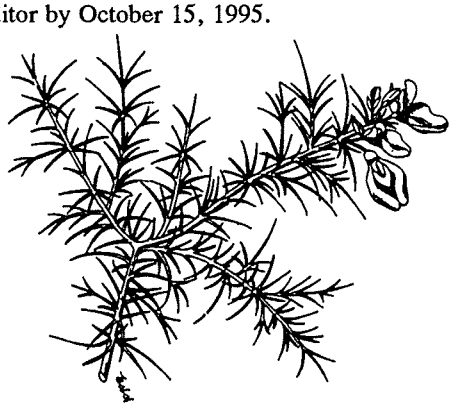
Who We Are

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 Fall 1995 issue is due with the editor by October 15, 1995.



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President's Message

Carla Bossard, president

A spirit of cooperation has been one of the distinctive features that has permeated CalEPPC since its inception. Consistently utilizing a cooperative rather than a confrontational approach is one of the most important reasons CalEPPC is successful in making progress towards its goals.

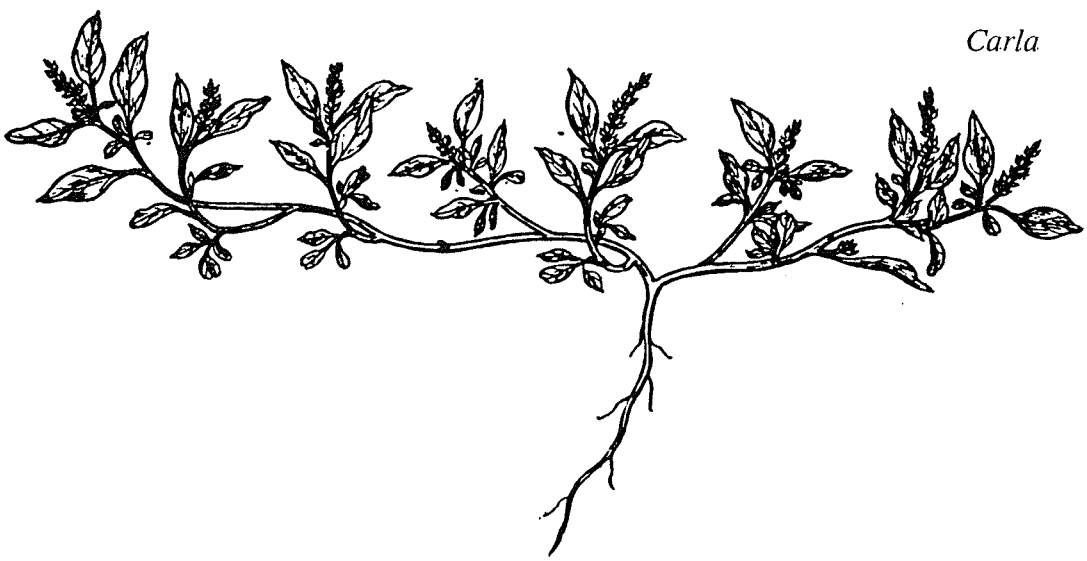
One reason cooperation works for us is that it allows us to benefit fully from our members diverse backgrounds, educations, professions, and prospectives. When one of our working groups decided two years ago to set up a research project, eleven members met to design it. As an academic with ample experience on committees that absorb time like a black hole, while generating little but acrimony, I did not have high hopes for this committee. However, because the refuge manager, volunteer coordinator, government forester, government wildlife ecologist, native plant conservationist, field machinery operator, botanist, graduate students, environmental study consultant, and chemical physiology professor actually listened to and valued the suggestions and experiences of each other person on this committee, a credible, doable research plan resulted after only two meetings.

Another benefit of cooperation is that it heads off mistakes. This has been very apparent in the functioning of the CalEPPC board. Whether planning symposium details, responding to an inquiry, or developing a plan of action, I have repeatedly seen how examination by the wide diversity of people on our board will catch and correct a potential problem that was not seen by the one or two individuals introducing the subject to the board.

Approaching potential problems in a spirit of cooperation allows us to focus time and energy on solving a problem rather than allowing it to disperse in a flare of hot words and emotions that solves nothing. For example, in June, a representative of the California Association of Nurserymen (CAN) attended a CalEPPC board meeting to explore issues of common concern and ways we could work together on them. As a result, CalEPPC will provide a series of informational articles for the journal *California Nurseryman*. Also, a group of CAN and CalEPPC members will jointly develop a list of alternative plants that can be recommended as substitutes for invasive species in environmentally sensitive locations.

A cooperative approach may not be effective in every instance relating to problems of invasive plant species, but for CalEPPC, it has been a key characteristic of and explanation for our success thus far. Come be a part of this cooperation at CalEPPC's Symposium '95 at Asilomar. See you there.

