GROWING Points

Department of Environmental Horticulture • University of California, Davis

Restoration Ecology: Renewing Our Disturbed Landscapes - Part II

Restoring Native Perennial Grasses to Rural Roadsides in the Sacramento Valley

By Robert L. Bugg, Assistant to the Director, Sustainable Agriculture Research and Education Program, UC Davis, Cynthia S. Brown, Graduate Research Assistant, Dept. of Agronomy and Range Science, UC Davis, and John H. Anderson, Owner, Hedgerow Farms

Landscape disturbance due to road-building is pervasive throughout California. Rights of way that extend beyond road edges create sizable areas that require maintenance to reduce fire hazard and maintain motorist visibility. In rural areas, roadside management schemes emphasize herbicides and tillage to suppress resident vegetation. An alternative approach could involve the establishment and maintenance of native perennial grasses. These grasses may be grown in conjunction with other native flora and may provide habitat for desirable wildlife while potentially reducing the threat of flooding, erosion and siltation, wildfire, and incidence of resident vegetation.

Perennial sod-forming and bunch grasses were once common in much of California, including the Sacramento Valley and the surrounding foothills. However, by the mid-1800s, the native grasses were greatly reduced, presumably by a combination of prolonged drought, overgrazing by feral and domestic cattle, cultivation, and competition from invasive annual grasses and forbs introduced from the Mediterranean area.

There is growing awareness of and concern for the conservation of California's native flora. Highway rights of way represent thousands of miles of potential habitat for native plants, including grasses and forbs. Further, many find the complexity of established native plant communities more aesthetically pleasing than the stands of star thistle or wild oat that commonly line California roadsides. Along with increased public interest in native grasses and ecological restoration, there are now opportunities to reestablish portions of the native grasslands.

Figure 1. *Polyculture of perennial grasses established for this study in Yolo County, Sacramento Valley, California.*

The purpose of this study was to seed and evaluate establishment of non-native and native perennial grasses, including several local accessions (descendants from seed collected at a single site), both in polycultures and in monocultures. In Trial I, different polycultures were established. Each seeded plant complex featured a different mix of grasses seeded to each topographic zone. It is important to assess the collective performance of various species in such polycultures because aesthetic, ecological, and general management considerations dictate that polycultures of various grasses will be used in practical roadside projects.

By contrast, in Trial II individual species were seeded across all the topographic zones described below. Such monocultures are important to evaluate because numerous accessions could have roles in various topographic zones. Their variable performance in those zones must be assessed individually to avoid potentially confounding effects of competition from neighboring seeded perennial grasses. In both polycultures and monocultures, widely used cultivars of non-

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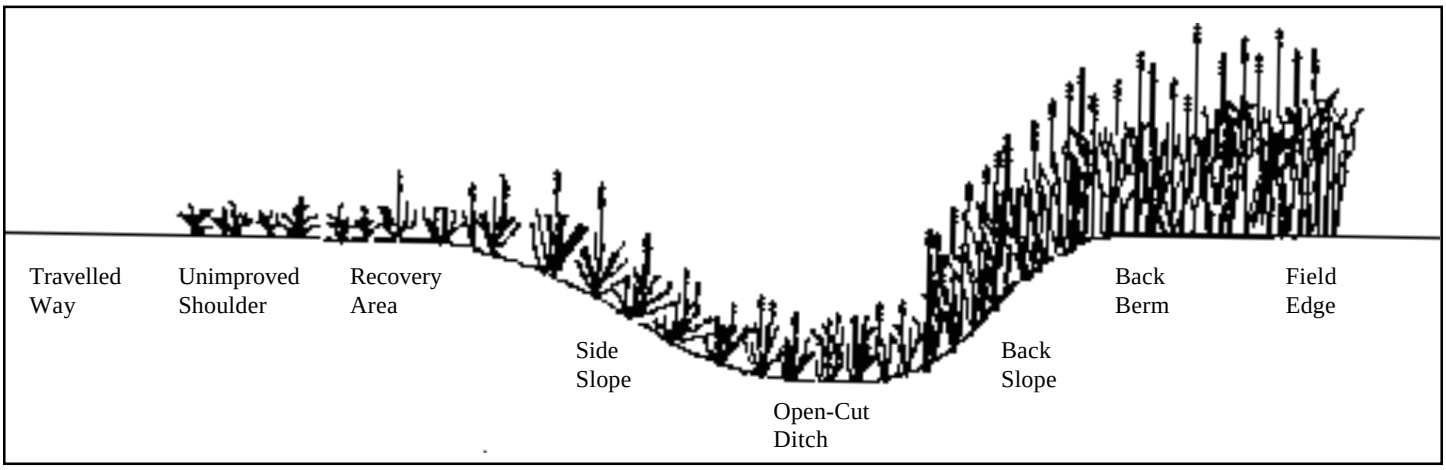

