



FREMONTIA

A JOURNAL OF THE CALIFORNIA NATIVE PLANT SOCIETY



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CALIFORNIA NATIVE PLANT SOCIETY

Dedicated to the Preservation of the California Native Flora

The California Native Plant Society (CNPS) is an organization of laypersons and professionals united by an interest in the native plants of California and is open to all. Its principal aims are to preserve the native flora and add to the knowledge of members and the public at large by monitoring rare and endangered plants throughout the state; by acting to save endangered areas through publicity, persuasion, and on occasion, legal action; by providing expert testimony to government bodies; and by supporting financially and otherwise the establishment of native plant preserves. Much of this work is done by volunteers through CNPS Chapters throughout the state. The Society's educational work includes: publication of a quarterly journal, *Fremontia*, and a quarterly *Bulletin* which gives news and announcements of Society events and conservation issues. Chapters hold meetings, field trips, and plant and poster sales. Non-members are welcome to attend.

Money is provided through member dues and funds raised by chapter plant and poster sales. Additional donations, bequests, and memorial gifts from friends of the Society can assist greatly in carrying forward the work of the Society. Dues and donations are tax-deductible.

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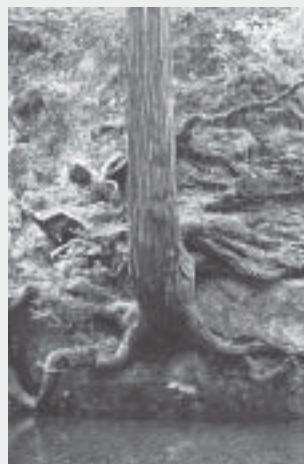
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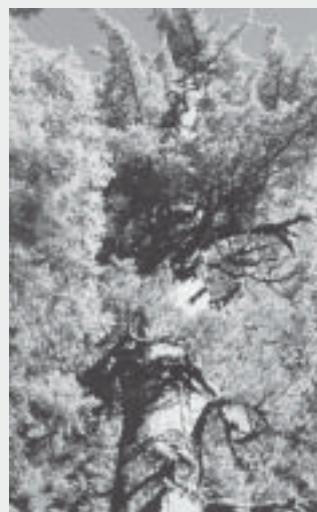
With growth and development comes the ever-increasing use of forest products, and thus ever-increasing threats to our native plants and their habitats throughout the Sierra Nevada. Vivian Parker addresses how these threats affect forested and non-forested habitats alike, and discusses the Sierra Nevada Framework.



PORT ORFORD CEDAR AND THE NON-NATIVE PATHOGEN, PHYTOPHTHORA LATERALIS by Cheryl A. Sinkiewicz and Erik S. Jules 14

Port Orford cedar (Chamaecyparis lawsoniana) is one of northern California's most treasured conifers, playing a major ecological role in numerous habitats. For the past several decades, the non-native pathogen, Phytophthora

lateralis, has been spreading across the cedar's range, causing widespread mortality and an increasing concern over the cedar's fate.



TRIPLE THREAT FROM SOUTH AFRICA by Jacob Sigg 21

Consider three plants native to South Africa: Cape ivy (Delairea odorata), ehrharta (Ehrharta erecta), and yellow oxalis (Oxalis pes-caprae), and how their very successful reproductive biology makes each of them among the worst threats to native plants of coastal California.



WAYNE RODERICK (1920-2003) by Ron Lutsko 29

Tribute is made to eminent horticulturist, California botanist, and California Native Plant Society Fellow, Wayne Roderick, who passed away in August, 2003. Ron Lutsko writes of Wayne's life and contributions, and others share their remembrances of Wayne, made at his memorial service.

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THE COVER: In her article on page 5, Vivian Parker discusses the current and future threats to the remaining natural habitats, such as this old growth forest, in the Sierra Nevada. Photograph by E. Beckwitt.

GUEST EDITORIAL

Known for spectacular peaks and mountains, high elevation meadows, old-growth forests and more, the Sierra Nevada holds a special place in the hearts of many. For me, John Muir captures it best: *"Climb the mountains and get their good tidings. Nature's peace will flow into you as sunshine flows into trees. The winds will blow their own freshness into you, and the storms their energy, while cares will drop off like autumn leaves."*

As will be seen in Vivian Parker's lead article (beginning on page 5), today this place of wonder is under siege. Our past use of the forests, meadows, streams, and woodlands on national forests in the Sierra has put a strain on this glorious landscape. The health and persistence of many native plants and animals that depend on old forests, meadows, and streams are imperiled. Beyond this, these ecosystems themselves have been radically altered by our actions: beneficial fire regimes have been lost, water flow disrupted, and invasive non-native species have spread. It is now time to use the current "state of health" in the Sierra Nevada to inform the management of actions for tomorrow in order to restore the natural resiliency of species and ecosystems.

Sadly, the plan adopted by the US Forest Service in January 2004 for the Sierra Nevada will not result in healthy and resilient forests. This plan is driven by a desire to reduce limitations on grazing and thus better serve ranchers, and to increase the removal of larger trees to provide more valuable timber to the market. What the US Forest Service proposes is a management strategy for the Sierra Nevada that fails to consider the imperiled species and habitats affected by these actions, and also fails to plan adequately for their conservation. This new direction for planning parallels movement on the national front with the Bush administration's "Healthy Forest Initiative," which seeks to increase the harvest of larger, commercial timber in the name of reducing the risk of wildfire.

Your voice on behalf of conservation is needed now more than ever. You can play an important role by engaging your local (or favorite) Forest Service Ranger District. Find out what types of timber or grazing projects they are doing, ask how they are protecting sensitive species and habitats, offer alternatives for management whenever possible. When the Forest Service takes actions that you find acceptable, let them know this, too.

For those with a love for the Sierra Nevada but who do not live nearby, there are several useful websites listed on page 33. From a distance you can follow the activities on a given national forest or the region as a whole. When there are opportunities for public comment, please join others in voicing the need to conserve this treasured area. And for those who feel uncertain about what to say, share the Parker article with others to get them thinking about the issues at hand.

Everywhere we look today, our natural resources are being challenged. The California Native Plant Society holds a special place in this debate, for we are among the few who speak specifically to protecting native plant species and plant communities. It is our job to remind people about the beauty and glory of the Sierra's flora as well as its ecological importance. Lest people forget about the relatedness of all things, we should remind them of John Muir's words: *"When we try to pick out anything by itself, we find it hitched to everything else in the Universe."*

Sue Britting
CNPS President, 2000-2003

USEFUL WEBSITES AND CONTACT INFORMATION

Sierra Nevada websites:

See "Notes and Comments," p. 33

California Native Plant Society:

www.cnps.org, with links to conservation issues, chapters, publications, policy, etc.

To sign up for "NPCC News," e-mail news on native plant science and conservation, send a request to npcc@cnps.org.

For updates on conservation issues:

Audubon Society www.audubon.org

Center for Biological Diversity
www.sw-center.org

Natural Resources Defense
Council
www.nrdc.org

Sierra Club
www.sierraclub.org

Wilderness Society
www.wilderness.org

For voting information:

League of Women Voters
www.lwv.org, includes online voter guide with state-specific nonpartisan election and candidate information.

US Senate
www.senate.gov

US House of Representatives
www.house.gov

California State Senate
www.sen.ca.gov

California State Assembly
www.assembly.ca.gov

To write letters:

President George W. Bush
The White House
1600 Pennsylvania Ave. NW
Washington, DC 20500

Senator Barbara Boxer
or Senator Diane Feinstein
US Senate
Washington, DC 20510

Your CA Representative
US House of Representatives
Washington, DC 20515

UPDATE ON THE SIERRA NEVADA— STILL IN PERIL

by Vivian L. Parker

As this issue of *Fremontia* goes to press, the landmark Sierra Nevada Forest Plan Amendment (the “Framework”) signed by then Regional Forester Bradley Powell in January 2001 is under attack. The Framework is the best science-based forest plan ever to emerge from the US Forest Service and has won two national planning awards. It would likely have won acceptance by the likes of Sierra Nevada defenders John Muir and G. Ledyard Stebbins as well, were they alive today.

The Framework amended forest plans for 11 national forests of the Sierra Nevada, from the Modoc Plateau at the northeast border with Oregon to the Sequoia National Forest. It is the result of 14 years of planning, research, and conservation efforts, and a cost of approximately \$22 million. The goal of the plan was to incorporate the best available science into forest planning in order to ensure the survival and health of the whole spectrum of natural resources and ecological processes that comprise the Sierra Nevada.

Striking a balance between the needs for resource protection and sustainable fuels management, the plan is supported by the Sierra Nevada Forest Protection Campaign, a coalition of some 80 different national, state, and grassroots conservation groups, including the California Native Plant Society (CNPS). It has been hailed as a landmark decision by a broad range of scientists, lawmakers, business leaders, and citizens (see sidebar on page 6).

Yet, with the ink barely dry on the decision document, the new leadership in the Forest Service under the Bush administration began to take aim at the plan, calling for a

review and subsequent dismantling of its landmark conservation elements. In December 2001 the new Regional Forester for California’s

federal forests, Jack Blackwell, chartered a team comprised of former district rangers, foresters, road builders, and other non-scientists to

This 500-year old sugar pine (*Pinus lambertiana*) is the nesting site for a pair of California spotted owls (*Strix occidentalis* ssp. *occidentalis*). Photograph by C. Thomas.



THE FRAMEWORK (SIERRA NEVADA FOREST PLAN AMENDMENT)

The Framework was signed into effect on January 12, 2001, during the closing days of the Clinton administration. Covering management activities on 11.5 million acres, the key components of the ten-year plan include:

- A commitment to restoration and protection of 4.2 million acres of managed old growth reserves.
- Limits on the harvesting of large trees (>20" diameter) on eleven million acres.
- Increased protection for rivers and streams and critical aquatic refuges, including a 300-foot stream buffer system, and 460,000 acres of critical aquatic refuges.
- Increased protection for at-risk wildlife, including key core area protection (639,000 acres) for the California spotted owl and Northern Goshawk and a one million acre Southern Fisher Conservation Area.
- Increased forest thinning ("thin from below" to reduce forest fuels), that is prioritized near communities in the wildland-urban interface.
- Fuels reduction program to focus on small diameter trees, brush, and surface fuels.
- Ending the destruction of hardwoods in timber management.
- Required analysis of the impacts of management activities on noxious weed proliferation.
- Increased monitoring of "management indicator species" and "species at risk" for both plants and animals.

ternatives—S1, or the Framework, and S2, the alternative now proposed by the Forest Service. The new Forest Service proposal in essence rolls back the restrictions on timber cutting that were the Framework's hallmark. If implemented as written, it will give the Forest Service discretion to maximize timber harvest and grazing, triple the volume of logging compared to the Framework, increase road building, and will reduce aquatic, riparian, and meadow protections. Essentially, the revision would turn back the clock in the Sierra Nevada to the days when resource extraction took precedence over all other considerations.

HISTORY OF THE SIERRA NEVADA FRAMEWORK

Considerable history preceded this recent turn of events, and understanding it sheds light on the continuing tension between logging interests and those who want scientific evidence to guide public policy. In 1992, the research branch

"review" of the Framework, and ostensibly to respond to the objections made to the plan by its opponents in the timber and ranching industries. After a year and a half of revision with limited public input, the review team released their recommendations in March, 2003, followed in June, 2003 by the "Draft Supplemental Environmental Impact Statement" (DSEIS) for the Sierra Nevada Forest Plan Amendment.

The DSEIS offers up two al-

Old-growth forests in the Sierra Nevada have been largely replaced by even-aged tree farms, called plantations by foresters. Wildfires are especially damaging to tree plantations lacking the diversity in tree sizes and classes seen in this photograph taken in Eldorado National Forest, 2002. All photographs by V. Parker unless otherwise noted.



of the US Forest Service produced the California Spotted Owl Technical Report, which documented threats to the old-forest-dependent owl (*Strix occidentalis* ssp. *occidentalis*) from habitat loss associated with logging, fire, grazing, and urbanization. (The closely-related Northern spotted owl [*Strix occidentalis* ssp. *caurina*] received protection under the Federal Endangered Species Act in 1990).

In California, the Forest Service responded with the short-term (two-year) 1993 California Spotted Owl Interim Guidelines and Environmental Assessment, known as the CASPO Guidelines. These were designed to protect the rare bird by conserving all trees greater than 30 inches dbh (diameter at breast height) and canopy cover up to 40%, and by protecting 300 acres around known nest sites. However, the CASPO Guidelines continued to permit logging of trees up to 29.9 inches, resulting in the destruction of suitable nesting and forage habitat across the range. The guidelines also lacked broader ecosystem protections for rivers and streams, and failed to protect other species associated with old-growth forests.

While the new rules were initially met by entrenched resistance among die-hard agency leaders, nevertheless the agency operated under these guidelines for eight years, during which time the owl continued to decline.