Carla



Wildlife and Weeds: Life in an Alien Landscape

Jeff Lovich
National Biological Service, Palm Springs Field Station

In 1958, Oxford ecologist Charles Elton outlined the devastating effects of invading species in the book, "*The Ecology of Invasions by Animals and Plants.*" He stated "...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 terrific dislocations in nature. We are seeing huge changes in the natural population balance of the world." Today few ecologists would disagree with Elton that invasive species have had profound effects on the structure and function of ecosystems.

An often overlooked impact of exotic invasive plant species is their effect on animal populations. As habitats are changed and plant community organization is modified, delicate relationships between plants and animals are altered or eliminated. For the most part, the impacts of exotic pest plants (EPP) on animals have been negative, but there are exceptions. Let's look at some examples of both.

Tamarisk is an EPP that is dominating springs and riparian areas in the western United States, displacing native plant species utilized by wildlife for food or cover (Lovich et al., 1994.) The suitability of tamarisk as wildlife habitat has been a subject of considerable debate. It generally provides unsuitable habitat for most wildlife because neither its foliage nor its flowers (including seeds) have any significant forage value in contrast to native species such as mesquite (a notable exception being the fact that the exotic honeybee utilizes the pollen). However, from a structural standpoint tamarisk does provide cover for some species, particularly birds. For example doves, Mississippi Kites, and various passerine birds are known to nest in tamarisk-dominated habitats (Glinske and Ohmart, 1983; Brown and Trosset, 1989; Rosenberg et al., 1991.) Rice et al. (1983) determined that tamarisk foliage height diversity was an important determinant of avian community organization, although native plant species were more important determinants.

The value of tamarisk to wildlife appears to vary geographically. Utilization of tamarisk by birds was high on the middle Pecos River, intermediate on the lower Rio Grande, and very low on the lower Colorado River. Avian use of tamarisk along the Pecos River may be enhanced due to the occurrence of seed producing shrubs and annuals within or adjacent to the exotic habitat (Hunter et al., 1988.) It is important to note that all published studies of the value of tamarisk as wildlife habitat have focused on birds. Purported benefits to studied birds do not necessarily extend to other animals. In fact, tamarisk invasion poses a potential threat to desert bighorn sheep water sources and the vulnerable habitats of desert pupfish and the desert slender salamander. Additional research is needed on the relationship between tamarisk and other groups of species including invertebrates.

In spite of the value that tamarisk may have for wildlife cover, most authors have concluded that the invader has little value to native wildlife (Kerpez and Smith, 1987; Anderson and Miller, 1990; Rosenberg et al., 1991.) As tamarisk displaces native vegetation the value of the original habitat is progressively diminished.

In the desert southwest, vast areas of desert tortoise habitat have been invaded by exotic annual grasses including bromes and Mediterranean split grass. Recent research by Hal Avery of the National Biological Service, Riverside Field Station has demonstrated that some EPPs have lower nutritional value for desert tortoises than native plant species. Although it is tempting to speculate that EPP's may have a negative impact on desert tortoise populations by virtue of their nutritional inferiority, other effects of EPP's may be more important. Desert tortoise habitat is characterized by communities of widely-spaced, long-lived, fire-sensitive shrub species and in some areas cactuses. Although fire had a role in the evolution of the desert plant community, it was probably minor with long intervals between fires and limited impact. With the invasion of fine-fuel species like exotic annual grasses the fire cycle has been significantly shortened and the potential for fires to propagate has increased. The result has been conversion of desert scrub landscapes to "weedscapes" dominated by EPP's. It is hard to imagine that this has not had a negative impact on tortoises and other species that co-evolved with plants in the desert ecosystem.

Weeds have had an impact on several other species of turtles as well. In Florida, habitat for the gopher tortoise, a Species of Special Concern, is being degraded by EPP's. Gopher tortoises prefer areas with relatively low canopy and shrub cover, but high herbaceous cover. Exotics like Brazilian pepper cause the percentage of shrub and canopy cover to increase thus causing tortoise densities to decline. Unfortunately, areas cleared of Brazilian pepper are easily recolonized by the invader, making management of tortoise populations that much more difficult (Stewart et al., 1993).

Interestingly, some EPP's may have benefitted turtles. The green sea turtle is an herbivorous species that is endangered world-wide. The red algae species *Hypnea musciformis* was introduced into the Hawaiian Islands in 1974 from its native Florida. Since its introduction it has spread rapidly invading niches occupied by native species

of *Hypnea*. Although the exotic algae is capable of inhibiting the growth of native species, some believe that the total productivity of certain Hawaiian reefs has increased due to the addition of *H. musciformis*. Green sea turtles utilize the exotic algae which sometimes represents 99-100 percent of the seaweed mass found in their stomachs (Russell and Balazs, 1994).