Figure 2. *Schematic diagram of roadside topographic zones.*

native perennial grasses can provide valuable benchmark data by which to gauge performance of the native species.

The present research addressed whether local forms of several native perennial grasses can be established and managed on disturbed sites. In light of the likelihood of within-region genetic distinctness of different populations of native grasses such as *Elymus glaucus* (blue wildrye), we believed that local forms of native perennial grasses should be used if available. The experimental site was set amid farmlands and was susceptible to run-off, flooding, and the inadvertent effects of herbicide drift and various agricultural production practices. In these important respects, the study reflects real-world conditions rather than rigorous local control by researchers.

Rural roadsides may be viewed as typically comprising several topographic zones (**Figure 2**): (1) unimproved shoulder; (2) recovery area; (3) side slope; (4) open-cut ditch (drainage); (5) back slope; (6) back berm; and (7) field edge. These zones present a range of environmental conditions and management options and requirements, and may necessitate the use of a variety of plant materials. Various native perennial grasses have diverse environmental optima and tolerances and differing growth habits, and thus may lend themselves to different topographic zones.

In general, it is a reasonable goal to use plant species that lead to reduced total aboveground biomass, yet retain high proportions of perennial vegetative groundcover. Other things being equal, this should reduce the threat of flooding, wildfire, and soil erosion. Prior to these experiments, one of us (John Anderson) had experience with large-scale roadside plantings and had made detailed observations of the natural habitats of native grasses. Thus, we had some knowledge of the suitability of various perennial grasses to the various topographic zones; our rationales for those assignments in Trial I polycultures follow.

Low-statured bunchgrasses, e.g., *Festuca idahoensis* (Idaho fescue), *Poa secunda* ssp. *secunda* (pine bluegrass), and low-growing forms of *Hordeum brachyantherum* ssp. *californicum* (California barley) are perhaps most suitable for the unimproved shoulder because they permit maximum visibility by motorists, are unlikely to break up pavement in the adjoining travelled way and, although they tolerate close mowing, require no mowing in many cases.

Festuca rubra (creeping red fescue), *Bromus carinatus* (California brome), and lower-growing forms of *E. glaucus* are intermediate in height and are candidates for use in the recovery area, through which motor vehicles occasionally travel. Perennial grasses like *Hordeum brachyantherum* ssp. *brachyantherum* (meadow barley), *H. brachyantherum* ssp. *californicum*, *B. carinatus*, *Melica californica* (California oniongrass), *Nassella* (*Stipa*) *pulchra* (purple needlegrass), *Nassella (Stipa) cernua* (nodding needlegrass) and *Elymus multisetus* (squirreltail) are candidates for both the recovery area and the side slope. The moderate biomass production of these grasses makes them unlikely to interfere with motor vehicles that occasionally use the area. Also, these grasses are drought tolerant and thus adapted to these two zones that may receive less water than do either the unimproved shoulder or the open-cut ditch.

H. brachyantherum ssp. *brachyantherum* is tolerant of intermittant flooding and has moderate stature. Thus, it would tolerate conditions encountered in most open-cut ditches and be unlikely to block the flow of water. If the open-cut ditch contains water for extended periods, *Eleocharis* spp. (spike-rushes) would be better adapted. For the back slope and back berm, tall-statured grasses, such as *B. carinatus*, *E. glaucus*, *Elymus trachycaulus* var. *majus* (slender wheatgrass), and *N. pulchra* appeared to be good candidates. If mowing is frequent, these species could also be used on the back slope and in intermittantly-flooded ditch beds. The field edge is subject to inadvertent damage by herbicides and agricultural implements. Therefore, the rhizomatous *Leymus triticoides* (creeping wildrye or beardless wildrye) is probably appropriate. This species is tall-statured, recovers rapidly from mechanical damage, and is believed by some workers to show resistance to glyphosate, a commonly-used broad-spectrum contact herbicide.