At the same time, in 1993, the US Congress commissioned and funded the Sierra Nevada Ecosystem Project (SNEP), a scientific review of the entire region. The need for the assessment came with the growing recognition among scientists, land managers, conservationists, and other citizens that the Sierra Nevada was in deep ecological trouble. During the decades following the 1960s, the forests of the Sierra Nevada had been decimated by high-grading (cutting the big-



Rattlesnake plantain (*Goodyera oblongifolia*) (above left), a terrestrial orchid that thrives only in the deep shade of mature forests. Although it has a wide distribution, this orchid is becoming increasingly rare in many regions of the continent due to loss of habitat, and is a federally-listed Endangered Species in Maine. • California lady's slipper (*Cypripedium californicum*) (above right) is an uncommon orchid (CNPS List 4) found only in California and southwestern Oregon. Its bog and streamside habitat is protected under the Framework. • Wild-ginger (*Asarum hartwegii*) (below) thrives on slopes in the shade of mature mixed conifer forests in the Sierra Nevada.

gest and oldest trees) and clear-cut logging. Many issues associated with this decline had already been documented by Tom Knudson in his Pulitzer-prize winning series "Sierra in Peril" published by the *Sacramento Bee* newspaper.

The precipitous decline of old-growth forests and meadows in the region and the concomitant decline in viability of species like the California spotted owl, Pacific fisher, American marten, willow flycatcher, mountain yellow-legged frog, Yosemite toad, and numerous plants were among the driving forces for the \$7 million study. An 18-member science team, comprised of eminent scientists in their respective specialties, with assistance by another 19 special consultants and many additional scientists, spent three years compiling data and assessments of the Sierra Nevada region. This resulted in the publication of the three-volume report, *Status of the Sierra Nevada*, published in 1996.

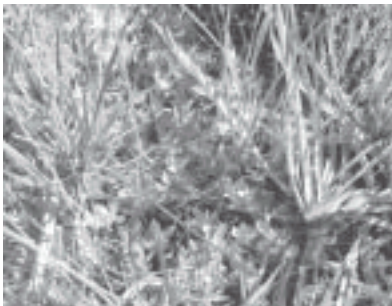
Unable to avoid the mounting scientific evidence documenting ecological decline in the region, and at the same time faced with pressure from the timber industry



opposed to the more restrictive CASPO guidelines, the Forest Service embarked in 1995 and 1996 on two failed attempts at designing a scientifically and legally sound management plan for the Sierra Nevada. In the end, both plans proposed doubling the amount of logging in the range while offering little in specific protection measures for the owl or other at-risk species. In 1996 grassroots conservation groups from up and down the range joined forces with national and statewide organizations including the Sierra Club, Natural Resources Defense Council, the Wilderness Society, the Center for Biological Diversity, and CNPS, ultimately forming the Sierra Nevada Forest Protection Campaign



Seasonal wetland filled with blue camas (*Camassia quamash*) (top and above left). • Under the proposed revision, protection is left to the discretion of Forest Service officials, potentially leaving meadow, seep, and streamside habitats open to increased grazing pressure, and threatening plants such as white-flowered bog-orchid (*Platanthera leucostachys*) and leopard lily (*Lilium pardalinum*) (above right). • Round-leaved sundew (*Drosera rotundifolia*) (below) is found occasionally in ungrazed Sierra Nevada meadows.



and representing over 80 member groups.

In 1997, the Secretary of Agriculture chartered a Federal Advisory Committee comprised of a panel of nationally known scientists to review the Forest Service's 1995 draft Environmental Impact Statement (EIS) for the region. The panel ruled that the Forest Service's

efforts to date were scientifically indefensible and insufficient.

The Forest Service then began efforts to completely revise the management plan for the Sierra Nevada, guided by the analysis found in the SNEP reports. Michael Dombeck, the new agency Chief, directed the region to "significantly improve the conservation strategy [for California spotted owls and all Sierran resources] through strong collaboration with partners and researchers" and to develop a strategy "that will stand on the solid foundation of the best available science."¹ This level of commitment was a breakthrough in natural resource management priorities.

By 1998 the Forest Service, under its newly-appointed Regional Forester Bradley Powell, had begun work in earnest on a new analysis. The Framework, as the new plan became known, focused on five "problem areas": 1) old forest ecosystems and associated species; 2) aquatic, riparian, and meadow ecosystems and associated species; 3) fire and fuels management; 4) noxious weeds; and 5) lower west side [west slope of the Sierra Nevada] hardwood forest ecosystems. Former Supervisor from the Lassen National Forest, Kent Connaughton, was named Project Manager. The best and the brightest among the Forest Service staff were put to work on development of the plan, with the full collaboration of the public, other agencies such as the California State Resources Agency, the US Fish and Wildlife Service, academics and other non-agency scientists. Over 120 public meetings were held across the state to invite public involvement and to fully incorporate the public's knowledge throughout the three years of development of the final plan.

In 2000, conservationists led by the Sierra Nevada Forest Protection Campaign, the Center for Bio-



Choke-cherry (*Prunus virginiana* var. *demissa*) (left) and Lemmon's blue-blossom, or Lemmon's mountain lilac (*Ceanothus lemmonii*) (upper right) are important species for birds and other wildlife that thrive in post-fire forest environment. They are often killed with herbicides under the intensive forestry management regimes practiced today. • Baneberry (*Actaea rubra*) (lower right), found in deep shade on moist soils near water, is seldom seen once forests have been heavily logged.



logical Diversity, Pacific Rivers Council, and others, petitioned the US Fish and Wildlife Service to list the California spotted owl, Pacific fisher, the mountain yellow-legged frog, and the Yosemite toad. Following the plan's publication in late 2000, over 47,000 cards, letters, and detailed comments by the public were received by the Forest Service, with more than 35,000 of these asking for stronger protections. And although conservationists were not overwhelmingly in favor of every

detail of the plan, virtually everyone agreed that it was a vast step forward in the direction of ecologically sustainable forest management.

Ultimately, although the Record of Decision signed in January of 2001 was followed by 234 appeals of the plan (most were one-page form-letter appeals by anti-government "wise-use" groups or the timber industry), all were dismissed in total even by the sometimes "industry-friendly" US Forest Service in Washington. This attested to the

solid scientific and legal foundation upon which the Framework was built.

RESISTANCE FROM WITHIN THE FOREST SERVICE

As many readers of *Fremontia* know, the history of the Forest Service has frequently been marked by resistance to new planning efforts designed to steer the agency to-

ward a firm scientific and ecologically sustainable foundation. It was no surprise to many, then, when the Bush administration called for a "review" of the landmark decision.

During the 32 months between the signing of the Framework Record of Decision (ROD) and the issuance of the latest Draft EIS amendment, the Forest Service made little effort to implement the plan. Opponents of the plan within the Forest Service objected to its science-based format, claiming that the plan would mire the agency in "analysis paralysis."

Meanwhile, biologists, ecologists, botanists, and other resource specialists in the Forest Service who were ready to implement the Framework were largely shut out of the review process, and in some cases, dissenting biologists were transferred and silenced. In short, science-based land management took a huge step forward in January, 2001 but then in 2003 took three giant steps backwards—at a huge cost to taxpayers and the environment.

TODAY: THE FRAMEWORK (S1) VERSUS THE PROPOSED ALTERNATIVE (S2)

While the Framework (S1) evolved out of concerns for declining wildlife—particularly those associated with riparian and old forest habitats—it was an ecology-based plan, and all plant communities in the Sierra Nevada would benefit from its implementation. Of particular interest to native plant lovers, the restrictions on timber cutting in old forests would ensure the protection of many plants associated with this habitat type.

Many species of orchids, such as phantom orchid (*Cephalanthera austinae*) and coral root orchids (*Corallorhiza* spp.), develop decades-

long complex relationships with mycorrhizal and intermediate-host plants deep in the shade of old-growth forest canopies. In the Sierra Nevada, the lady-slipper orchids (*Cypripedium californicum*, *C. fasciculatum*, and *C. montanum*) are associated with mature forests and disappear under forestry management regimes that emphasize commercial timber harvest. The Framework will also benefit old-growth-associated bryophytes, lichens, and fungi, many of which are important links in the food web of the California spotted owl.

Meadow and other riparian habitats in the Sierra Nevada region would see increasing protection under the Framework. Livestock grazing is excluded in wet meadows, bogs, fens, and lakes in Yosemite toad habitat, while measurable limitations (30–40% allowable utilization of cover) are placed on all other types of livestock grazing. Uncommon plants like the carnivorous bog plants, round-leaved sundew (*Drosera rotundifolia*) and California pitcher-plant (*Darlingtonia californica*), bog-orchid (*Platanthera* spp.), ladies tresses (*Spiranthes porrifolia* and *S. romanzoffiana*), bog asphodel (*Narthecium californicum*), moonwort (*Botrychium* spp.), and dozens of other meadow species would have a greater chance for survival in grazed meadows under this plan.

Under the proposed Alternative (S2), however, instead of measurable limitations on grazing, the Forest Service would be given discretion to subjectively determine "the amount and timing of grazing." For example, a population of plants could be eliminated from a site by cattle, while the site might still pass an arbitrary and subjective standard. Similarly, meadow habitats could become simplified over time, losing native plant diversity, while grass forage levels appeared sustainable.

According to biologist Dr. Susan Sanders, who since 1986 has

been actively engaged in studying the willow flycatcher (*Eximetus trailii adastus*), the Forest Service's alternative proposal (S2) fails to make use of the best and most recent information concerning threats to this species and the meadow ecosystem it depends on. The willow flycatcher, now seriously in decline in the Sierra Nevada, will face further degradation of its remaining habitat under the revision.

Regarding the use of fire as a land management tool, the Framework (S1) supports fuel reduction and prescribed fire in order to restore a more natural fire regime and protect remaining old-growth habitat. This would enhance viability for the hundreds of native plant species in the Sierra Nevada that are fire-adapted and, in many instances, fire-dependent. In addition, the Framework is consistent with the National Fire Plan and the Western Governor's Comprehensive Strategic Plan, both of which are designed to address wildfire concerns in the west.

Under Alternative S2, however, the Forest Service would thin 51,500 more acres than under the Framework, using mechanical methods more than prescribed fire, and would permit cutting trees up to 30 inches dbh in all land allocations. Canopy could be reduced to 40% closure in the proposed reversion, even though owl scientists have determined that the California spotted owl requires a minimum of 50% canopy closure. This increased level of disturbance and canopy removal, coupled with the increased creation of new roads, is likely to contribute to further declines in the viability of native plants and wildlife, and to further increase the establishment and prevalence of non-native invasive plants throughout the Sierra Nevada region—an issue of concern for CNPS.

By contrast, under provisions of the Framework, canopy closure cannot be reduced by more than 20% in general forest stands, and may

not be reduced by more than 10% in old-forest areas (4.1 million acres). In addition, canopy may not be reduced to below 50% total closure in these stands. However, even in old forests, the Framework permits thinning trees up to 12 inches in diameter, and allows for using fire to manage these stands in order to restore and enhance old-growth attributes.

Another issue of concern in the proposed Framework Revision is the broad discretion given to Forest Service officials to implement projects on any land allocation under the guise of restoration. Restoration is not clearly defined, but can be prescribed wherever the agency determines that “a more desirable condition for a given land allocation” is necessary. The term “a more desirable condition” is not defined. The plan lists “reforestation” as one appropriate prescription for restoration, including “harvest, . . . site preparation, planting, release [Forest Service jargon for herbicides], and animal damage control [use of strychnine to poison gophers].” Post-fire forest sites dominated by hardwoods and shrub species could be deemed undesirable in order to justify conversion of these ecologically important sites into tree farms.

THE QUINCY LIBRARY GROUP

Management of national forest lands in the Sierra Nevada has been further complicated by the passage in 1998 of the Herger-Feinstein Quincy Library Group Recovery Act. The Act directed the Forest Service to conduct a pilot project to increase logging on the Lassen and Plumas National Forests and the Sierraville Ranger District of the Tahoe National Forest for a period of not more than five years. The act was recently extended by another five years by Senator Dianne Feinstein, coauthor of the bill.



A portion of a Defensible Fuel Profile Zone, or DFPZ, on the Lassen National Forest, required by law under the Herger-Feinstein Quincy Library act. Photograph by S. Evans.

The Act, unpopular with most environmentalists, permits logging increases in the form of multiple small clearcuts on 8,700 acres per year (up to 280 million board feet per year), and calls for making fuel breaks (termed Defensible Fuel Profile Zones, or DFPZs) on 40,000–60,000 acres per year. The Act’s potential for harm was softened by Senator Feinstein’s requirement that the act be subject to the outcome of the scientific analysis contained in the Framework. Ultimately, the Forest Service determined that the logging intensity proposed under the Act could lead to federal listing of the owl, so it placed limitations on cutting in suitable owl habitat on the west slope.

Implementation of the Act under the Framework Revision, however, would reverse that decision, allowing large increases in logging and other disturbance. At the same time, new leadership at the US Fish and Wildlife Service under an administration philosophically opposed to the concept of endangered species listing has dramatically reduced

the number of new species that have been granted legal protection.

Case in point: the petition for federal listing of the California spotted owl was recently denied, although the owl is thought to be more threatened than the Northern spotted owl when it was listed in 1990. Conservationists are suing the agency to reverse the denied petition. Without federal protection and a forest land management plan that protects old forests, the owl and the habitat in which it lives may stand little chance for survival.

THE ROLE OF FIRE

The role of fire in Sierra Nevada ecosystems and how it has been perceived historically is central to understanding the controversy surrounding the Framework and the methods used to gain support for increased logging proposals such as the Herger-Feinstein plan and the Framework revision. For decades scientists have been documenting that fire is a natural factor in most

ecosystems of the West. Decades of fire suppression have played a large role in increasing fire hazard from the unnatural build-up of small diameter trees, shrubs, surface fuels, and “ladder” fuels in the forest understory.