Our world is changing due in large part to the spread of exotic plant species. While the visual impacts are easy for the trained eye to observe the more insidious effects are often overlooked. Wildlife is an important component of any ecosystem and when the plants in the ecosystem change animals may be the losers.

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Weed Alert!

German Ivy (*Senecio mikanioides*)

CalEPPC member Daniel Glusenkamp writes to report the southern range of feral German ivy has been extended into Baja California, Mexico. German ivy is a common exotic in coastal canyons of central California and occurs as far north as Redwood National Park in Humboldt County. The plant was recently found growing wild in a coastal canyon near La Misión, north of Ensenada. This population is approximately 68 kilometers south of the Mexico-US Border, and more than 80 kilometers south of Temescal Canyon (San Diego County), the former southern limit. The species has also been sighted in landscaping further south in Baja (Carla Bossard, pers. comm.), which makes additional range expansion likely.

This new Baja population occurs in habitat very similar to that occupied by *Senecio mikanioides* in the rest of California. Plants were found growing in a waste area adjacent to a river one kilometer from the Pacific Ocean. The number of individuals is difficult to determine with this species, but the plants covered about $20m^2$ and were festooned with flowers in late December.

Vetiver (*Vetiveria zinzaniodes* L.)

The CalEPPC board was alerted to the possibility of Vetiver, a perennial grass from India, being used for erosion control purposes in the Southern California area. This grass has been utilized primarily in tropical climates to control erosion. The board is seeking scientific literature regarding the use of this POSSIBLE PEST PLANT in a Mediterranean climate. If you have any knowledge of the use of Vetiver in other than a tropical climate, please contact Carla Bossard.

Ravennagrass or Erianthus (*Saccarum ravennae* = *Erianthus ravennae*)

Louis B. Fleming writes, in *Letters*, Fall 1995 issue of *Pacific Horticulture*, of his experience contacting nursery people about the inroads of ravennagrass in coastal areas, and its domination of the native ceanothus. He received a response from David Salman, president of A High Country Garden, Santa Fe, NM, who has instructed his staff not to sell ravennagrass to customers in coastal California. Mr. Salman encourages gardeners to use native plants and cooperate with efforts to protect plants in their native habitats.

Mr. Fleming states, "It is indeed appalling, driving along Highway One, to see the proliferation of Erianthus, a tall, sturdy grass from Europe and Asia related to sugar cane (*S. officinarum*) and the consequent decline of our beautiful native shrubs. I ... hope that other nurseries may be inspired to follow David Salman's example."

Biological Control of Invasive Exotic Pest Plant Species
A Report on the Importance of Maintaining and Enhancing our Nation's Biological Control Capabilities
Prepared by the California Exotic Pest Plant Council Biocontrol Committee

Introduction

Invasive exotic pest plants are an economic burden to agricultural operations and rangelands across the nations. Exotic pest plants are also a severe form of biological pollution that is degrading our remaining natural ecosystems. The costs of controlling these pests, using traditional technologies such as mechanical clearing or herbicides is already many orders of magnitude beyond what the nation can reasonably afford to spend in this era of ever-tightening federal and state budgets. However, the consequences of doing nothing will be an even greater distribution and array of pest plants across the nation as well as the loss of major elements of our national heritage.

Biological control is a technology that offers a solution to this dilemma. It employs the use of natural enemies to control invasive exotic pest plants, and provides economic and environmental benefits that are non-polluting, sustainable, and cost-effective. It is often the only feasible control option for non-native weeds that have already infested large areas. Biological control also represents a fiscally-responsible technology for managing our agriculture and rangelands and natural areas. Funding for existing programs should therefore be increased as a cost-effective investment for the future.

This paper provides a factual support for why biological control of invasive exotic pest plants is needed and for improved funding for existing programs.

1. Invasive Exotic Plant Species are Causing Severe Environmental Damage to Our Nation's Ecosystems. This is Not a Problem That Can be Ignored.

Invasive exotic plant species can fundamentally alter whole ecosystems, by changing fire regimes, depleting water availability, or causing major changes to a system's vegetative structure. Just as the discharge of toxins into a body of water pollutes the aquatic ecosystem, so do invasive exotic plants pollute the terrestrial ecosystem.

Once considered only an agricultural problem, invasive weeds are now the greatest single threat to natural ecosystems in the western United States. The Bureau of Land Management recently completed a survey of plant communities on the 189 million acres under their administration. The data show that non-native invasive weeds currently occupy 3 million acres and are expanding their range by 14 percent each year; that is ca. 2,300 acres per day.

Most natural areas across the United States have been invaded and adversely affected by invasive exotic pest plants. These organisms alter the communities they invade, using resources that would have otherwise been consumed by native species. Left uncontrolled in parks and preserves, they can reduce or eliminate the species and communities the areas were set aside to support. Rare species, in particular, may be threatened by non-native invaders. For example, 30 of the state of California's 53 federally listed endangered plant species are threatened by exotic vegetation. Invasions by exotic plants (and animals, fungi, and microbes) continue to spread on their own and are not limited in space or in time. Once introduced, they may spread from site to site and even to other regions, across state and national boundaries.