Experimental Design:

The trials were conducted at Hedgerow Farms, approximately 8 km north of the town of Winters, Yolo County, California. For both Trials I and II, there were five experimental blocks involved, with Blocks I and II situated on Brentwood silty clay loam (fine, montmorillonitic, thermic Typic Xerochrepts [Class 1 agricultural soil]) and Blocks III-V on Capay silty clay (fine, montmorillonitic, thermic Typic Haploxererts [Class 2 agricultural soil]).

In Trial I, each level of plant complex included a different mix of perennial grasses seeded into each of several roadside topographic zones, based on principles discussed earlier. Trial I involved 3 factors: plant complex, block, and topographic zone. Plots were arrayed in 5 randomized complete blocks; each plot extended along 7.63 m of roadside and was 7.63-9.15 m wide, extending to the edge of an agricultural field. Thus, each plot comprised all the roadside topographic zones previously mentioned. As noted earlier, different mixes were sown into the various topographic zones. Seeding rates were relatively high and were intended to promote rapid establishment and homogeneous stands.

In Trial II, plots were seeded to 15 native Californian and 3 non-native accessions of perennial grasses. This trial entailed 3 factors: grass, block, and topographic zone. As in Trial I, seeding rates were relatively high. There were 5 randomized incomplete blocks. Plots were of dimensions 3.1 m x 7.63-9.15 m (a 3.1-m length of roadside). As with Trial I,

each plot included all roadside topographic zones mentioned earlier and there were plots of resident vegetation embedded in the design.

Results:

Several perennial grasses showed good establishment and persistence in both polycultures and monocultures. Particularly good performance was observed for the non-native perennial grasses *Dactylis glomerata* (orchard grass) and *Thinopyrum intermedium* ssp. *trichophorum* (intermediate wheatgrass), and the following native grasses: *Bromus carinatus, Elymus glaucus, Elymus trachycaulus,* all accessions of *Hordeum brachyantherum* ssp. *brachyantherum,* a prostrate accession of *Hordeum brachyantherum* ssp. *californicum, Nassella cernua,* and *Nassella pulchra.*

In Blocks I and II of both trials, the dominant resident plants in terms of canopy cover were *Avena fatua* (wild oat), *Malva rotundifolia* (cheeseweed), *Brassica nigra* (black mustard), and *Centaurea solstitialis* (yellow star thistle). In Blocks III and IV, *Polygonum aviculare* (common knotweed), *Bromus diandrus* (ripgut brome), *Bromus hordeaceus* (soft chess), *A. fatua,* and *M. rotundifolia* were common but did not appear to impede establishment of the seeded species. In Block V, *A. fatua, Lolium multiflorum* (annual ryegrass), and *Phalaris sp.* (a canarygrass) were the dominant resident plants, based on canopy cover.

Discussion:

The results suggest good establishment and persistence of several of the seeded perennial grasses, both in polycultures and in monocultures. In Trial I, the polycultures performed well in all blocks, which represented a range of soil moisture conditions. In the first spring (1992), height was greater for both native plant complexes than for the complex of non-native perennial grasses. By the spring of 1993, differences were not so clear cut, with control taller than all other levels of plant complex, Native Grasses-l (a mix of 8 species) taller than the non-native perennial grasses and Native Grasses-2 (a mix of 13 species) statistically indistinguishable from either of the other two seeded complexes.

In 1993, all seeded plant complexes in Trial I had significantly less canopy cover by resident vegetation than did the control. Moreover, biomass of resident plant species was significantly greater in control plots than in any of the the seeded polycultures.

Tall turf reduces the establishment of many weedy species. However, in light of the past use of herbicides and other weed-control measures in the seeded plant complexes but not in the control plots, there is no firm basis in the present study for attributing reduced weed cover to the presence of perennial grasses.