Ancient forests in the West had burned regularly, but the huge trees with their thick bark were essentially immune to the fires which crept along low to the ground, consuming small shrubs and trees and reducing fuels. Other ameliorating conditions associated with old-growth forests include higher moisture content (huge fallen logs act like giant sponges, slowly releasing their moisture all summer long); shade from dense canopy cover that lowers temperatures; and the presence of deep duff that helps to preserve moisture while cooling the forest floor.

The loss of these old-growth characteristics in the forests is now seen as a contributing factor to the increasing numbers of fires in heavily-logged habitats. Other factors include the widespread accumulation of slash left behind after logging operations, and the increased risk from wildfire resulting from fragmented habitats, dry-edge habitats, uniform tree plantations, higher road density, human-related ignitions, and even climate change.

These factors all contribute to wildfires that burn very differently from the fire regimes that shaped the Sierra Nevada prior to 1849. And although it has been known for decades that the Sierra Nevada and much of the forest areas in the West are adapted to a frequent fire regime, this knowledge was rarely incorporated into an ecological context in forest planning. However, the Framework reflects this understanding, which is one reason it is a landmark document.

The 2001 Framework requires the Forest Service to concentrate its thinning efforts on small-diameter trees and brush in order to

hasten a return to more natural conditions that ensure that forests have the resiliency to survive regular fires. The use of prescribed fire, because of its many ecological benefits, is encouraged whenever conditions allow it to be reintroduced. In some instances, the use of mechanical thinning activities is a necessary first step in order later to introduce fire into a stand. The guidelines for accomplishing these goals are not difficult to understand, nor are they difficult to implement. The plan also requires that the agency work collaboratively with the California State Resources Agency and to use a science-based adaptive management approach to fire management.

The 2001 Framework also provided land managers plenty of flexibility to allow more intensive vegetation management to protect human life and property near forest communities. In the wildland-urban interface (2.5 million acres) near communities where high fire hazard has been identified, trees may be cut up to 30 inches dbh in the 319,000 acres of the “Defense Zone,” within 1/4 mile of dwellings and communities. Trees up to 20 inches dbh may be cut in the remaining “Threat Zone” that extends out an additional 1 1/4 mile from the Defense Zone. Under the Framework, the Forest Service could produce commercial timber for 5–10 years, while at the time accomplishing badly needed fuels reduction work in the wildland-urban-interface.

The current Framework is largely a restoration-based plan, rather than a commercial model for forest management. Therein, more than anything else, lies the rub. Forest Service die-hards wedded to the “get the cut out” philosophy that was common during the peak of the Forest Service logging days seem unable to understand or accept the ecological model of restorative forest management. They are aided

and abetted by the timber industry in pursuit of a larger bottom line, regardless of the ecological costs. The Forest Service now argues that it cannot implement the Framework because it needs the revenue from cutting more of the largest trees in order to finance the necessary non-commercial thinning. Yet the millions of dollars that were spent “re-analyzing” the Framework could have been used to implement sustainable forestry management. Environmentalists argue that the Forest Service needs to restructure its budgetary framework, begin implementing the Framework, and prioritize the thinning in the wildland-urban interface.

SWEEPING NEW REVISIONS OF EXISTING LAW

The proposed Framework revision is California’s special edition of the one-two-three *punch* which comprises the assault on our National Forests known as the Healthy Forest Initiative. A recent analysis of this initiative and court arguments under the Bush administration by Defenders of Wildlife summarized the situation well:

“Despite the deceptive rhetoric employed by Bush administration environmental officials, the Forest Service is engaged in the most dramatic revision of forest management policy in agency history. Unchecked, the changes proposed by the Bush administration in response to its litigation failures will destroy the balance of ecological, commercial, and recreational values that have ensured the productivity and vitality of our national forests. Unless either Congress or the federal courts intervene, the Forest Service of President George W. Bush may do permanent harm to this nation’s irreplaceable forests.”³

The closing date for taking public comments on the proposed revi-

sion to the Framework (S2, also called the Sierra Nevada Forest Plan Amendment Draft Environmental Impact Statement) was September 12, 2003. A final decision is expected to be released by the Forest Service before the end of the year.

EPILOGUE

In January, 2004 the Forest Service issued their final Record of Decision and Final Supplemental Environmental Impact Statement for the Sierra Nevada Forest Plan Amendment, reaffirming the proposed draft revision from June, 2003, and rolling back the key conservation measures found in the 2001 Framework. The decision was made in spite of a highly critical internal review from the Forest Service Washington DC office in September, 2003. At the same time, a regional science consistency review effort, comprised of interagency and academic reviewers, gave poor marks to the Forest Service, citing failure to appropriately apply the best available science.

The revision was also the subject of highly critical review by research scientists in the fields of Sierra Nevada forest ecology and included owl and fisher scientists, fire ecologists, and other specialists. Senators Barbara Boxer and Dianne Feinstein opposed the revisions, as did Mary Nichols (Secretary of the California Resources Agency), Bill Lockyer (California Attorney General), Representative George Miller and current Governor Arnold Schwarzenegger.

The words of eminent old-growth ecologist Dr. Jerry Franklin best summarize the feelings of many who are disappointed in the revision of this landmark management plan: "*I believe that it is a major step backward from the ecologically sound approach that had been adopted...In my view, you are proposing to homogenize the Sierran na-*

tional forests with your proposed new approach. I view your selected alternative as a significant step back from the Sierra strategy."

WHAT YOU CAN DO

The 2004 revisions can be appealed by anyone concerned about Forest Service management of the Sierra Nevada. The last day to file an appeal is April 29, 2004. Under the National Forest Management Act (NFMA), Section 36 CFR § 217.9, your appeal should contain the following: 1) State that the document is a Notice of Appeal pursuant to 36 C.F.R. 217; 2) Your name, address, and telephone number; 3) Identify that you are appealing the *Final Record of Decision and Final Supplemental Environmental Impact Statement for the 2004 Sierra Nevada Forest Plan Amendment* dated January 21, 2004; and 4) Identify the name and title of the Deciding Officer: Jack Blackwell, Regional Forester, Pacific Southwest Region, USDA Forest Service; 5) Identify the portions of the document you are appealing and state the reasons for your objection and the specific changes to the document that you believe are necessary.

Send your appeal to: Chief, USDA Forest Service; Attn: Appeals—Barbara Timberlake (Mail Stop 1104); 1400 Independence Avenue, SW; Washington, D.C. 20250-1104. Alternatively, send e-mail to appeals-chief@fs.fed.us, or send a fax to: (202) 205-1012.

A copy must also be simultaneously be sent to: Regional Forester; USDA Forest Service, Pacific Southwest Region; 1323 Club Drive; Vallejo, CA 94592. Alternatively, send e-mail to appeals.pacificsouthwest-regional-office@fs.fed.us, or send a fax to (707) 562-9091.

Further information about filing an appeal can be found at: www.sierracampaign.org.

ACKNOWLEDGMENTS

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PORT ORFORD CEDAR AND THE NON-NATIVE PATHOGEN, *PHYTOPHTHORA LATERALIS*

by Cheryl A. Sinkiewicz and Erik S. Jules

For botanists traveling in northern California and southern Oregon, one of the greatest delights is spotting the large and elegant tree, Port Orford cedar (POC). While found across a relatively small region, this conifer plays a surprisingly important ecological role in many habitats, including riparian areas, serpentine soils, sand dunes, and coastal plains. Among the many characteristics of POC, its straight grain and extreme resistance to rot have made it equally valuable to builders and artisans, although working with old-growth POC lumber is becoming increasingly rare.

Unfortunately, both the ecological and economic services that POC provides are at great risk. Since 1952 the native range of POC has been steadily invaded by a fatal, non-native root pathogen, *Phytophthora*

lateralis. This pathogen has gradually advanced into large portions of the cedar's range, spreading with the aid of human and animal activity into even remote watersheds. Many POC stands have been reduced to a fraction of their former abundance by *P. lateralis* infection, and longer-term impacts of this pathogen are a growing concern among land managers and conservationists alike.

TAXONOMY AND NATURAL HISTORY

Port Orford cedar (*Chamaecyparis lawsoniana*) is a member of the Cupressaceae and is the largest of eight taxa in its genus. These include Alaska cedar (*Chamaecyparis nootkatensis*) and eastern white cedar (*Thuja occidentalis*) from North America, and five additional species found in eastern Asia. Other common names used for POC are Lawson cypress, Oregon cedar, white cedar, ginger pine, and Port Orford white cedar. POC has reddish-brown bark, flattened branches, and scale-like leaves. It can sometimes be confused with Alaska cedar, incense cedar (*Calocedrus decurrens*), and western red cedar (*Thuja plicata*), but is generally easy to identify by the x-shaped stomatal bloom on the underside of the leaves. POC's spherical cones, comprised of 7–10 scales, are also useful to differentiate it from the latter two cedars.

POC is endemic to southwestern Oregon and northwestern California, with the greatest abundance of trees occurring in Oregon. Its range stretches from the Pacific coast to approximately 70 kilome-

ters inland, and cedars can be found up to 1,500 meters in elevation. Old-growth POC trees often reach 30 to 60 meters in height and can be up to 2 to 3 meters in diameter. They can live up to 900 years of age. The largest known POC is found south of Powers, Oregon, at 69.8 meters in height and 3.65 meters in diameter.

Large POC trees exhibit an unusually high resistance to decay and insect damage due to high levels of volatile oil that give trees a strong, characteristic ginger-like odor. Because of these wood properties, individual trees are able to persist for many years after death. Amazingly, tree ring studies have shown that in some cases, dead specimens can remain standing for over 100 years. Field studies have revealed one cedar that is still standing after its death in 1738. Along with its thick, fire-resistant bark, POC's decay resistance provides for a stable, long-lived tree in many habitats.

POC is found in a wide variety of vegetation types. On the California side of its range alone, POC is an important member of at least 34 named associations. These range from mixed conifer stands—where POC can be found, for example, with western red cedar, Douglas fir (*Pseudotsuga menziesii*), sugar pine (*Pinus lambertiana*), and white fir (*Abies concolor*)—to California pitcher plant (*Darlingtonia californica*) fens, where POC is the only tree found within the fen. In part, POC's ability to grow with so many other trees is due to its wide tolerance of soils. POC is found on soils derived from numerous parent materials, including quartz diorites, metavolcanics, sedimentary materials, and ultramafics (including

Foliage and cones of Port Orford cedar.
Illustration by A. Pickart.



serpentinite, dunite, and peridotite). Interestingly, POC can be found growing directly on sand dunes near Coos Bay, Oregon.

Although POC has a seemingly wide ecological amplitude within its range, it is quite limited to areas with high availability of water. Because of this limitation, POC is often found growing along streams where its roots are in direct contact with flowing water. Although POC's role in stream habitats has not been quantified in any comprehensive study, research and observations suggest that POC may play an important ecological role in these sensitive habitats.

Cedars in riparian areas help to shade the stream, reduce water temperatures, and stabilize streambanks, which are vulnerable to erosion during high winter flows. Large cedars can also act as an important stream channel-forming agent when their root systems become large enough to withstand channel movement. Once dead and fallen onto floodplain surfaces or into streams, POC's large trunk, decay-resistant wood, and exceptionally long residence time provides lasting and diverse habitat for salmonids and other aquatic life.

POC is particularly important to streams flowing through the Josephine ophiolite, an extensive, botanically unique area of ultramafic soils on the Oregon-California border. Ultramafic environments are nutrient poor, have low calcium to magnesium ratios, and contain levels of metals toxic to most plants (e.g., copper and zinc). On ultramafics the cedar is often the only large conifer in riparian areas and may help improve soil fertility by incorporating calcium into the soil.

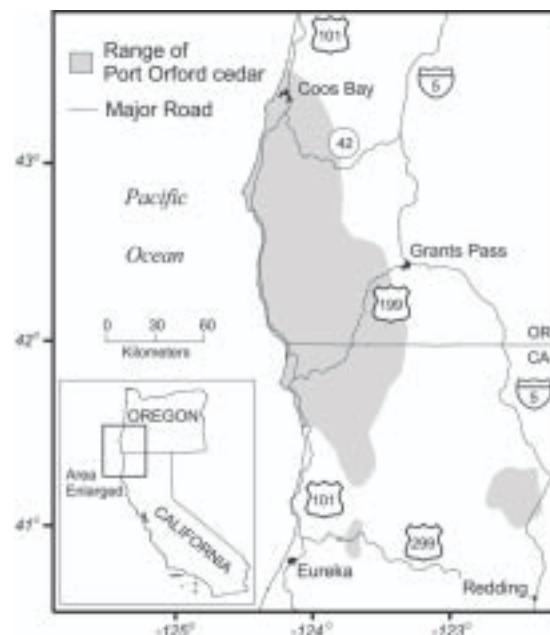
The Josephine ophiolite is also home to most of the known *Darlingtonia* fens, unique wetlands that contain rare and endemic plants such as California pitcher plant (*Darlingtonia californica*), Waldo gentian (*Gentiana setigera*), Oregon

willow-herb (*Epilobium oreganum*), large-flowered rush-lily (*Hastingsia bracteosa*), purple-flowered rush-lily (*Hastingsia atropurpurea*), and western bog violet (*Viola primulifolia* ssp. *occidentalis*). POC is the dominant tree in these fens and is likely an important player influencing nutrient cycling, shade availability, fuel loads for fires, and erosion rates.