The invasive species that cause the greatest damage are those that alter ecosystem processes such as nutrient cycling, the intensity and frequency of fire, hydrological cycles, sediment deposition, and erosion. For example, the firetree (*Myrica faya*) sharply increases rates of nitrogen accumulation in young volcanic soils on the island of Hawaii. Greater nitrogen availability will alter patterns of succession and ultimately favor invasion by other non-native species that thrive in nitrogen rich soil.

Downy brome (*Bromus tectorum*) has invaded millions of acres of rangeland in the Great Basin. This invasion has led to widespread increases in frequency of fires from once every 60-110 years to once every 3-5 years. Native shrubs, which do not recover well from the more frequent fires, have been eliminated or reduced to minor components in many of these areas. Similarly, native vegetation in Hawaii has been severely impacted by alterations in the natural fire regime which resulted from the rapid spread of exotic grasses. Fires are believed to have been extremely rare in most Hawaiian vegetation before the arrival of humans, and they set back, or kill, many native Hawaiian species. Native species that survive a fire often compete poorly afterwards with non-native invaders, especially those stimulated by fire.

A number of wetland and riparian area invaders are known to alter hydrology and sedimentation rates. The punk tree (*Melaleuca quinquenervia*) invades herbaceous wetlands in south Florida and can convert what was sawgrass marshlands into a nearly monospecific swamp forest. This leads to changes in ground temperatures and probably in plant/soil/water relations since Melaleuca is believed to use more water than the sawgrass communities it replaces. Indeed, this is the primary reason that more than $2.2 million is spent annually in Florida to control Melaleuca. Melaleuca also alters fire frequency and intensity in areas it infests,

promoting extremely hot burns. It provides little or no habitat for native wildlife species including deer, and has been the major cause of the decline of the Everglades.

Purple loosestrife (*Lythrum salicaria*) is one of the most conspicuous invasive species in North America due to its vibrant purple flowers. It was introduced from Europe in the early 1800s and has since invaded wetlands throughout the northern United States and southern Canada from the Atlantic to the Pacific. If forms large monotypic stands that push out native species, including those that provide food and cover necessary for many waterfowl and other species of wildlife. It also eliminates shallow open-water areas that certain waterfowl and other animals require for feeding. Large, spreading infestations threaten various endangered plants and animals.

Tamarisk or salt cedar (*Tamarix chinensis; T. ramossisima; T. pentandra*). which invades wetland and riparian areas in the American Southwest, are also believed responsible for lowering water tables. In these areas, where water is scarce, the result is significant reduction or elimination of surface water habitats required by native plants and animals. Tamarisk infestations can also trap more sediments than stands of native vegetation, and thus alter the shape, carrying capacity, and flooding cycle of watercourses.

Grasslands and rangelands across the nation are also subject to severe infestations by invasive exotic plant species. Leafy spurge (*Euphorbia esula*) and yellow star thistle (*Centaurea solstitialis*) are among the most damaging of these species. Leafy spurge crowds out most native herbs and grasses, infesting rangeland and nature preserves throughout Montana, western Minnesota, the eastern Dakotas and elsewhere. The Nature Conservancy's Altamont Prairie is so badly infested that it is no longer regarded worth managing as native prairie and cannot be sold as cropland.

Yellow star thistle is an annual plant that can quickly colonize or re-establish itself due to its ability to produce large numbers of seeds, and the rapid growth rate of its seedlings. It is favored by soil disturbance, but is clearly capable of invading areas that have not been disturbed by humans or livestock for years, and has invaded a number of relatively pristine preserves. The species has expanded its range in California at a roughly exponential rate since the late 1950s, increasing from 1.2 to 7.9 million acres between 1958 and 1991. It is also a severe problem in Oregon, Washington, and Idaho, especially in and around the Hell's Canyon area.

When United States national park superintendents were surveyed about conditions in their parks, 61 percent of the 246 respondents indicated that non-indigenous plants were a moderate or major problem. Parks with severe plant and animal invasion problems includes Everglades, Great Smoky Mountains, Zion, Olympic, Channel Islands, Hawaii Volcanoes and Haleakala.

2. Biological Control is the Most Cost Effective Method of Managing Invasive Pest Plants

Biocontrol technology is a way to substantially reduce land management costs. Cutting biological control research programs may save a small amount of research dollars now, but will substantially raise future costs to public agencies, private land managers, and the agricultural community. The very intent of biocontrol research programs is to develop effective and environmentally safe pest plant controls that can be applied in an extremely low-cost manner over large areas. The alternative is to continue to rely on very expensive, and less effective, control methods that will become increasingly difficult to carry out as public and private funds become more scarce.