Trial II data on canopy cover by resident species strongly suggest a pervasive effect of the chemical and mechanical weed control measures employed, but also suggest some suppression of weeds by perennial grasses. In plots where seeded *Festuca ovina* failed to establish, cover by resident vegetation was nevertheless significantly less than in control plots. Furthermore, data analysis for 1993 data from Trial II indicate that greater canopy cover by seeded perennial grass species is associated with lesser canopy cover by resident plant species. Data suggest that in the absence of seeded perennial grasses (0% canopy cover by perennial grasses), canopy cover for resident plant species would be about 39%. These values are much less than the values observed for resident plant species in the untreated control (75.59%±6.50), but correspond closely to the 40.37%±8.71 canopy cover observed for resident plant species in plots of the failed seeding of *F. ovina.* The differences between the data from the plots where perennial grasses failed to become established and the observed values for control suggest the effect of the chemical and mechanical weed control measures applied to all but control plots. Other experiments are clearly needed to address the use of perennial grass borders to control agricultural weeds.

As suggested earlier, high biomass of seeded, resident, and seeded + resident plant species may imply greater threat of flooding and fire. All three seeded complexes showed similar biomass for resident species, but the non-native perennial grasses showed by far the greatest total biomass for seeded + resident species. This suggests that the two native perennial grass complexes might be preferable to the non-native perennial grasses in terms of flood and fire issues.

In monocultural plots of Trial II, low-statured grasses that showed good initial establishment were *F. ovina, Poa secunda* ssp. *secunda, Elymus multisetus,* and the prostrate form of *Hordeum brachyantherum* ssp. *californicum.* Of these, only the last-mentioned grass persisted well. Intermediately-statured grasses that showed good initial establishment and persistence included all accessions of *Hordeum brachyantherum* ssp. *brachyantherum.* Tall-statured grasses that performed well included *Bromus carinatus, Elymus trachycaulus* var. *majus, Nassella pulchra, Nassella cernua, Thinopyrum intermedium* ssp. *trichophorum,* and *Elymus glaucus.*

Several accessions performed poorly in the present experiments. These included both forms of *Festuca idahoensis, Melica californica, Melica imperfecta,* and *E. multisetus.* For seed produced in very dry years, *F. idahoensis* shows reduced germination rates and seed longevity. These factors may have contributed to the failure of the local forms of *F. idahoensis* in the present trials, inasmuch as 1990-1991 was a dry year in Solano County, where the seed was collected.

Despite the present findings, several other forms of *F. idahoensis* have done well in subsequent vineyard trials (in San Joaquin County, for example) and in other plantings. Based on our recent experience, depth of seed incorporation may have been excessive for both *M. californica* and *M. imperfecta.* Moreover, both species are susceptible to weed competition, and embryo dormancy in both species may limit stand development if first-year seed is used, as was the case in this study. *E. multisetus* showed good establishment, but stands of this species later deteriorated markedly. This species is generally considered more appropriate for poor,

Restoration-Related Studies in Progress

Pinyon-Juniper Regeneration - Alison Berry

Pinyon-juniper woodlands occupy millions of acres in the semiarid western United States and play a critical role in soil, water and nutrient cycles. Nitrogen-fixing shrubs such as Purshia tridentata (bitterbrush) are commonly found in pinyon-juniper woodlands that have regenerated after fire. This study looks at the interaction between patterns of postfire secondary succession in pinyon-juniper woodlands and the distribution (and nitrogen accretion) of P. tridentata. Information gathered in this study could reveal new possibilities for management of pine woodland ecosystems.

Tree Suppression With Native Species - Truman Young and Frank Chan

In order to reduce fire risk and provide access, power companies currently clear brush and apply herbicides to maintain transmission line rights of way. These practices are costly, both economically and environmentally. This study investigates ways to control tree invasion of rights of way by establishing native species that suppress tree recruitment.

Red Fir Regeneration - Michael Barbour

See Profile, page 7.

rocky sites than for the rich agricultural soils used in this study.

In Trial II, establishment of monocultures on wet, heavy soil was relatively poor. On such sites in the Sacramento Valley, the weedy grass *Lolium multiflorum* posed a particular problem, apparently due to its vigorous growth, late-season maturation, and great tolerance of mowing.