POC is also valuable to the timber and horticultural industries. There are approximately 220 cultivated varieties of POC used in landscaping applications, and they are readily available in North America as well as Europe. POC is easily propagated for landscaping since it is able to reproduce from seed at a very early age, and cuttings are easily induced to form new roots. In the best of nursery conditions, sexual reproduction (cone production) can begin within the first five to nine years of life.

In the timber trade, POC has historically been a valuable resource demanding a high market price. In the late 1800s, POC brought at least twice what redwood and Douglas fir sold for in San Francisco. Attributes that have made POC such a desirable wood to work with include its beautiful white sapwood (sometimes indistinguishable from its heartwood), its small knots, lack of splintering and tearing, and an ability to hold paint better than most other woods. Through the early 1900s it was utilized in the construction of ships and houses. At the peak of its production in the 1920s and 1930s, POC was used in the making of venetian blinds and electric storage battery separators, as well as in the construction of airplanes during World War I. An increased demand for storage battery separators during World War II led to POC's classification as a "critical material."

Besides small specialty uses, there has been little domestic production of POC for several decades. Starting in the 1960s, commercial



Range map of Port Orford cedar. Map by D. Ritts.

production primarily served the export market to Japan. Due to its resemblance to the traditional Japanese hinoki cypress (*Cupressus obtusa*), which is no longer available in Japan, POC has been highly prized by the Japanese for use in the construction of temples and shrines. For a time, prices paid for large trees were exceptional, although this market has largely disappeared due to changes in the Japanese market and the restrictions on harvesting of POC in National Forests.

THE CULPRIT: *PHYTOPHTHORA* *LATERALIS*

The genus *Phytophthora* (meaning "plant destroyer") is commonly known as a fungus and was once thought to be a member of the fungi kingdom, Kingdom Myceteae. Currently however, *Phytophthora* is placed in the Kingdom Chromista, Phylum Oomycota. Once thought of as a "typical fungus," the Phylum Oomycota (or Oomycetes) is now known to vary at the molecular level



Old-growth Port Orford cedar along riparian area. Photograph by B. Ullian.

from the true fungi. For example, the cell walls of oomycetes contain cellulose and the amino acid hydroxyproline, unlike the cell walls of fungi, which are composed of chitin (a complex polysaccharide carbohydrate also found in animal exoskeletons and nematode egg shells) and glucans other than cellulose. The nuclei of oomycetes contain two sets of chromosomes, compared to fungi which only possess a single set of genetic information. Phylogenetic studies have shown the Oomycota to be a monophyletic group, having evolved from a common ancestor, the heterokont photosynthetic algae.

The family Pythiaceae contains the two closely related genera *Phytophthora* and *Pythium*. Both of these parasitic genera thrive in moist conditions on foliage and in soil. *Pythium* actually has the ability to act as a parasite on some *Phytophthora* species. For instance, *Pythium oligandrum* has been found to be an effective biological control for *Phytophthora infestans*. *Phytophthora*

infestans is the pathogen responsible for the Irish potato blight and the first taxa to be named in the genus. Now a large genus of over 50 mostly rare species, *Phytophthora* has been found to affect an amazingly wide variety of cultivated and wild species with diseases such as sudden oak death, black pod of cacao, black shank of tobacco, and root rot of the avocado tree.

In 1923, *Phytophthora lateralis* was first reported affecting POC in the commercial nursery industry near Seattle, well outside the cedar's range. This resulted in the eventual collapse of the industry in less than 20 years after the initial discovery. The pathogen was finally named and fully described in 1942 by Tucker and Milbrath. Unfortunately, in 1952 *P. lateralis* had been carried south, almost assuredly by a vehicle, and was reported within the cedar's native range. Although the origin of *P. lateralis* remains unknown, its extreme virulence and episodic nature on POC clearly indicates that it is a non-native pathogen. Much later, in 1991, the Pacific yew (*Taxus brevifolia*) was reported to be a host for *P. lateralis*. Mortality is much lower for the Pacific yew, and is highest when present along streams with infected POC.

Infection of POC by *P. lateralis* initiates at the tree's roots, and symptoms of the host's impending mortality can occur after a few weeks or a few years, depending on the size of the tree. The first obvious symptom of infection is a change in foliage color from green to yellow, then to reddish brown, and eventually to brown. Symptoms of infection are most obvious after colonization of the entire root system, after which mycelial growth of *P. lateralis* (i.e., the asexually growing, or vegetative component of the pathogen) girdles the root collar and travels as much as 50 cm up the above-ground vascular cambium. Infected roots often appear dark brown and saturated with water and the above-ground cambium is also stained a diagnostic dark brown.

When POC becomes stressed during this process of infection, it is vulnerable to invasion by bark beetles and secondary fungi, which may further stress the infected trees. Death of the entire tree crown is most visible across the landscape in late spring and summer when moisture stress can become extreme. Importantly, the time between initial infection of the roots and death of the tree can be as short as a few weeks for small seedlings, and up

Port Orford cedar lining a pond. Photograph by B. Ullian.





Port Orford cedar root system along Silver Creek, Oregon. Photograph by B. Ullian.

to seven years or longer for old-growth trees. Large trees also differ from small trees in that they tend to have higher infection rates due to their larger root systems, which provide an easier target for incoming spores.

Spread of the root rot disease occurs in one of two main ways: either it is transported by vehicles, or spread from nearby infected trees. In the first instance, spores are transported long distances (e.g., many kilometers) from infected POC populations to uninfected populations by vehicles traveling the many roads within the cedar's range. While infecting a host tree, *P. lateralis* will produce chlamydospores (or, less commonly, oospores) which are relatively durable compared to the spores that actually infect roots (zoospores). Chlamydospores can be picked-up in mud or organic material on tire treads, the underside of a vehicle,

or in goods being transported such as gravel or soil. If this material is released from the vehicle near uninfected cedar, a new infection may occur. Once spores are carried to an uninfected area, they can either be deposited near POC roots or washed into creeks and streams where the spores will be carried to vulnerable host sites. Because the spores of *P. lateralis* require moisture, exposure to sunny, dry conditions while in transit can kill the disease and reduce infection risk.

The deposition of chlamydospores near a potential POC host does not directly lead to infection. Rather, chlamydospores must germinate and produce a sporangium, from which flagellate, motile zoospores are released. Emerging from the sporangium, the zoospores have a tendency to move towards the water surface, possessing an ability to swim or move passively through water currents. Zoospores result in

the development of the vegetative mycelium that infects POC roots. In unfavorable conditions, zoospores can encyst themselves in a thick cell wall, in which case germination and infection may occur later.

The second major way in which the pathogen is dispersed occurs at a more localized scale after infection begins on a host tree in a newly invaded population. Because the pathogen on newly infected hosts will be making additional spores while developing on the tree, the new host acts as a source of dispersing spores for downstream trees. Spores from this initial infection can move downstream or short-distances downhill in moving water. As such, once a body of water is infected, all POC trees downstream are at high risk. Studies have found a mortality rate greater than 90% in cedars whose roots are in direct contact with water.



A creek with Port Orford cedar infected with *Phytophthora lateralis*. Note the road crossing the creek as well as the culvert. Dead trees (without needles) and dying trees (with drying foliage) are shown, as well as a healthy tree (far left). Infections usually are transported to creeks by vehicles, and subsequent infection spreads through the population downstream. Illustration by C. Sinkiewicz.

Movement of infection down broad slopes is also observed most commonly near coastal sites where overland flow of water occurs at least seasonally. Also, wildlife and humans (collectively termed “foot traffic”) can move *P. lateralis* over short distances. In the only study that has assessed the relative impact of foot and road traffic, foot traffic accounted for 28% of newly infected populations. Movement of disease by foot traffic, however, occurred over short distances compared with road traffic; the longest dispersal distance via foot traffic was 264 meters, while the longest dispersal by road traffic was 3.8 kilometers.

MANAGEMENT OF *PHYTOPHTHORA* *LATERALIS*

Because much of POC’s range is heavily roaded and includes both publicly- and privately-owned land, slowing the spread of *P. lateralis* into uninfected areas has been challenging and, unfortunately, largely unsuccessful. While some efforts are definitely working, new infections continue to be found in remote areas. Almost always, however, long-distance movement occurs along roads.

For example, in the Kalmiopsis Wilderness of southwestern Or-

egon, activities facilitated by motorized access on an old existing mining road are thought to be responsible for the introduction of the pathogen deep into the heart of the wilderness. More than eight miles of river within the wilderness, including the National Wild and Scenic Chetco River, are now infected by the pathogen. *Phytophthora lateralis* was also recently introduced into a roadless area watershed and Forest Service Botanical Area, where the point of infection was an unused gravel pit at the top of the watershed. The introduction of the pathogen into the Klamath River Basin in 1995 was thought to be

Infected Port Orford cedar displaying characteristic staining of cambium by *Phytophthora lateralis*. Photograph by E. Jules.



from off-road vehicles in a headwater area. The second root disease introduction in the Klamath Basin (1996) occurred on a paved road, more than 30 kilometers from the nearest infection source.

Yet the fact that *Phytophthora lateralis* is dispersed primarily along roads is also a reason for optimism. Put simply, if the disease were dispersed aurally, as are other virulent diseases, we would have limited options for controlling the spread. Controlling the movement of chestnut blight, for instance, was impossible due to its aerial mode of transmission. That disease was able to completely alter the composition of forests of eastern North America in just a few decades.

Likewise, sudden oak death is caused by the closest relative of *P. lateralis*, *P. ramorum*, but the two diseases differ in two fundamental ways. First, *P. ramorum* appears capable of moving through the air, though the precise mechanism is still under study. And second, *P. ramorum* is known to infect over two dozen host species, a list that continues to grow. In comparison, the mode of *P. lateralis* spread on POC is severely limited to the movement of spores in moist organic material and water, and to only one primary host. Therefore, predicting areas of high risk and controlling the movement of the disease vectors should be much easier than for air-borne diseases.

Because vehicles traveling roads are the greatest threat to uninfected POC, efforts to slow the spread of *P. lateralis* focus primarily on regulating roads. These efforts have been coupled with a large suite of other strategies (see sidebar).

There is general agreement that permanent road closures offer the greatest chance of success in preventing further spread of the infection. Although miles of old logging roads have been closed, a related issue of access rights on public land has made this a difficult strategy to

SLOWING DISEASE SPREAD

Strategies listed below are used to control the spread of *Phytophthora lateralis* to uninfected populations of Port Orford cedar (POC). The efficacy of some strategies remains untested.

- Permanent and seasonal road closure.
- Washing of vehicles after leaving infested areas and before entering uninfested areas.
- Using heavy equipment in the dry season only.
- Removing POC from road areas to lower infection risk (sanitation logging).
- Paving and elevating road surfaces.
- Directing water runoff away from POC areas.
- Utilizing pathogen-free water for road maintenance and fire fighting.
- Educating the public about the influences of human activity on disease transmission.
- Introducing POC to sites unfavorable to the spread of infection.
- Thinning of trees to create distance between potential hosts.
- Regulating harvesting of POC timber to reduce infection spread.

implement and enforce. Road closures during only the rainy season are easier to implement than permanent closures and are likely to reduce the spread of disease, although the risk reduction is difficult to quantify. The fact that some road surfaces can remain moist well into the summer within the cedar's range suggests that new infections may occur even in the dry season.

Public education efforts also face challenges, mainly because community opinion and support regarding the future of POC is highly variable. Even in light of the risk to such a valuable resource, resentment over road closures has led, for instance, to a large number of locked road-closure gates being vandalized. On the other hand, one place where efforts by federal agencies have not been contentious, and probably have been critical, is in the education of workers who frequently travel in remote areas, such as mushroom harvesters and bough cutting collectors (for floral arrangements). While there is strong agreement that these programs must continue

and perhaps grow, unfortunately their success is difficult to monitor.

The washing of large equipment and vehicles traveling between infected and uninfected areas is a technique often employed that may be useful in preventing further spread of the infection. The ability to completely free a vehicle of mud and organic material using high pressure hoses has been questioned and we are unlikely to have a clear answer to this question anytime soon. However, vehicle washing can probably reduce somewhat the risk that logging vehicles pose to continued *P. lateralis* spread.

Another method employed to slow spread of *P. lateralis* is sanitation logging, which involves the removal of POC trees along roads. This technique has two different goals, depending on the site-specific situation. First, in areas that are not infected, the goal of sanitation is to reduce the number of host "targets" along the road, thereby reducing the probability that an infection will occur. Second, in areas that are already infected, the goal is



Port Orford cedar is often the only tree found within *Darlingtonia* (*Darlingtonia californica*) fens. Photograph by E. Jules.

to reduce inoculum (spores) along roads that may be transported elsewhere.

At this time it is unclear how successful this technique may be, but preliminary studies are underway. Due to its potentially destructive ecological impact, this is a controversial practice that is being debated by land managers, the scientific community, and concerned community members. Proponents of sanitation logging have been criticized for supporting the technique since so far there is little evidence for its efficacy.

Plant pathologists are actively seeking POC trees that are resistant to *P. lateralis*. This work has shown promise and may be one of the best options for reestablishing

POC to areas already affected by *P. lateralis*. Some POC trees demonstrate heritable variation in susceptibility, which appears mainly to be expressed as an increase in time of death after exposure. Some individuals have lived while existing in infected areas for over 15 years. Although offering room for optimism, a fully resistant genotype has not yet been found. Resistant genotypes could be used to restore areas that once had healthy POC populations and aid the commercial production of POC timber. Of course, this would not provide ecological benefits for many years to come in areas where *P. lateralis* has decimated stands with centuries-old trees.