Exotic pest plants cause severe economic damage, chiefly through reduced agricultural production and increased control costs. A recent Office of Technology Assessment report estimates that 79 selected invasive exotic weed species caused $97 billion in losses to the United States between 1906 and 1991, and that 15 high-impact non-native species would likely cause another $134 billion in losses between the years 1991 and 2000. If no serious efforts are undertaken to deal with the problem, these costs will become even greater.

The only effective way to reduce these costs (usually by several orders of magnitude) is to employ biological control techniques. Biological control does not require the expenditures needed for labor-intensive hand-removal of pest plants, expensive application of chemicals over large areas, or the use of heavy equipment. It merely requires the properly managed and monitored release of a weed's natural enemies - such as insects. Almost all the expenses in biological control are borne up-front during the identification and host-specificity testing required before a control organism is released.

Biocontrol is a very integral part of Integrated Pest Management (IPM), a concept almost universally endorsed as the most cost-effective way to manage exotic pest plants. Biocontrol also complements and enhances chemical control methods. The amount of herbicides that may have to be applied can often be substantially reduced under an IPM program that includes biological control elements. This allows for more effective use of herbicides.

The potential and actual costs of invasive exotic pest plants and the economic benefits from their successful biological control can be gauged from the following case studies:

- **Klamath Weed**

Klamath weed (*Hypericum perforatum*) is a poisonous weed from Europe that is invasive on rangelands in the Northwest. By 1944 it had infested more than 2 million acres in California alone. Ranches in California and Oregon were rendered almost worthless by Klamath weed infestations. Biocontrol insects from Europe reduced Klamath weed to less than 1 percent of its former abundance in California and Oregon. It was estimated at the time that the savings to California agriculture from the successful control of Klamath

weed amounted to $21 million between 1953 and 1959, at an estimated rate of $3.5 million in 1964 dollars. These savings accrue each year, and total $143 million since 1953, and would, of course, amount to an even greater savings if corrected for inflation.

- **Tansy Ragwort**

Tansy ragwort (*Senecio jacobaea*) is a poisonous weed from Europe that is invasive on rangelands and pastures along the Pacific Coast. Tansy ragwort insects introduced from Europe as biocontrol agents have reduced the weed to less than 1 percent of its former abundance in California and Oregon. The annual savings in control costs and poisoned livestock resulting from successful control of tansy ragwort was recently estimated at $5 million annually in Oregon alone.

- **Yellow Star Thistle**

Yellow star thistle (*Centaurea solstitialis*) is a spiny and poisonous weed from southern Eurasia that is invasive on rangelands and other environments in western states. Recent estimates of yellow star thistle infestations include 8 million acres in California, 1 million acres in Oregon, 200,000 acres in Idaho, and 134,000 acres in Washington. Yellow star thistle is spreading rapidly in these states and invading other western states. For example, its area of infestation in California increased an estimated 420 percent between 1965 and 1985.

A glimpse of the damage caused by yellow star thistle is provided by the following case. After the TeePee Butte Fire near the Oregon-Idaho border in the Wallawa-Whitman National Forest in 1988, the Forest Service aerially sowed a grass seed mix to quickly revegetate the burned area. The seed used was unknowingly contaminated by yellow star thistle seed which resulted in the National Forest and adjoining private land becoming infested by the weed. A lawsuit filed against the Forest Service by the rancher whose land became infested by yellow star thistle was reportedly settled out of court in 1994 for $500,000.

Five yellow star thistle insects from Europe have been recently introduced and established in the United States as biocontrol agents for the weed. These biocontrol agents are expected to halt the spread of star thistle and ultimately reduce control costs on both public and private lands.

- **Purple Loosestrife**

Purple loosestrife (*Lythrum salicaria*) is an aquatic weed from Eurasia that is invading and degrading wetlands across the northern states. The estimated annual cost of purple loosestrife to natural resources in the United States is $229 million. Purple loosestrife insects from Europe have been recently introduced into the United States as biocontrol agents for the weed. It is too soon to know their impact.

- **Tamarisk (salt cedar)**

Tamarisk (*Tamarix chinensis; T. ramossisima; T. pentandra*) is a woody perennial from Eurasia that invades streamside areas in the southwestern United States It was first introduced in the early 1800s as an ornamental. From these early beginnings, it spread rapidly and now infests nearly every drainage system in the southwestern United States It currently occupies 1.5 million acres nationwide, including 16,000 acres in California. The impact of tamarisk on streamside areas in the desert region is substantial. Tamarisk has a very high evapotranspiration rate, exceeding that of native vegetation, and can reduce groundwater on land it occupies. The trees consume 185 billion gallons of water each year in the Colorado River Basin alone.