Oryzalin herbicide was applied in the autumn of 1992 at recommended rates, yet it virtually eliminated *P. secunda ssp. secunda.* Members of the genus *Poa* are particularly susceptible to this pre-emergence herbicide. In nearby untreated replicated plots, *P. secunda* ssp. *secunda* continued to survive and to reproduce. Oryzalin has approximately 6 months of activity at the rates used here, and probably reduced seedling recruitment by most perennial grasses as well as by resident vegetation during 1992-1993. Growth by established plants of some species was probably reduced as well. Oryzalin is probably inappropriate for use in this context and other pre-emergence herbicides should only be used with caution. Oryzalin is commonly used on agricultural crops, and moves off-site with eroded soil. Thus, the intentional application of this herbicide in these trials may have simulated the conditions encountered in rights of way adjoining some conventionally managed agricultural fields. In addition to problems with oryzalin, inadvertent drift from a nearby aerial application of glyphosate (spring of 1992) severely damaged monocultural stands of *E. trachycaulus* var. *majus* in Blocks I and II. This species appears particularly sensitive to this commonly used contact herbicide.

Conclusion:

Despite difficulties due to herbicides, persistent stands were obtained for several species, including local native forms. We believe that the accessions that retained at least 25% canopy cover in the present monocultures are probably suitable for use in roadsides and other rights of way in the Sacramento Valley. This belief is bolstered by our collective experience in large-scale, long-term plantings, and additional ongoing small-plot work by one of us (Cynthia Brown).

With the increased interest among farmers in reestablishing native plants along field edges, our results raise the possibility of including certain native perennial grasses and incorporating the theme of restoration ecology into standard production agriculture and right of way management. Based in part on the present studies, native grass plantings are now being established along rights of way in Yolo County and elsewhere.

Partial funding of these studies was provided by Wallace Genetic Fund, Inc., the California Water Resources Control Board, the Elvenia J. Slosson Endowment Fund for Ornamental Horticulture, and by Awards for Research Excellence in Wildlands (1992 Pacific Gas and Electric Company Gifts).

(This article is adapted from: *Restoring Native Perennial Grasses to Rural Roadsides in the Sacramento Valley of California: Establishment and Evaluation,* in press with *Restoration Ecology, Vol. 5, Issue 3.*

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John H. Anderson: (916) 662-4570 or (Email) HEDGEFARM@aol.com

Perennial grass seed sources:

- Pacific Coast Seed, Inc., Livermore, Ca.
  David Gilpin (510) 373-4417
- ConservaSeed, Rio Vista, Ca.
  Scott Steward (916) 775-1646
- Hedgerow Farms, Winters, Ca.
  John Anderson (916) 662-4570

News From the Ex(tension) Files

By Linda Dodge

From time to time, the Department receives inquiries from the public concerning gardening problems or requests for advice about various landscape situations. In this new feature, we will share information on some of these topics that we hope our readers will find useful, or at least entertaining.

July, 1997--Mrs. P.G. asks: This is our first summer on our property outside of Auburn. We have several mature California buckeye trees amongst other natives on a dry slope. The buckeyes seem to be losing their leaves, but the other shrubs and trees are intact. What is wrong with the buckeyes?

Answer: Nothing is wrong with your buckeyes. *Aesculus californica*, or California buckeye, naturally loses its leaves early in our dry summers. This deciduous species chooses to go dormant in July rather than try to maintain its canopy of leaves through the entire summer. This adaptation is called "drought evasion" by ecologists. The other native shrubs and trees on your slope have different adaptations for enduring the dry California summer and so remain green and intact. In situations where California buckeyes receive irrigation during the summer, they tend to hold their leaves until autumn. You could perhaps achieve this by supplying drip irrigation to your individual buckeye trees. On the other hand, you could simply enjoy the contrast of the buckeyes' silvery trunk and branches with their pear-shaped fruit against the greens of the other plants on your dry slope.

August, 1997--Mr. D.T. writes: We have a large Valley oak on our lot and this year the leaves have some kind of disease or deformity. The leaves are covered with raised bumps that look like pink Hershey's kisses. What should we do? Is there a chemical that will cure this problem?

Answer: Nothing is wrong with your valley oak. The little pink bumps on the leaves of your *Quercus lobata* are called oak cone galls and don't pose any threat to your tree. They represent a part of the life cycle of a small insect, one of many species of cynipid wasps. The female wasp lays her eggs in the tissue of the oak leaf. As each egg hatches and a larva begins feeding, the surrounding leaf tissue is stimulated to grow, forming a gall characteristic of the particular species of wasp. The gall protects the larva as it develops and until it emerges as an adult to fly off and begin the cycle again. The pink cones on your oak leaves are characteristic of the wasp species *Andricus kingi.* The wasps do no damage to the oak tree and, indeed, depend on it for their survival.