CONCLUSION

Although POC is in no danger of becoming extinct, its important ecological roles are certainly threatened. In infected areas, the loss of many of the larger, older trees due to *P. lateralis* infection has dramatically changed forest composition. In riparian areas, wetlands, and on ultramafic soils, its role appears to be unique and the effects of its loss poorly understood.

Fortunately, we already know enough about POC and *Phytophthora lateralis* to slow the spread of the root rot. There appears to be consensus among all groups that permanent road closures and a moratorium on new road construction are the most effective measures for excluding *P. lateralis*. That *P. lateralis* is spread primarily by way of the road system, then, should offer optimism to anyone working to conserve POC. Nonetheless, that optimism is met by stark reality—new infections along roads occur every year and the disease continues to spread across the cedar's range. Increased attention and more difficult decisions are needed from land managers and the public if

POC is to retain its importance in our region's flora.

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TRIPLE THREAT FROM SOUTH AFRICA

by Jacob Sigg

[Editor's Note: The section of this article on the invasive weed *Oxalis* appeared in a slightly different form in the California Native Plant Society (CNPS) Yerba Buena Chapter Newsletter and in CalEPPC News, journal of the California Exotic Pest Plant Council (now Cal-IPC News).]

In the California weed world it is axiomatic that most of our widespread weeds come from Eurasia, and, either by accident or design, they accompanied migrating human beings. But as time goes on, the percentage of pest species of Eurasian origin is decreasing as international trade and travel bring new plants and animals from everywhere.

From the perspective of the California coast, an increasing number of troublesome plants seem to originate in South Africa, especially from the region around Cape Town with its Mediterranean climate. Some seem to have an effective means of dispersal and thus escape cultivation. Sooner or later they find a niche in California's varied, complex topography and microclimates, and, lacking the pests that depleted their energy at home, proliferate exuberantly.

In this article I discuss three: Cape ivy (*Delairea odorata*), ehrharta (*Ehrharta erecta*), and yellow oxalis (*Oxalis pes-caprae*). I clump these biologically and strategically very different plants for discussion, because individually any one of them is capable of eliminating our coastal biodiversity, and together they constitute a triple threat of appalling proportions.

On the immediate coast the three frequently vie for the same habitat. Plants of yellow oxalis and ehrharta often compete directly with each other, although their ranges may eventually diverge at the edges.



Cape ivy (*Delairea odorata*), which has neither tendrils nor aerial rootlets to help it climb, is very successful in reaching into the upper levels of tall trees. Here it is aided by broken limbs which provide it a climbing scaffold. When such supports are unavailable, it can ascend to considerable heights by means of several stems twining around each other, thus strengthening the otherwise weak stems. This specimen is abundantly flowering, and the seeds, each with a parachute-like pappus, can travel long distances in the wind. All photographs by M. Bars unless otherwise noted.

Plants of Cape ivy frequently compete with those of ehrharta or yellow oxalis, but Cape ivy growth excels in cool, damp, shady environments where the plants clamber to the tops of large shrubs and trees. None of these three species has reached the limits of its potential

range, and populations of all three continue to expand aggressively. Their distributions, however, are different, and the changes of these distributions over time should be of interest. There is no coastal community or microhabitat that can't be invaded by at least one of this trium-



A diverse wetland community at this site has been all but converted into a monospecific stand of Cape ivy, save for three species of willows. San Francisco Recreation-Park Department Natural Areas Program staff, aided by CNPS volunteers, pulled the ivy out of the crowns of the willows, buying time until eradication becomes feasible. If volunteers had not done that, the well-watered ivy would overtop the willows in smothering masses, and they would then die for lack of ability to photosynthesize. There are still small surviving patches of sedges, water parsley, dogwood, coffeeberry, lady fern, and stinging nettle, which will serve as sources for restoration once Cape ivy has been eradicated.

virate, so in time they will likely exploit every niche.

While it may be difficult for some of us to envision a David-like ehrharta slaying a Goliath-like tree, not only is this possible, but it often happens in only a few decades. The incremental process by which small invasive plants displace much larger ones is insidious. We hardly notice it because it occurs slowly, subtly, surreptitiously. The main strategy employed by invasives to overrun native habitat—preventing parent plants from regenerating by choking out their seedlings—has proven highly effective. If the oak can't establish seedlings, it is eventually doomed. The dilemma for those of us involved in the work of conservation through control of invasives is how to communicate this scenario effectively to the public and policymakers. While humans can fairly easily comprehend the projected lifetime of a coffeeberry or coyote bush, envi-

sioning that of a several-hundred-year oak is another matter. Humans don't work on this scale, but nature does.

If there were some way of fast-forwarding to an invasion endpoint so people could see today what a majestic stand of California oaks will look like after two or three centuries without seedling regeneration, the public would be outraged and demand immediate preventive action. Unfortunately, we cannot do that, so we cannot "prove" our case. There is an unconscious assumption that the scene one sees now will remain that way. Every human generation takes as nature's standard or baseline what existed at first sight, or what they became accustomed to while young. Tragically, they remain unaware of what was lost in previous generations, as well as what is continuing to be lost incrementally during their own lives.

Since there is no natural check on the inexorable spread of invasive

weeds, what hope do we have for preventing the conversion of our coastal flora to an exotic triculture wasteland? For those familiar with the three plants, it doesn't take much imagination to envision carpets of ehrharta, oxalis, and Cape ivy from San Diego to Oregon. Are we willing to allow this holocaust scenario? These three plants are not only widespread, they are also exceedingly difficult to control, whether by manual, mechanical, or chemical methods. There is only one feasible technology: biocontrol, or the use of one non-native organism to control another.

Introducing an exotic organism, especially an insect, into a system where it didn't evolve is inherently risky, which makes the use of this control method very expensive initially, since it requires intense, rigorous research into the potential effects of introduction. The record of classical biocontrol is good, and whatever risk is entailed must be weighed against the risk of doing nothing. If the biocontrol is successful and controls the targeted weed, its cost will seem minuscule in comparison to the costs of damage caused by the weed and the use of other control measures. Currently biocontrol on wildland plants is grossly underfunded, and it will take broad, sustained effort to achieve a level of funding that can make biocontrol a viable option for resource managers.

CAPE IVY

Cape ivy is known to resource managers and volunteers on the California coast as an extremely difficult and worrisome plant to manage. Considering this, and the fact that it is a grave threat to our coastal flora, it is odd that nothing has been written about it in *Fremontia*, although it has appeared in chapter newsletters and in the *CalEPPC Newsletter*. Its low visibility before

the mid-1990s can be explained by its beauty and its ability to blend into the landscape; after all, it is very green and always looks like it belongs there.

My own history with the plant began in the mid-1950s when I had it sitting on a window ledge in my boardinghouse room. In 1960, as a gardener for the City of San Francisco, I was assigned to a section of Golden Gate Park called De la Veaga Dell, now known as the AIDS Memorial Grove. A small infestation of Cape ivy there had grown up through a groundcover of English ivy and climbed into rhododendrons, covering them with masses of foliage.

In attempting eradication I noticed its brittleness; every time I pulled a strand it would snap and each segment of stem that fell on the ground rooted and grew again. Brute force wasn't working. It took three years of patiently disentangling it by gently threading it through the English ivy stems, by which time the plant had won my respect—so much so that I was reluctant to declare victory for another two years.

For the next three decades I was preoccupied with horticulture, unaware of even the concept of ecosystems, much less the growing crisis in biodiversity. I knew nothing about Cape ivy's distribution in natural systems or the damage it was doing. When this painful knowledge eventually crept into my consciousness I became concerned, but found no one who wanted to hear about it.

That was until the fateful arrival of New Year's Day, 1994. I was volunteering for the Golden Gate National Recreation Area (GGNRA) along with Greg Archbald, who coordinated volunteers for them, in a spot adjacent to the Golden Gate Bridge. (For readers who don't know Greg, he has always had a special talent for organizing, and, with Huey Johnson, co-founded the Trust for Public



Land. These introduced Tasmanian blue gums (*Eucalyptus globulus*), as seen on Mt. Davidson in San Francisco, shed their outer bark yearly, a very effective defense mechanism against epiphytes and most climbing vines, including Cape ivy. English ivy, shown here, possesses strong aerial rootlets that serve as holdfasts; these rootlets are apparently able to penetrate the thin deciduating outer bark and fasten onto the smooth inner bark, enabling them to ascend to the very crowns of 150-foot trees. The opportunistic Cape ivy will then use the English ivy as a climbing ladder. In time, the trees become weighted down with tons of biomass. This, plus intense root and light competition, spells doom—something not grasped by the unsuspecting public, which values its “forest” (actually a plantation). The trees, unable to regenerate from seed in this scenario, disappear, to be replaced by a biological wasteland—a mono- or bi-culture of English and/or Cape ivy. This scene is about to be played out in many of our central and northern coastal forests.

Land. Greg was also one of the founders of the California Invasive Plant Council, Cal-IPC.)

For over two hours, Greg and I had been painstakingly disentangling stems of German ivy—as we knew it then—from the rhizomes of a minuscule 4 by 4 foot patch of the native creeping wild rye (*Leymus triticoides*). In a moment of truth, Greg exclaimed, “Jake, how much time have we spent on this tiny patch? There's two acres of it here!”

His epiphany fell gratefully on my ears. Help at last, I thought. “We've got to do something—we need to form a study group!” were his next words. As a recruiter and volunteer coordinator he knew the difficulty of mobilizing and energizing volunteers, and he knew that you needed to marshal facts first.

The study group was convened within days. It tapped latent interest in the plant, and very shortly German ivy was being talked about

CAPE IVY

Botanically, Cape ivy (also referred to as German ivy) is a member of the sunflower family. Known in the US until recently by the botanical name *Senecio mikanioides*, it is recognized internationally within the monotypic genus *Delairea* as the only species, *D. odorata*. I speculate that Germans, who formerly controlled portions of eastern Africa, may have grown the plant in their conservatories, hence the common name of German ivy. We do not know how, why, or when it came to this country.

Similarly, I long ago guessed that it was imported into the US as a houseplant. Unfortunately, that guess has now become part of the literature as fact, but I know of no corroborating evidence or records. All I have determined is that an herbarium specimen in the Jepson and University Herbaria at UC Berkeley was collected in Alameda County in 1892, and there was another specimen collected in Pasadena in 1905. The 1925 *Jepson Manual of the Flowering Plants of California* records it along streams and gullies of the Bay Area and San Luis Obispo. The 1951 *Weeds of California* by Robbins, Bellue, and Ball locates it “at several places along the coast.” The Munz 1959 *A California Flora* locates it on the southern and central California coast.

Jepson mentions nothing about seed, and fertile seed was not documented until recently; however, Munz states that achenes are glabrous—an important little bit of information that somehow eluded everyone until researcher Ramona Robison and others finally documented seed production. It may be that seeds were not viable until cross-pollinated. Jepson’s specimens were stipular, but many populations lack stipules, suggesting that two genetic strains may have come into contact, at which time fertile seeds were produced. None of this is documented, so we are left to guess. Most of the native populations in South Africa are without stipules.



Cape ivy is a member of the sunflower family, as indicated by the flowers in heads. Photograph by M. Bors.

up and down the coast. All the action regarding this plant started from that moment. Grassroots activists, homeowners, and resource managers had been becoming increasingly concerned about the plant, but no one was talking about it, and it was absent from the weed literature. Others who were un-

aware of it started to notice, and the German ivy problem began coming into focus. Four years later, due to a fortunate concomitance of factors, USDA Agricultural Research Service instituted research into its control through biological agents. That doubtless would not have happened had it not been for

the foundation laid by the study group.

Cape ivy (as it is commonly called today) has now infested every coastal county in the state. It is merely a matter of time before this noxious weed becomes one continuous infestation along the California coastline. Its seeds germinate in the dim light of the shade provided by shrubs and other tall plants, where very slowly they gather strength to start the climb to light. Cape ivy is capable of reaching 40 feet or more. It has been called the kudzu of the west because its infestations form thick, smothering mats over other vegetation, cutting off light and air and all but eliminating native plant and animal diversity.

Plants spread both sexually through seed, and vegetatively, as when stems touching the ground root, or through fragments that are carried to a new spot (washing downstream, for instance, or sometimes unwittingly transported by those attempting manual or mechanical eradication). Cape ivy grows vigorously in physically challenging environments, such as on ocean bluffs, or on steep slopes and streamside thickets of willows, blackberry, and poison oak.

Its growing habits make it extremely difficult to control by conventional mechanical or chemical means. The plant’s succulent stems are covered with a waxy cuticle that prevents desiccation, and if the plant runs out of water it shuts down and waits patiently for the next rain. That piece of stem lying on the pavement may look dead, but don’t be fooled. It simply looks dead, but is merely waiting for the chance to start growing again once it comes in contact with moist soil.

The large scale of its range of infestation argues against chemical treatment, save for discrete populations, and its use risks damaging native plants on which it grows. It is frequently difficult to inventory young infestations, because they of-

ten start in remote spots and are not readily apparent until well-developed. Infestations are spreading much faster than they can be controlled by physical and chemical methods.