Tamarisk causes an increase in the frequency of fire in infested areas because of increased fuel load. Tamarisk is tolerant of fire, and that, coupled with fire-intolerance by native streamside species, effectively allow tamarisk to invade and dominate native streamside communities. Finally, tamarisk generally provides unsuitable habitat for most wildlife. It takes approximately 170 man-hours to remove tamarisk from one-acre of land. Assuming $6.00/hour for labor, this results in removal costs of $1,020.00/acre. The cost to remove tamarisk from the 16,000 acres infested in California alone would exceed $16.3 million dollars.

A biological control agent could not only substantially reduce these expensive control costs, but could also help save the precious water resources of the southwestern and western United States.

- **Hydrilla**

Hydrilla (*Hydrilla verticillata*) is a non-native aquatic plant that infests waterways, irrigation canals, lakes and ponds throughout the United States. Its growth is so prolific that it can completely fill waterways and lakes with plants restricting water flow in irrigation and drainage canals, impeding navigation and public water uses and increasing sedimentation rates in flood control reservoirs. Hydrilla was accidentally introduced sometime after 1956 as an aquarium plant and has spread throughout the United States.

The State of Florida has spent $55,352,000 to control hydrilla in its waterways between 1980 and 1991. According to the Army Corps of Engineers, if hydrilla and Eurasian water-milfoil (*Myriophyllum spicatum* L), another non-native aquatic weed, were allowed to grow unmanaged over the next 3-4 years, economic losses from $75-100 million would be expected. Recently, 12,000 acres of a Florida lake were chemically treated to remove hydrilla. The cost for this effort was $1.2 million, which is equivalent to $100 per

acre. California has an aggressive program aimed at eradicating hydrilla. From 1976 to the present, over $20 million has been spent on this program. The eradication program is expected to continue for 3-5 more years at a cost of $2 million per year.

3. Biological Control is the Most Environmentally Beneficial Way to Manage Invasive Exotic Plants

Biological control is one of the most sustainable, resource-conserving and environmentally-compatible strategies for management of pests of agriculture, forestry and nature preserves. Strategic use of biological control can also promote a more judicious and effective use of herbicides and pesticides.

The reason biological control is so effective and safe is that a rigorous scientific protocol must be followed under USDA regulations before a potential control organism can be released into the environment. This protocol is termed "classical" biological control.

It is essential that classical biological weed control is underpinned by the strongest possible research base. Classical biological control is characterized by introduction of natural enemies of weeds from the home range of the weed. Classical biological control is a global scientific strategy for managing pests that has been conducted for over 100 years and has resulted in many successful programs.

There are six steps in classical biological control that are normally conducted. Each step in the process is linked with previous steps, and involves basic research, and requires a strong scientific base. A very brief description of these steps follows.

- **STEP 1: Identification and Approval**

  The pest species must be identified accurately, and its home range determined. The pest species must then be confirmed as a target for biological control. Collaboration is critical at this stage to ensure a smooth transition from basic research to technology transfer, and to build the teams of Federal, State and local cooperators that can most effectively plan, implement, and evaluate each program. A high level of specialized scientific skill in ecology, biogeography, systematics, and other areas is essential.

- **STEP 2: Foreign Surveys**

  Surveys for natural enemies (generally these are insects, mites, nematodes, and diseases) of the pest species are conducted in its home range. This process can take several seasons, because the weed populations are often small and widely scattered in their home ranges, and often the most promising control species are also rare, and can be missed in short or georgraphically-limited surveys. A high level of specialized scientific skill and experience in ecology, population dynamics, sampling, biogeography, systematics, and other areas is essential.

- **STEP 3: Host-specificity Testing**

  Once the suite of natural enemies is determined, they are ranked for their potential for impact on the weed population, and thus to contribute to management of the pest if introduced into the United States. The highest ranked species are tested for their host-specificity. This process can be conducted in overseas laboratories or in quarantine facilities in the United States. Host-specificity testing is a difficult, time- and resource-demanding activity that is the cornerstone around which the exemplary safety record of biological weed control is based. Testing can take up to 6 years for each species, but is normally completed in 3-4 years. A high level of specialized scientific skill and experience in rearing plants and animals, maintaining cultures for long periods of time, ecology, experimental design, statistical analysis, and other areas is essential.

- **STEP 4: Importation and Quarantine Clearance**

  Following approval from federal and state regulatory officials, biological control agents that are sufficiently host-specific are introduced into quarantine in the United States. In quarantine, agents are generally reared through at least one generation to ensure that they are free of parasites and diseases. This process demands considerable scientific and technical skills in rearing plants and animals, maintaining cultures for long periods of time, ecology, experimental design, statistical analysis, and other areas, and can only be accomplished in specialized quarantine facilities that are approved by the United States Department of Agriculture. (There is only one USDA facility on the West Coast, located in Albany, California).