Master Gardener International Conference Held in Sacramento

By Susan Imboden

More than 100 Master Gardeners from counties statewide volunteered their efforts to bring about the Sixth Master Gardener International Conference and Trade Show in July. Sponsored by Associate Dean Michael Reid of the College of Agriculture and Environmental Sciences at UC Davis, the conference drew 850 Master Gardeners and horticulture advisors from across the country as well as Canada and Sweden. According to Coordinator Sharon McCray, the three-and-one-half day event, which marked the 25th anniversary of the Master Gardener Program, was well received. This comes as no surprise, considering the offering of presentations, classes, guest speakers, exhibits, walks, and tours made available to attendees.

Each day's schedule of events began with a group breakfast, followed by docent-led Capitol Garden walks. Attendees then convened to hear keynote speeches by: Dr. Stephen Buchmann, research entomologist at the Carl Hayden Bee Research Center and author of *Forgotten Pollinators*; Dr. Merle Jensen, University of Arizona agricultural scientist known for his work with controlled environmental agriculture and future alternatives for agriculture; and Lee Stetson, Yosemite naturalist and performer of *Conversations With A Tramp,* a one-man theatrical accounting of the life and times of John Muir.

After the mid-morning stretch, *Search For Excellence* presentations introduced successful horticulture projects currently underway throughout the country. Selected from outlines submitted by 50 applicants, the ten programs exemplified new concepts in involving members of society's underrepresented groups with horticulture. After slide presentations on school, prison, neighborhood, and other horticulture programs, attendees were given time to ask questions. "It was an incredible opportunity for networking," reports McCray, adding that "as a result, extension agents and Master Gardeners from all over the country have become interested in starting programs of their own."

Afternoon classes consisted of one-hour lectures and workshops on a variety of topics. *Creative Water Gardens*, *Seed Saving*, *Horticulture Therapy*, *Vegetable Garden Tricks,* and *Computers in Horticulture* are titles of a handful of the 111 sessions led by extension agents, Master Gardeners and private industry consultants. Nancy McClanahan, Montgomery County, Texas Master Gardener, found the classes exciting and informative: "You know you love gardening, so you decide to become a Master Gardener. Then you find out how much you didn't know!" As a Master Gardener in her home state, she answers public inquiries and contributes to her group's newsletter and demonstration garden.

A conference participant reviews information about Gardening Behind Bars, an educational program developed by the Master Gardeners of Santa Clara County at the Elmwood Correctional Center for Women in Milpitas, California.

While most classes were held at the Sacramento Convention Center, some took attendees to off-site locations of interest. Marilyn Diamond, a Master Gardener since 1984 and coordinator of the Prusch Farm Park Project in San Jose, travelled to the Small Farm Center at UC Davis to hear Director Desmond Jolly speak on *Gardening and the Development of Human Capital.*

Participants who visited the Small Farm Center at UC Davis listen to Mark Van Horn, Program Director of the Student Experimental Farm, explain its history and objectives.

"One important goal of the Prusch Farm Park Project," she says, "is to let San Jose kids (many of whom are children of migrant farm workers) know that there are ways to make a living in agriculture besides picking the crops." A nurse by trade, she lacks formal teacher training, but has always believed that people learn best by doing. "Dr. Jolly validated my feeling that it's okay not to be a classroom person, that hands on experience is also a good way to learn," she says. In addition to gaining confidence that her teaching ideas are sound, she came away with new information that she feels will assist her in performing many other Master Gardener duties.

Because Master Gardeners are routinely called upon to provide useful, accurate, and up-to-date information on all kinds of gardening topics, the ability to acquire research-based information is vital to the success of their programs. By attending training workshops and classes and communicating with county advisors and university extension agents, they are able to keep abreast of new findings that become available.

State, regional, and international conferences provide an even broader opportunity for the sharing of information among volunteers and professionals. One strength of this year's International Conference, McCray feels, was its success in increasing the number of county advisors in attendance. "So often it seems like there is academia, and then there is everybody else," she explains. "It was exciting to get everybody together in the same room."

The Proceedings of the Master Gardener International Conference and/or audiotapes of class sessions may be obtained by calling Sharon McCray at (408) 241-9973.

Notes From the Chair...