Land managers in coastal regions are left with no successful technique for controlling Cape ivy, and the imminent threat is that this weed will fully overrun coastal habitats. No wonder it's listed as an A-1 wildland weed on Cal-IPC's ranking of *Invasive Plants of Greatest Ecological Concern in California*, and has just been declared a Noxious Weed by the State of California. (The state has just listed its first wildland weeds document pursuant to a CNPS bill enacted in 1992; Cape ivy was one of 11 on the list. Others include tree of heaven, *Arundo*, jubatagrass, Spanish broom, and saltcedar.)

The threat of Cape ivy to native habitat was rated so high at Golden Gate National Recreation Area and Point Reyes National Seashore that, in a national competition, these two parks won a three-year \$600,000 natural resource protection grant from the National Park Service for physical containment and documentation of Cape ivy infestations within their boundaries. Theirs was one of only three such awards. (The GGNRA won a second, larger grant, but the funds were diverted to homeland security.) Key factors weighed by the Park Service in their decision included the rapid expansion of Cape ivy in size and number of infestations, and threats to 12 listed or rare plant species, two federally-listed butterfly species, freshwater shrimp, and Coho salmon habitat.

There is preliminary evidence that Cape ivy may damage aquatic biota of coastal streams by interrupting food sources for aquatic species and possibly poisoning aquatic vertebrates and invertebrates due to toxic compounds contained in the plant. This could have implications for the future of anadromous fish, including endangered runs of

salmonids, and other wildlife depending on coastal streams and riparian zones.

Given this sobering picture and the high biological stakes, we need every possible weapon to combat this species. First and foremost is the development of a safe and effective biocontrol program for Cape ivy. Biocontrol agents emerged as the most promising long-term solution to this weed when researchers found out how well predatory insects controlled Cape ivy in its native South Africa, where it is an uncommon plant and known to few people.

The USDA Agricultural Research Service (USDA-ARS) began researching potential biological agents for Cape ivy in 1998. Funding for this type of research is not easily come by, and we were very lucky that USDA-ARS is undertaking it. However, it was necessary for Cal-IPC to raise private funds for the critical South African research. The project currently has broad community support, with the bulk of contributions coming from CNPS members and coastal chapters. The research originally focused on stem borers and leaf feeders, and has yielded two promising insects now in quarantine in California. However, the discovery of viable seed production here created a need for expanding the program to flower and seed feeders, which would necessitate additional support. This is a challenge, as there are many other priorities competing for Cal-IPC's attention, and there is no research into this aspect because of lack of funds. The program is continuing, but at a lower level than we would like.

EHRHARTA

Bermuda, crab, and quack grass are well-known among gardeners, and farmers and ranchers could add others, but whoever heard of

ehrharta (*Ebrharta erecta*)? The fact that the plant has escaped attention may simply be a tribute to its stealth—it has been insidiously proliferating for half a century while we have been blissfully unaware of it.

The genus name of many plants—iris, dahlia, rhododendron, camellia, magnolia, chrysanthemum—is also the common name. *Ebrharta erecta*, for lack of an established common name, has come to be referred to simply as ehrharta in the San Francisco Bay Area, where it is most common. (There is little danger of confusion with its destructive congener, *Ebrharta calycina*, as that one is universally known as veldt grass, and *E. longiflora*, presently in San Diego, is not considered much of a problem.)

A look at the strategies of *Ebrharta erecta* reveals reasons for its success. Although this article concerns the invasion of ehrharta into wildlands, its behavior in urban environments illustrates its essential character. It moves down San Francisco's streets, taking block after block, appropriating every niche or crack in the sidewalk and thence entering adjacent home gardens. It usurps habitat even from tough urban weeds: dandelion, knotweed, foxtail barley, mallow, filaree, and other formerly invincible toughies. Only the yellow oxalis, *Oxalis pes-caprae*, seems able to stand up to it.

Its seed can germinate in very low light, and it will grow undetected in the dark until it pushes through several feet of overlying plants, such as dense prostrate junipers. At this point it triumphantly displays its porcupine-like culms in the bright sunshine, by which time it has already dispersed copious seed.

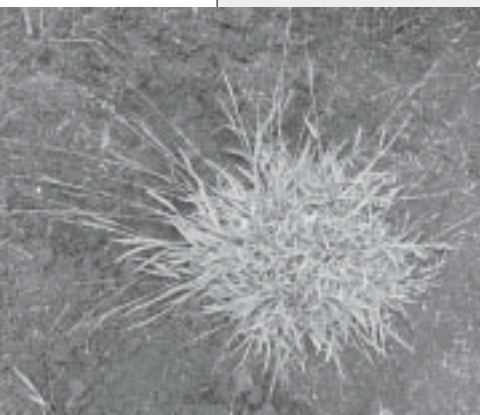
It is difficult to descry it among other grasses. Its tough, matted, fibrous root system generates jointed stems that lie on the ground or are slightly elevated—belying the specific epithet *erecta*—thus avoiding mowers or grazers. The stems go laterally into and through

EHRHARTA ERECTA

Ehrharta erecta was the first member of this genus to be reported in California. The urbanized San Francisco Bay Area was evidently its center of distribution and it is now widespread in the area. *The Jepson Manual: Higher Plants of California* (1993) lists its distribution as “eastern San Francisco Bay and Santa Barbara and Ventura counties.” It almost certainly was more widespread than that, merely undocumented. However, there is no question that its spread in the last ten years has been blitzkrieg-like and frightening. It infests wildlands in most or all of the north and central coast and is a common urban weed in southern California.

The plant was collected by G.L. Stebbins and Harlan Lewis as “adventive in Botanical Garden, UCLA Campus, Los Angeles” in May 1946 (the source of Stebbins’s research material?). As the only species in the genus in his 1959 *A California Flora*, Munz listed *Ehrharta erecta* as adventive in California: “Naturalized on the Berkeley campus of the University of California. Introduced from South Africa,” and added *E. calycina* (veldt grass) in his 1968 Supplement. Hitchcock, in *Manual of the Grasses of the United States* (1950), stated that *E. erecta* had “Escaped, Berkeley, CA (evidently from the campus of the University of California). Shows considerable competitive ability and may become of value in replacing some of the troublesome weeds.” Indeed!

J.C. Willis, in *A Dictionary of the Flowering Plants and Ferns*, remarks on the genus *Ehrharta* “. . . as useful pasture grasses for sandy soil.” The genus occurs in New Zealand and a few islands, but it is concentrated in South Africa, the origin of all the species of *Ehrharta* now naturalized in California.



Ehrharta (*Ehrharta erecta*). Photograph by M. Bors.

adjacent plants, even very dense ones, depositing seed on the other side. The fine branches of the flowering stalk hug its outermost reaches and support tiny flowers, resembling a fine-seeded native melic (*Melica* spp.). Then the branches open out in a tree-like manner and the gestalt becomes distinctive, no longer resembling the form of a melic.

Plants with flowers located at the extremities of long decumbent culms can deposit seed a half meter from the roots of the parent. In *ehrharta*, this trait, in combination

with prodigious tillering, assures a dense turf which is too tight for germination or growth of other plants. Once *ehrharta* gains territory, this perennial never yields it. When a niche is vacated, another *ehrharta* individual is the first to move in. Seedlings mysteriously appear from nowhere.

Weed warriors frequently find themselves operating in an information vacuum. Answers to basic questions, such as *ehrharta*’s dispersal system and seed longevity, are unknown. I find it in surprising places that stymie logical explana-

tion. Tiny seed is doubtless blown over surfaces by wind, but how does it spontaneously appear in the midst of a plant community? Birds might act as the dispersal vector, but there is no evidence in support of this theory yet. Does the seed pass through a bird’s digestive tract incompletely digested, or stick to their feet and feathers? Does it hitch a ride in nursery containers? The presence of *ehrharta* on the Farallon Islands—where it has nearly exterminated the local flora—suggests birds are the dispersal agents, although humans cannot be ruled out.

Roads and trails are notorious corridors for invasion by weeds, enabling exotics to penetrate otherwise resistant native communities. For example, in the dark Douglas fir forest of Point Reyes National Seashore, with its dense and thriving huckleberry (*Vaccinium ovatum*) understory, *ehrharta* lines miles of single-track hiking trails. One foot from the trail there is healthy native habitat. Whenever a shrub or tree dies or is toppled, *ehrharta* moves in; the seeds can germinate even from as little moisture as provided by a wet fog. When an infested area burns, I fear an exponential expansion of the usurper. Disturbance, including natural disturbance, favors weeds.

Ehrharta tolerates a wide range of conditions. On the coast, it grows on warm, dry banks or in cool, moist, deep shade. It favors pure sand, but also thrives in heavy soils, in soils that stay waterlogged for extended periods (thus a threat to wetlands), in thin, rocky soils, and in cracks in vertical rock faces. I found one plant growing high on a north-facing, solid uncracked concrete wall. A seed had found a little space to lodge in. How did the seed get there and how did the plant wrest a living? While it thrives on moisture, in its absence the plant will hunker down and wait for it.

Willis’s remark about the abil-

ity of *Ehrharta* species to thrive in sandy soils (see sidebar on page 26), the known distribution near the coast, and its predilection for fog, indicates that in terms of wildlands ehrharta invasion may remain primarily a coastal problem. However, ehrharta also thrives in gardens in Davis, California. According to Andy Sanders of the University of California, Riverside, it is a common urban weed in southern California, and he recently found it as a weed in landscaping at 3,000 feet near Cajon Pass.

There are a few reports of its presence in southern California wildlands. Well known San Diego weed warrior Mike Kelly, a former CAL-IPC president, states that it is common around San Diego and that all three species of *Ehrharta* have been found in Torrey Pines State Reserve, where *E. erecta* has displaced *Coreopsis maritima* and other natives. Does it invade wildlands away from the coast? While I know of no major infestations inland, due to its preference for moist environments, riparian areas should be closely monitored.

If biocontrol research is instituted, genetic differences between plants may be important. Is the plant extant in California the autotetraploid developed by the great geneticist, G. Ledyard Stebbins, or the natural diploid? Is the tetraploid weedier than the diploid? In the past, biological control for grasses was never considered because of possible risk to crops in the grass family. However, predators of members of this group can be as host-specific as for any other family, so control by biological agents is not out of the question. It may be our only hope.

YELLOW OXALIS

If one needs an illustration of how natural controls function on an organism, they need look no further than yellow oxalis (sour grass

or Cape sorrel, *Oxalis pes-caprae*), a scourge of the California coast. In its home range of South Africa, native fowl eat the foliage, a mammal digs the bulbs, and parasites infest bulbs. Freed from these pests and herbivores in California, its spread near the coast is untrammelled.

People are incredulous upon learning that viable seed from this plant has never been reported in California. An exasperated, "then how does it get around?" is usually followed by a stunned silence. The abundant production of bulb offsets and lateral runners by this plant partially accounts for its alarming spread, yet some unanswered questions remain: how does it travel so fast, how does it cross the roads, and how does it find its way into a second-story flower box? Contaminated soil may account for some occurrences like the flower box, but can't explain most of them, especially in wildlands. Gophers have been implicated in its spread, but cannot be the sole agent.

The latest version of the Cal-IPC weed lists published in 1999 did not address the question of how to rate yellow oxalis, treating it as "needing more information." Up to then it had been considered a weed of "disturbed areas" (a relative term—is there any part of low-elevation California that is not disturbed?). At the same time, oxalis began rising on my personal worry list, and in the last three years I've become panic-stricken as I see it proliferating across landscapes.

In heavy soils it multiplies rapidly; in sand it explodes. In a remnant native plant community occupying a stabilized sand dune near my house in western San Francisco, I watched a small semi-circular infestation with an approximate radius of 20 feet spread seemingly exponentially in approximately 15 years to dominate the whole ten-acre natural area, which is now on its way to becoming an oxalis-ehrharta biculture. I was too busy

with other concerns, so I wasn't watching its progress that closely, but it surely did not spread entirely by lateral runners. It must have leap-frogged, but lacking time-lapse photos, that will never be known. Now it may be too late to save the native biological community of this site.

Yellow oxalis certainly does like disturbance. (On an amusing side note, a weed brochure produced in the Bay Area recommended getting rid of oxalis by rototilling, a sure-fire way of quadrupling its numbers overnight! Please, please don't throw me in that briar patch!) However, it no longer requires active soil disturbance to become established, and it is an increasingly aggressive invader of native plant communities. Once established in a grassland, dune, or even shrubland, its advance is inexorable, and without human intervention the outcome is inevitable—it is on the road to creating a monoculture.

Although it is active only during the brief rainy season, when days are short and the sun is low in the sky, populations nevertheless expand rapidly and aggressively, displacing plants that are photosynthetically-active year-round. Free of the need to produce extra energy to support wildlife, the robust photosynthetic engine generates enormous quantities of energy to produce—in about February or early March—prodigious bulb offsets and lateral runners to invade surrounding areas and to incrementally muscle out native plants much larger than it.

A lateral runner travels several inches at a time; it is a peculiar fat, translucent organ resembling an icicle, with emergent slender, white, one-inch shoots at the tip (see illustration on page 28). It inserts itself into the middle of an already crowded clump of healthy natives, even into the tight center of a vigorous bunchgrass, sedge, or rush, where it slowly but steadily burgeons, capturing space and light. Its roots compete with the bunch-

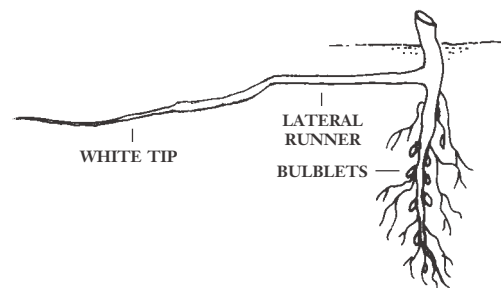
grass and even with shrubs such as coffeeberry or coyote bush. It is certain that it will prevent a new generation of that or any other native plant at the site. Thus, the long-term prognosis at such sites is for a monoculture of oxalis.