- **STEP 5: Mass-rearing and Release into the Environment**

  A special rearing system must be developed for each agent species. This is often the most challenging part of the process. Contrary to popular belief, insects (and other biological control agents) are often very difficult to rear. Programs succeed or fail based on the ability of the scientist to mass-rear the agent. A high level of scientific skill in rearing plants and animals, maintaining cultures, ecology, experimental design, statistical analysis, and other areas is essential. Release into the environment follows approval from federal and state regulatory officials. Often, collaborators play a major role in mass-rearing and release of approved biological control agents.

- **STEP 6: Evaluation**

  Once released, each agent species should be evaluated for establishment, spread, impact on the target species, and impact on non-target species. A benefit:cost evaluation should also be conducted. A high level of scientific skill and experience in ecology, experimental design, statistical analysis, economic evaluation and other areas is essential. Careful, long-term evaluation provides basic scientific data that can be used to improve other programs, saving considerable time and resources.

4. Introductions of Potentially Invasive Species are Increasing and We Need the Strong Scientific and Technological Base to Deal With Them.

The Congressional OTA has recognized this problem and is conducting an on-going study of existing biocontrol efforts. The OTA study will recommend to Congress future biocontrol policy options. It makes little sense to close existing facilities or programs until the OTA study is complete.

According to the Congressional Office of Technological Assessment (OTA), there are more than 4,500 invasive exotic plant species in the United States. Of these, 15 percent (more than 675) cause severe economic/environmental harm. Additionally, the OTA found that more than 200 new invasive plant species have been introduced since 1980, and new introductions are increasing. The report also indicated that there is a gap between the need to manage these harmful species and the tools (biological control agents) available to do so.

Congress was so concerned with this gap that they charged OTA with a second report on Biological Control. There are five goals for this study, which was approved on September 30, 1993:

1. Evaluate to what extent biological control can help fill the expected pesticide gap;
2. Examine the relative safety of biocontrol and how pesticide problems can be avoided;
3. Determine if the current system of federal funding, research, incentives, and regulations helps or hinders development of biologically-based approaches;
4. Address the potential for transfer of biocontrol from agriculture to other areas;
5. Develop policy options for Congress.

5. Federal Agencies Have Adopted Major Policy Initiatives That Are Fully Compatible with Biocontrol. These Policies Need to be Followed by Actions.

Globally, biological control and biologically-based pest management is gaining popular and political support at an unprecedented rate. It is hoped that this valuable policy support will be translated into actions.

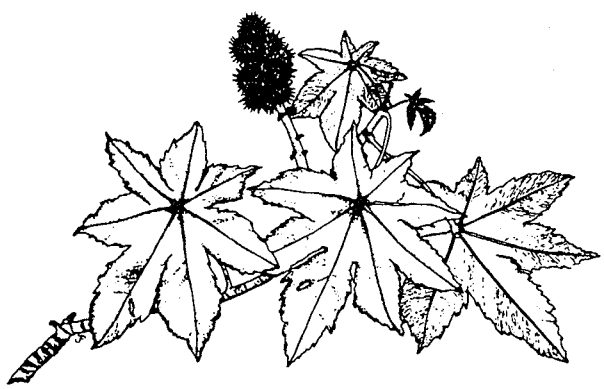
Some of the most important recent developments are listed below:

- The Department of Agriculture (USDA) and Animal and Plant Health Inspection Service (APHIS) announced a "Biological Control Philosophy" (August 1992) and initiated policy changes that are now being implemented.
- The USDA Forest Service (FS) and the Department of the Interior announced major policy changes to "ecosystem management" (1992-1993).
- USDA FS established the "National Center for Forest Health Management" in Morgantown, WV (April 1993).
- Major pest management policy changes announced by the Clinton Administration: United States will reduce pesticides by increasing biological and cultural control (USDA, EPA and FDA, June 1993).
- The Office of Technology Assessment (OTA), the research arm of Congress, released a major report on Harmful Non-Indigenous Species in the United States (September 1993).
- The OTA was given the charge by the House Committee on Agriculture to investigate biological pest control and suggest policy options (September 1993).
- The USDA Cooperative State Research Service announced a biological control section of the National Research Initiative (1994).
- The National Academy of Science conducted a major study into biologically-based pest management in natural systems (1994).
- The Department of Defense (DoD) issued pest management standards for DoD installations.
- The North American Plant Protection Organization announced a "Biological Control Philosophy" based on APHIS' philosophy (October 1994).

CONTRIBUTING MEMBERS

CalEPPC would like to welcome the following new members who joined the Council during the months of June through July 1995:

Claire Brey
Jean Conner
Jenny Marr
Fred McPherson
Don Stiver



CalEPPC Symposium '95!