By Dave Burger

Patricia Lindsey, Landscape Horticulture Extension Specialist with the Department since 1993, has resigned her appointment to accept a position as Assistant Professor of Landscape Architecture and Environmental Planning at UC Berkeley. She will also serve as Director of Blake Garden (the campus arboretum) and teach horticulture classes. We wish her much success with her new endeavors.

We welcome **Edie Cances** to the office staff position of Administrative Assistant II. Edie, who comes to us from Chemical Engineering and Materials Science, will be handling personnel/payroll matters and processing and tracking new grants. She replaces **Suzanne Melendy**, who relocated to Seattle in August.

Congratulations to **Heiner Lieth** on his recent promotion to full Professor. A departmental faculty member since 1984, he continues to carry out his research, extension and teaching duties in ornamental horticulture.

Michael Parrella, Chair of the Dept. of Entomology, who holds a faculty appointment with our department, has been selected as the recipient of the Society of American Florists' (SAF) 1997 Alex Laurie Award for Research and Education. The award, presented annually to an individual who has made broad-scope, long-lasting contributions to the floriculture industry through research or education, was presented at the All-Industry Awards Banquet during SAF's 113th annual convention in Palm Springs.

Ali Harivandi, Environmental Horticulture Advisor for Alameda, Contra Costa and Santa Clara Counties, was selected for the Rise Horticulture/Turfgrass Study Tour, taking place in October in New York.

Thanks to **Thomas Koo** for his grant of $2,000 to support Jim Harding's new project on the germination of ancient *Nelumbo* (lotus) seeds.

A departmental search committee chaired by **Michael Barbour** is currently conducting an international search to fill the position of Restoration Ecologist. This new position will bring an important and unique perspective to issues related to the consequences of global climate change, detoxification of environmental pollutants, maintenance of biological diversity, and the creation of management policies for the sustainable use of plant resources.

The appointee will conduct research geared toward developing practical methods of achieving sustainable habitats and landscapes and rescuing endangered California species and vegetation. He or she will also teach both undergraduate courses within the Environmental Horticulture and Urban Forestry (EHUF) major and graduate courses, as well as advise EHUF students.

The research committee of the California Cut Flower Commission has awarded grants totaling $60,000 for six research projects conducted through the UC system. Receiving funding are **Michael Reid** (Environmental Horticulture, UC Davis), $9,000 for *Optimal temperature management during transportation of California cut flowers*; **James MacDonald** (Plant Pathology, UC Davis), $8,000 for *Alternatives to methyl bromide for control of soilborne plant pathogens*; **Michael Parrella** (Entomology, UC Davis), $10,000 for *Registration and use of biorational pesticides for the cut flower industry*; **Heiner Lieth** (Environmental Horticulture, UC Davis), $11,000 for *Development of optimal rose canopy management strategies for California growers: bending vs. traditional production*; **Clyde Elmore** (Weed Science Program, UC Davis), $15,000 for *Control of problem weeds in field and greenhouse-grown ornamentals*; and **Heather Costa** (Entomology, UC Riverside), $7,000 for *Application of UV-absorbing plastic film to thrips control*.

The City of Modesto has granted $15,000 to researchers at the **Western Center for Urban Forest Research & Education** for Phase One studies that will quantify the tangible asset value of city street trees. Researchers at the Center will use inventory data for 85,000 trees and computer models to calculate net benefits.

The **Western Center for Urban Forest Research & Education** wishes to announce that the steering committee of the *Best of West Summit: Common Challenges and Shared Solutions in Urban Forestry* is soliciting proposals for success story presenters. The goal of the conference is to bring together leaders from across the Western states to address prominent issues impacting urban and community forestry. The regional conference will be held September 16-18, 1998 in San Francisco. Proposals must be postmarked by January 9, 1998. For more information, contact Martha Ozonoff, Summit Coordinator, Western Center for Urban Forest Research & Education, U.S. Forest Service (916) 752-7636.

Where are they????

Art Cameron, who received his Ph.D. in Plant Physiology with Mike Reid in 1982, lives with his wife, **Marlene Weiss Cameron** (M.S. degree in Plant Physiology with Roy Sachs, 1982), in Haslett, Michigan. Art is now a professor at Michigan State University where he is teaching a horticulture course for non-majors and has active research programs in postharvest. He also works with herbaceous perennials in a joint project with Royal Heins, Will Carlson, and numerous graduate students.