Eradication is difficult and time-consuming because of its bulb. Removing a small infestation in a discrete area is a feasible project. I was able to manually rid it from my garden, which contained many hundreds of oxalis plants, by persisting in removal of the above-bulb plant parts for four or five years. Repeated timely removal of top-growth will deprive the bulb of its stored energy. Optimal time for this is mid-winter, around January, just before it starts producing offsets.

Placing fingers at soil level beneath the crown and pulling gently but steadily with both hands will frequently get the whole taproot, especially when it is growing in sand. The bulb will probably remain and still have stored energy to produce

more top-growth. A repetition of this operation during the same season may kill the plant or draw down its energy so severely that one more pull usually effects kill, providing it is well-timed and does not allow time for the bulb to recharge its energy. Monitoring is required for an additional two years, as I have sometimes found a single, small leaf hiding among other plants, slowly building up the bulb's strength for a comeback.

For large tracts, spraying may be the only option. I don't know of definitive information on the effectiveness of herbicides on oxalis bulbs. Anecdotal information I have received says that 2% glyphosate is effective—providing you have a good surfactant, since oxalis leaves tend to shed water. Another anecdote holds that it is effective to spray it in the early part of its season, before bulb off-setting begins, around January or early February. I have not verified any of this information. Spraying may be the only



Lateral runner, root structure, and bulblets of yellow oxalis (*Oxalis pes-caprae*). Illustration by R. Pitschel.

current option for large infestations, but for the larger landscape only biocontrol offers hope.

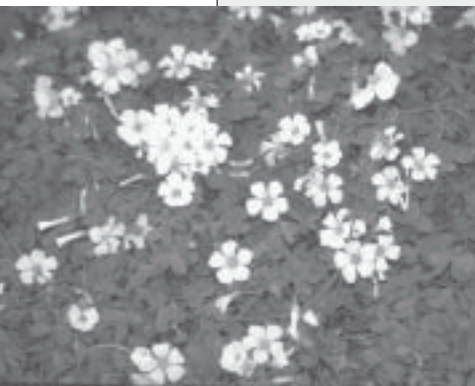
CONCLUDING THOUGHTS

If we are to preserve our biological heritage, weed control will require much greater attention and funding than presently available. The number of acres lost to development is quantifiable; community destruction by invasive species is not. The oft-cited statement that invasive organisms are second only to development as a threat to biodiversity is probably outdated. I think that the insidious effect of invaders has long since overtaken development in destroying diversity. We need to create a response that recognizes that troubling thought. Research is driven by public demand, and so far there is insufficient awareness of the seriousness posed by the weeds cited in this article and other pernicious plants destroying diversity. What appears to me a tragedy, an inevitable scenario yet to be played out, does not loom large enough in the rough-and-tumble realm of public priorities, where wildland weeds are rarely even noticed. Yet perhaps this is an overly gloomy assessment: awareness is rising, and the resources required for addressing the problem, while comparatively small to date, are also on the rise. Let us hope we do not lose this race.

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YELLOW OXALIS

Yellow oxalis (*Oxalis pes-caprae*) is a member of the same family (Oxalidaceae) as our native redwood sorrel (*O. oregana*). It is native to South Africa, but has been in the Mediterranean area since the 18th century and it doesn't produce seed there, in California, nor in Australia, where, in 1992, it was rated the number one target for biocontrol. I don't know how, when, or why it came to California. Bailey's 1930 *The Standard Cyclopedia of Horticulture* listed it (as *O. cernua*), so it was probably in the horticultural trade then. It is not listed in the wild in the 1925 *Jepson Manual*. The first mention of it as a weed known to me was in the 1951 *Weeds of California* by Robbins, Bellue, and Ball, where it was listed as *O. cernua*. These authors reported it in orchards in the San Francisco Bay Area and southern California. It may have been more widespread than that, and it may have been in cultivated sites before 1925.



Yellow oxalis (*Oxalis pes-caprae*). Photograph by J. Game.



Wayne Roderick in Bear Valley, circa mid-1980s, surrounded by flowers of adobe lily (*Fritillaria pluriflora*). Photograph by S. Edwards.

WAYNE RODERICK (1920-2003)

by Ron Lutsko

Wayne Roderick passed away peacefully in his Orinda home on August tenth. Befittingly, he was seed collecting with a close friend near Carson Pass when he took ill and had his first of a series of strokes.

To extol Wayne's personal attributes and contributions to the worlds of both botany and horticulture would far exceed the capacity of this writing. Wayne was truly a legend within his disciplines with a stellar reputation around the world. He displayed great wit and humor, was down to earth, generous, energetic, and shared his enthusiasm for plants with everyone.

When I first met Wayne in the 1970s, I asked him which group of

plants was his favorite. His reply was . . . "plants." He truly was plant happy, as he would put it, and coveted any plant that fit his outwardly ambiguous but internally rigorous criteria of "a good plant." During his final days I made a quick pur-

Adobe lily (*Fritillaria pluriflora*) flowers from Bear Valley. Photograph by S. Edwards.



view of his front porch collection, and found tropical orchids and begonias, Asian rhododendrons, African succulents, Mediterranean palms, native shrubs, and, of course, bulbs—bulbs from everywhere and everyone; from simple yet stalwart species to complex and high strung hybrids. Bulbs, corms, and tubers were truly his area of special interest and keen expertise. His bulb collection revealed an impressive breadth and contained rarities from around the globe. And thanks to Wayne, many people now have comparable collections. Generosity was synonymous with the name Wayne Roderick.

All this began when Wayne was a child. His mother was a gardener

EXCERPTS FROM WAYNE RODERICK'S MEMORIAL, EAST BAY REGIONAL PARKS BOTANIC GARDEN, OCTOBER 28, 2003

Thank you, Wayne, for being an inspiration and a guiding light in the world of plants. Your smile and knowledge, I always look forward to them, and maybe I will be able to excite someone into loving gardening and the world of plants around me.

—Zeke Palaceos

Wayne, you had a heart of gold, no matter how much you tried to convince us otherwise. You truly kept the spirit of gardening for us all. I will never forget your sharing not only of plants, but of philosophy and kind words.

—Kritin Yanker-Hansen

Jim Roof told me years ago (1973) that Wayne Roderick was the best bulb man in California. He also told me that Cook and Green Pass in Siskiyou County was recognized and eventually saved due to the efforts and enthusiasm of Wayne. We have lost a great soldier in the war against planetary destruction.

—Bert Johnson

His T-shirt [sweatshirt] said “most miserable bastard.” As hard as he tried to be mean, his gentle heart was always more on display than his assumed “meanness.” His passing is not only a loss to horticulture but to any of us who love plants.

—Barrie D. and Carol Coates

Wayne at the Regional Parks Botanic Garden, circa 1977. Photographer unknown.

Wayne was a more generous man than I am able to put into words. The constant gifts of plant material were merely one outward expression of his love of sharing, and his love for all the people in his life. His deepest gifts were those he gave to the hearts of those who shared his life. Those, doubtless, are the gifts from Wayne we will all carry to the end of our days.

—David A. Lomba

Wayne was fun, cute, and so generous not only with plants, but with his donation of time and service. I'll miss our Christmas parties together. He meant a lot to us all.

—Kathy Echols

There have been three people who have inspired my interest in plants over the years. Wayne was one of the most meaningful. I first knew Wayne at the UC [Botanical] Garden [at Berkeley] where he would pass on hints about seeds and cuttings and how to grow them. When he came to the Native Garden [Regional Parks Botanic Garden] there were even more tips. Now, when I go through my garden, tags with “bulb from Wayne,” “seeds from Wayne,” and others are all around and flourishing. His generosity was grand. What I shall remember most of Wayne is his honest friendliness and most affectionate “I hate you”—I shall miss him very much.

—James Denning



Wayne Roderick, circa 1961, with leaf of skunk cabbage (*Lysichiton americanum*) for scale. Photograph by W. Knight.

"What I have to put up with!" is what Wayne would always say when he would unload seeds or plants on us. Rarely coming empty handed, Wayne would stop by to give us hell. A great, generous friend, always ready with a smile backed up with a cranky comment. We will miss him.

—Sherrie Althouse

Wayne: thank you for sharing plants, places, and people with all of us. You gave so much of yourself to teach us. I will always remember.

—Barbara Coe

Wayne had me teaching classes on California natives at the Regional Parks [Botanic] Garden long before I was hired to teach at Merritt College. His enthusiasm and humor were legendary. He was like the "Pied Piper," leading armies of Tilden volunteers. We all loved him. Bless you Wayne!

—Judy Thomas

Wayne loved books nearly as much as he loved plants. The beautiful collection of rare books (the oldest a Gothic German herbal dating back to 1502!) was his gift to the Strybing Library 25 years ago, and since then he has continued to bring treasures to brighten my days. I will remember him with love and he will continue to inform my life as I share his books and their hand-colored illustrations with horticulture and botany students during library show-and-tell orientations.

—Barbara M. Pitschel

I'm going to miss Wayne so much—especially the way he said, "The things I have to put up with!" Who's going to say that now? Who's going to bring in envelopes of seeds and ask for labels? Who's going to ask me to type his annual letter to his friends abroad? Who's going to blow up balloons and turn the plant sale into the event of the year?

—Teresa LeYung Ryan

I have known Wayne for many, many years, only through seed packets and alpine writings, but I give many sincere thanks to Wayne, a distant and unseen friend, who has brought me much pleasure through growing the plants he collected and distributed, and his helpful writing.

—Rick Lambert

We may be sure that Wayne is botanizing the Elysian Fields.

—Paige Woodward

Wayne has been a very important part of my life. I admire his curiosity and zest for living, his adventurous spirit, his dedication to the protection, knowledge, and horticulture of native plants, and his love of flowers in bloom. Wayne's presence was so uplifting because he smiled and joked a lot, and I always left his house happier than when I came. He shared his vast knowledge about California's native plants and horticulture freely with me, always patiently making time and never asking for anything in return. Wayne was an incredible mentor and teacher and he will be deeply missed—he was a remarkable man.

—Kat Anderson



Wayne teaching with soaproot (*Chloragalum* sp.), circa 1970. Photographer unknown.



Wayne in the California section of the University of California Botanical Garden at Berkeley, circa 1970. Photographer unknown.

during his childhood in Petaluma. He ran the Roderick Nursery there as a young man and then moved to the Bay Area where he had two illustrious careers at Bay Area botanical institutions. His first was managing (and building) the California native plant collection at the University of California, Berkeley, Botanical Garden, from 1960 to 1976. After that he took over the directorship of the Regional Parks Botanical Garden until he retired in 1982. At each garden he built world class collections of California native plants, focusing particularly on herbaceous materials.

All the while he was extremely active in extracurricular activities related to his discipline. He was an insatiable plant adventurer, beginning each year with trips to Mexico and deserts of the southern US, then progressing up in latitude and altitude as the season drew on. By Oc-

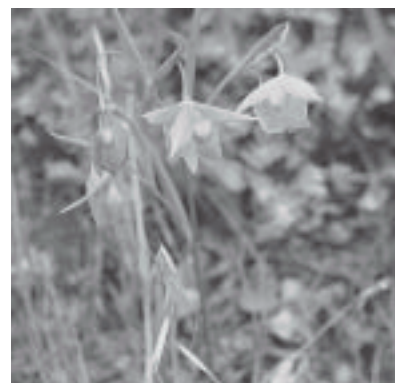
Wayne collecting globe lily (*Calochortus amabilis*) for the 1999 Oakland Wildflower Show. Photograph by H. Forbes.



tober or November he had collected enough seed and dried plant materials to put out his internationally distributed seed list and to provide local institutions with educational and ornamental material. He frequented England, Greece, and Turkey. He has also visited China, the Middle East, most of the Mediterranean basin, South Africa, Costa Rica, Chile, Mexico, and of course most of the US, particularly the west. He knew the British and American botanical institutions intimately and was active in many horticultural societies and groups throughout the world. He served on the board of the Ruth Bancroft Garden and on the horticultural committee to *The Jepson Manual*.

Wayne had many collections from, and made contributions to, all of these regions and institutions. He also made many, many friends throughout his travels. Wayne was an open-hearted and genuine spirit who embraced people and friendships wherever he went. I remember attending a lecture in San Francisco by a renowned British horticulturist who referred to him as "that old coyote, Wayne Roderick," surely an endearing sign of a long and close friendship with someone from another land. He even had a relationship with my studio manager instigated by his initial call telling her that I was going to catch hell if I didn't call him immediately! (She tracked me down quickly fearing that we had an irate client).

Wayne produced his own private list of wild-collected native plant seed for many years. This was not a commercial endeavor; he distributed it to private gardens and institutions around the world at no cost. I had the good fortune of participating in this endeavor with him for almost a decade. The two of us would merge our annual collections for distribution. I managed the mailing lists and through this learned just how many friends Wayne really had throughout the world. Sel-



Globe lily (*Calochortus amabilis*). Photograph by H. Forbes.

dom did a request for seed come to us without a personal inquiry, anecdotes of shared experiences, or family and garden pictures! My own daughters and wife know him as Uncle Wayne. This began when he brought over colchicum bulbs at each of their births, bare and in flower, to set on my daughters windowsill. He continued this celebration of their late summer and autumn birthdays year after year.