Please attempt to register early for the ***CalEPPC Symposium '95*** to be held at the Asilomar Conference Center October 6 - 8, 1995. Registration fees received after Friday September 1, 1995 will be subject to a $20.00 late fee. If you are a late registrant who would like to take one of the field trips, please submit a second, separate check for the field trip so it may be returned if the field trip is filled to capacity.

Also, please remember to send your registration forms to the Asilomar Conference Center on a timely basis - before August 4th if possible - to assure room space at the conference center. Remember, registration is for two nights and includes all meals during the Symposium.

Symposium Proceedings

There will be a formal, professionally-printed "Proceedings" of the symposium this year which is included with the symposium registration. Those who are unable to attend ***CalEPPC Symposium '95*** may order proceedings in advance from the editor which will be released November 1995. The cost will be $10.00 which includes postage. Please make check payable to CalEPPC and mail to P.O. Box 1045, Cambria, CA 93428-1045.

Call for Posters

A large and interesting poster display at ***CalEPPC Symposium '95*** will be located in the symposium break area. Informal presentations by poster authors are invited but not required. You and interested colleagues are invited to display an information al poster at the symposium. Table-top and standard-size easel mounted posters will be employed. Video or slide displays may be possible. Poster content must be relevant to the study and/or management of non-indigenous flora or fauna in natural areas, including preserves, parks, rural rights-of-way, forests, and rangelands. There is no display charge.

Make arrangements to display your poster no later than Friday, September 1, 1995 by contacting: David Boyd, c/o CA Dept. of Parks and Recreation, 1455-A East Francisco Blvd., San Rafael, CA 94901. Telephone (415) 456.1286.

Upcoming Events

September 11, 1995

The next CalEPPC board meeting will be held September 11, 1995 at Fort Mason, GGNRA at 9:30 a.m. If any member has thoughts or comments regarding exotic pest plant issues, please contact one of the board members listed on page 2 of this newsletter. Members are welcome to attend board meetings in order to give their input in person, or simply to observe the workings of the board.

March 27 - 29 1996

The Western Aquatic Plant Management Society, western chapters of the North American Lake Management Society, and Portland State University will sponsor a Symposium on Non-native Organisms in Western Aquatic Ecosystems on 27 March 1996. The Symposium will feature invited speakers who will discuss the biology, impact, and management of non-native organisms in aquatic ecosystems in the west. For additional information contact: Mark Sytsma, Program Chair, Biology Department, Portland State University, P.O. Box 751, Portland OR 97207. Phone: 503.725.3833 - FAX: 503.725.3864 - E-mail: h2ms@odin.cc.pdx.edu

April 20 - 21 1996

A two-day broom workshop will be held in Portland, Oregon April 20 - 21, 1996. This symposium is supported by the Bullitt Foundation and will be sponsored by a coalition of EPPCs - CalEPPC, PNW-EPPC - the Oregon Department of Agriculture, the Washington State Noxious Weed Control Board, and possibly others. The conference will include information on Scotch broom, French broom and Spanish broom, with speakers from California, Oregon, Washington, British Columbia, Hawaii, New Zealand, and Australia. For more information, or to volunteer to assist, contact Dennis Isaacson at 503.986.4621 or Carla Bossard at 916.758.1602.

Announcement

Please write U.S. Senator Daniel Akaka (HI) regarding SB690, an amendment to the Federal Noxious Weed Act, supporting his amendment. We would like to request that you write both U.S. Senators Barbara Boxer (112 Hart Office Bldg, Washington DC, 20510) and Diane Feinstein (331 Hart Office Bldg., Washington, DC 20510) to co-sponsor of the amendment. SB690 will become part of the next farm bill.

NEW CORPORATE DUES AND BENEFITS STRUCTURE ANNOUNCED BY CALEPPC BOARD OF DIRECTORS

The CalEPPC Board of Directors has reorganized its institutional categories to provide more benefits to corporate sponsors. Individuals who contribute $250.00 may also be considered a sponsor. Institutional members will still continue to receive four quarterly CalEPPC newsletters, be eligible to join CalEPPC working groups, be invited to the annual symposium, and participate in selecting future board members.

Regular institutional CalEPPC membership for one year for a $100.00 contribution. Member will be recognized in the CalEPPC News for corporate sponsorship. One designated staff member will receive quarterly issues of the CalEPPC News.

Contributing institutional CalEPPC membership for one year for a $250.00 contribution. All of the above, plus Contributing member will become a symposium sponsor and be recognized in the symposium program and the proceedings. Plus complimentary symposium registration for one designated person.

Patron institutional CalEPPC membership for one year for a $500.00 contribution. All of the above, plus two designated staff members will receive quarterly issues of the CalEPPC News. Complimentary symposium registration for two designated persons.

Sustaining institutional CalEPPC membership for one year for a $1,000 contribution. All of the above, plus a beautiful plaque of recognition.

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