Wayne had many plant discoveries to his credit. *Ceanothus roderickii*, *Fritillaria roderickii*, *Erythronium purdyi* ssp. *roderickii* and *Erigeron glaucus* 'Wayne Roderick', to name a few. He has introduced and named many plants, amongst them, *Garrya elliptica* 'Evie', *Carpenteria californica* 'Elizabeth', and *Heuchera micrantha* 'Martha Roderick' (after his mother).

Wayne was always humble about his accomplishments and contributions. Due to his generosity, his discoveries and introductions will forever live on and be a significant contribution to the world of plants; he has earned a place alongside Lester Rowntree and Willis Linn Jepson. The world of horticulture and California botany will miss a legendary figure and those of us fortunate enough to have known Wayne personally will miss a friend in the truest sense of the word.

Ron Lutsko, Lutsko Associates, San Francisco, CA. ron@lutskoassociates.com

FROM THE ARCHIVES

By contributing articles for both this issue (pages 21-28) and the April 2003 issue of *Fremontia* ("Consider the Weeds of the Field—My How They Grow!"), Jacob (Jake) Sigg, past California Native Plant Society President, has made a great effort to educate us about the threat to the native plants of California posed by weeds.

Throughout the years, there have been many articles on weeds and their impact on native plants and their habitats published in *Fremontia*, and the reader who wishes to learn more should note those in three special "weed" issues of *Fremontia*: Volume 26 No. 4, October 1998; Volume 13 No. 2, July 1985; and Volume 12 No. 4, January 1985.

Other articles on weeds are listed below; the curious and concerned reader is encouraged to peruse these articles and to visit websites on weeds as listed in the "Notes and Comments" column of the *Fremontia* April 2003 issue (Volume 31 No. 2) page 34.

SELECTED ARTICLES ON WEEDS

- Barrows, C.W. 1994. Tamarisk control: a success story. *Fremontia* 22(3):20-27.
- Johnson, S. 1987. Can tamarisk be controlled? *Fremontia* 15(2):19-20.
- Bulman, T.L. 1988. The eucalyptus in California. *Fremontia* 16(1):24-27.
- Miller, L. 1988. How yellow bush lupine came to Humboldt. *Fremontia* 16(3):6-7.
- Anonymous. 1989. Control of the aliens: Unnatural plant communities in the Santa Monica Mountains. *Fremontia* 17(2):22-24.

COMPLETE YOUR SET

Back issues of *Fremontia* are available for sale from the CNPS Office, 2707 K Street, Suite 1, Sacramento, CA 95816; phone (916) 447-2677. Issues for Volume 28 and later (2000-present): \$5 each or \$10 for three. Issues before Volume 28: \$2.50 each or \$6 for three. Double issues priced as two single issues; shipping costs determined upon order placement.

NOTES AND COMMENTS

UPDATE ON JASPER RIDGE

The article "Plant Diversity at Jasper Ridge Biological Preserve" [*Fremontia* Volume 31, No.1, January 2003] indicated that Gairdner's yampah (*Perideridia gairdneri* ssp. *gairdneri*) and serpentine linanthus (*Linanthus ambiguus*) are found at the Preserve. Although both species were recorded by a knowledgeable botanist, Duncan Porter, in the 1960s, the JRBP herbarium does not have specimens of either species. Efforts are being made to determine their presence/absence.

BOOK REPLACEMENT FOR FIRE VICTIMS

There were a number of local

naturalists, botanists and other members of our CNPS community who lost their homes in the recent fires. Many have lost their reference libraries, along with their personal effects, offices, tools and supplies. Some of us, botanists or otherwise, have reference books (botany, ornithology, natural history, etc.) sitting unused on our shelves. If you'd like to help rebuild a fellow botanist's or naturalist's lost library by donating books (new or used), please bring them to the monthly CNPS San Diego Chapter meeting in the Casa del Prado in Balboa Park. If you cannot make it to the meeting, we can make other arrangements. We cannot guarantee that books or other donations will go to a particular person. If you know of someone's particular need, please contact that person directly. What we will try to do is to match needs with donations received.

Some of us may also have other surplus items (household, office, tools etc.) which these fire victims need. If you have something you'd like to donate, please contact us. If you lost your home or office in the fires, please send your "wish lists." (Fire victims and donors names will be kept confidential, unless they request otherwise; we'll keep track of who requests what, and who is donating what.) Donors and fire victims may contact Callie Mack at callie@sdccu.net. For more information, visit www.cnpsd.org/fire/donations.html.

SIERRA WEBSITES

For further information concerning the Framework and other forestry issues, including the Healthy Forest Initiative, and to find ideas and tools

to help you get involved, please visit the following websites: Sierra Nevada Forest Protection Campaign, www.sierracampaign.org; the CNPS federal issues page, www.cnps.org/federalissues/; and CNPS Framework comments (click on "Comment Letters," www.cnps.org/federalissues/).

Sierra Nevada Forest Protection Campaign (www.sierracampaign.org) is a coalition of over 80 conservation groups (including CNPS) that advocates for species and ecosystem conservation on Sierra Nevada national forests. This site contains the latest updates on national forest planning in this region.

Sierra Nevada Forest Plan

Amendment, US Forest Service (www.fs.fed.us/r5/snfpa/) houses the Forest Service planning information for the Sierra Nevada region. The final plan and the final environmental impact statement can be reviewed at www.fs.fed.us/r5/snfpa/final-seis/. Preliminary review shows that it solves none of the problems that caused CNPS to oppose the plan revision from its inception. The plan establishes new management for 11 million acres of Sierra Nevada national forests.

Problems with the revised plan include increased logging and road-building in sensitive areas and old forests, increased grazing in sensitive species habitat, and reduced clarity

and consistency in management of the area.

CNPS will keep you informed of opportunities for public input to the Forest Service on this revised plan. In the meantime, you may wish to write letters to the editor of your local papers expressing your views on appropriate land management in the Sierra Nevada. You can read CNPS comments on the Framework Revisions at www.cnps.org/federalissues/PDFs/CNPSFmwkRevis8.03.pdf. Don't forget to include your name, address, and phone number with your letters or they may not be printed. The papers will not print your address or phone number.

LETTERS TO THE EDITOR

Rare Plant Issue

The July/October 2001 issue of *Fremontia* (Volume 29 Nos. 3 and 4) had an extremely useful article entitled *How to Comment on a CEQA Document*. Besides providing practical information about Negative Declarations and Environmental Impact Reports, it made the point that often community members have more specific, relevant knowledge of a site's ecological issues than the person preparing the document. Several of us who had never before participated in an environmental review process followed the article's advice, reading and commenting on a Neg Dec for a project in our local park. Eventually the city decided that the effect of this project and other proposed projects warranted a complete EIR, addressing the cumulative impacts of past, present, and future park projects. It will be a great step forward for the long-term health of our wonderful park.

Even people who aren't technical experts can use their common sense and knowledge of an area in reviewing Neg Decs and EIRs. We want to encourage others in our community to start reading and commenting on environmental documents, and Taylor Peterson's article provides the best information we've seen on how to do this. I'm very pleased to see that the entire July/Oct 2001 issue is available online and even happier to learn that back issues of *Fremontia* can be purchased. They'll make great gifts for people who recently joined CNPS.

Also, I'm really happy to learn that I can purchase back copies of *Fremontia* for only \$5 or \$10 plus shipping. Last year, I had to choose between two friends who both coveted the Vernal Pools issue and several times I've regretted giving it away at all.

Susan Mason
Mt. Lassen Chapter

Tofieldia Clarification

On reading my letter published in *Fremontia* Volume 31 No. 1, I detected a typographical error of some omitted words in the paragraph on *Tofieldia* (p. 30) which make the sentence erroneous. [The sentence was incorrectly published as: "The genus *Tofieldia* has been removed from our flora and limited to *T. pusilla*, *T. coccinia* being returned to the genus *Triantha*. . . ."] The first sentence of the paragraph beginning on page 30 should read: "The genus *Tofieldia* has been removed from our flora and limited to *T. pusilla*, *T. coccinea*, and *T. glabra*. *Tofieldia glutinosa*, including three subspecies in the western flora, was returned to the genus *Triantha* by John Packer, . . ." etc., as in the published letter.

Kenton L. Chambers
Emeritus Professor of Botany
Oregon State University,
Corvallis, OR

BOOK REVIEW

Flowers From Fire, CD-Rom with photographs by Don Jacobson, Produced by Forest Issues Group, PO Box 1334, Nevada City, CA 95959.

www.forestissuesgroup.org. Price \$17.50 plus \$2.50 for shipping.

"By forces seemingly antagonistic and destructive, Nature accomplishes her be-

neficent designs," observed John Muir over 100 years ago. While the mainstream media is busy fanning our fears about forest fire, it's important to re-

mind ourselves that nature is infinitely wiser and more complex than even journalists might imagine. While those fears may be well-placed along the urban-wildland interface, the issue that never makes the headlines is the important role that wildfire plays as an agent for renewal, re-growth, and succession. From the ashes of even the most devastating fires, a rebirth inevitably follows—often with a riot of color rarely seen on the forest floor. This burst of creativity has been captured in a series of eloquent photographs by local glass artist, photographer, and forest activist Don Jacobson. The CD-Rom “*Flowers From Fire*” contains 72 art-quality, high-resolution color images of the flash of wildflowers that germinated in the ashes of the 2001 Red Star Fire in Duncan Canyon, upper North Fork American River watershed.

The images, which include alluring wildflower close-ups and bold washes of wildflower color at a landscape-scale, are excellent for printing at 8x11 or larger. Don’t be bashful—try zooming in for a closer examination of the flower’s reproductive parts, characteristics that are often diagnostic in wildflower identification.

The CD also includes a collection of 40 images as screensavers (PC only), which are easily downloaded from the folder, as well as a fairly complete plant list for the area in 2002. Navigate first to “Instruction Sheet” for a quick background description and instructions for downloading the screensavers. A free photo viewer for PC is provided, should you need one. In the folder titled “The Burn,” you will find several intriguing photos of the low intensity burn areas and large-scale landscape photos to get a sense of the mixed burn pattern, keeping in mind that burns of all sizes and intensity are important for maintaining forest biodiversity—not just low intensity fires. The size, shape, and intensity of fires produce different effects on the landscape and its many inhabitants.

Never mind that the CD is a bargain, it also comes with the satisfaction of knowing that 50% of the proceeds will be contributed to one of the area’s most effective conservation groups, the Forest Issues Group



Kellogg's lewisia (*Lewisia kelloggii*). Photograph by D. Jacobson.

(FIG). Its purchase is also a great way to acknowledge Don’s remarkable contribution to this community, including this generous gift of images, 19 years of service as a forest activist,

and as the creator and host of the popular KVMR folk music program “Long & Dusty Road.”

Carolyn Chainey-Davis
Redbud Chapter

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FROM THE EDITOR

Those of us who are at home in the natural environment know that it is always changing, both through the seasons, and through the years. Yet we fall in love with certain places, and come to expect to find our favorite plants in their specific habitats year after year, because undisturbed habitats manifest changes within a state of equilibrium. This issue of *Fremontia* includes three articles discussing our effect on nature, the first about how we should manage our impacts to answer practical human needs while being responsible stewards of the natural world, and the second two about the effects and possible ways to control human-introduced alien organisms.

In the first article Vivian Parker describes the Sierra Nevada Framework, a well-thought out plan to manage Sierra Nevada forests and related ecosystems, and how the current administration has proposed a revision to this plan that greatly reduces its conservation and wise-management goals.

Next is an article by Cheryl Sinkiewicz and Erik Jules, discussing the Port Orford cedar root pathogen, *Phytophthora lateralis*. This non-native fungi-relative has spread even into remote watersheds, and threatens not only Port Orford cedar, but the plant communities associated with this beautiful tree. In the third article Jacob Sigg informs us of the threat posed to native plants by three aggressive in-

troduced species: Cape ivy, ehrharta, and yellow oxalis. This companion piece to his article in *Fremontia* Volume 31, No. 2 helps us understand the insidious threat to coastal habitats posed by only three weeds.

Closing this issue is a tribute to Wayne Roderick, famed horticulturist and native plant enthusiast, written by Ron Lutsko, with comments from Wayne's memorial service. I only knew Wayne slightly, but am thankful for even that. He brought to the society the best qualities: abundant knowledge of native plants and how to grow them, generous sharing, and great humor. We will miss him.

Linda Ann Vorobik
Editor

CONTRIBUTORS

Susan Britting was President of the California Native Plant Society (CNPS) from 2001 through 2003. She is also the Science and Policy Advisor for the Sierra Nevada Forest Protection Campaign, where she works to promote sound management of national forests in the Sierra Nevada.

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Ron Lutsko is a San Francisco landscape architect, well known for his use of native plants. He received his training at the University of California, Berkeley.

Vivian L. Parker is a biologist and resource policy analyst for the California Indian Basketweavers Association. She is also the conservation coordinator for the Sierra Nevada forests for the CNPS Forestry Program.

Jacob Sigg, past president of CNPS, is currently chair of the CNPS Invasive Exotics Committee and conservation chair of the CNPS Yerba Buena Chapter.

Cheryl A. Sinkiewicz is a botanist and scientific illustrator living in northern California.

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