Art and Marlene enjoy taking frequent trips. Last year they went to Beijing, Yuchuan, and Xian and are looking forward to an upcoming trip to Germany, Holland, England, and Turkey. Art can be reached at (Email) cameron@pilot.msu.edu.

Carl Mankinen received his Ph.D. in Genetics with Jim Harding in 1972 and is now Laboratory Director of the Nemours Children's Clinic in Jacksonville, Florida. He was appointed Assistant Professor of Pediatrics at the Mayo Medical School and was elected to the American Society of Clinical Oncologists. He is also a founding member of the American College of Medical Genetics.

Kendra West Williams, who received a B.S. degree at UC Davis in the 1980s and her M.S. degree in Plant Physiology with Jack Paul in 1990, worked for a year for Don Shor at the Redwood Barn Nursery in Davis. In 1991, she went to work for Calgene, managing their oil division greenhouses, which are 27,000 square feet in size and growing. Since Monsanto purchased Calgene, they are considering consolidating their overall greenhouse operations in the Davis area.

Kendra enjoys gardening and singing in her spare time and she and husband Fred like to travel. She can be reached at (916) 753-6313.

In January of this year, **Judy Lee** joined Kendra at Calgene, managing the greenhouses used to grow transgenic plants. Her new duties include pest inspection, pesticide application, environmental controls, crop rotation scheduling, labor management, and working with growth chambers. Judy is very excited to be back working with plants again.

Judy earned her B.S. degree at UC Davis in the 1980s. She can be reached at (916) 753-6313.

Calgene is a plant genetic engineering firm located in Davis that has close ties to the College of Agriculture and Environmental Sciences at UC Davis.

Profiles in Environmental Horticulture

Michael Barbour, Plant Ecologist and Professor of Environmental Horticulture

In California, the logging industry places great demands on our coniferous forests. If not managed properly, the impact of this practice can affect the long-term sustainability of more than 15,500,000 acres of ponderosa and suger pine, red and white fir, and incense cedar.

An important part of good forest management is maintaining an environment that allows for regeneration of logged species. Michael is one of many plant ecologists whose research attempts to determine the biological needs of these conifers by asking questions such as: How do winter and summer conditions affect seedling and sapling survival? What are their requirements for light and termperature? How are they affected by current fire suppression practices? By providing answers to these and other questions, research ecologists hope to help land resource managers harvest trees in a sustainable way.

For the past 12 years, learning about the biological needs of *Abies magnifica* (red fir) has been one of Michael's primary research interests. At various sites in the Sierra Nevada, he continues to gather information through studies funded by the U.S. Forest Service that assists managers in regenerating this species. By determining, for example, that red fir seedlings need a lot of shade to regenerate, he has supported Forest Service proposals to reduce the size of clear cuts—from the customary 5-40 acre swaths to narrow strips or "group selects" of not more than one acre in size. As a result, red fir seedlings receive enough shade from surrounding mature trees to survive summer heat. Michael adds that his interest in helping regenerate red fir extends beyond economic concerns, stating, "They need to be regenerated because they're beautiful."

Currently he is studying old growth mixed conifer forests throughout the Sierra Nevada, Transverse, and Peninsula Ranges to gather information about the dynamics of remnant stands. By observing the number of saplings, understory trees, and mature overstory trees per acre, he hopes to create a target plan for public land managers and also for private landowners who wish to manage for old growth vegetation on their own lands. On a recent trip to an old growth forest in the high (10,000 ft.) elevations of Baja California, he observed landscapes that "may be what our coniferous forests looked like in the 1800s." He feels optimistic that this site may provide a good restoration model for future projects.

"Many people wonder what an old growth forest is," he says, admitting that the definition is vague. "Generally speaking, there are some big trees, some standing snags, and some downed wood. And the stand has not been disturbed for at least 150 years." Currently he is mapping and defining old growth forests in the Tahoe Basin as part of the Tahoe Research Group. This project is funded by the Environmental Protection Agency.

At a press conference preceding the July 25th Lake Tahoe Summit, he and others highlighted the University's participation in restoration research and stressed the need for additional federal funding, telling media interviewers: "The federal agencies are trying to do a good job. They have the right idea but need the budget, especially for prescribed burning in the Tahoe Basin." As it turned out, President Clinton pledged to double Tahoe Basin forest research funds. Some of those funds will be earmarked for the prescribed burning that Michael and others say is necessary to maintain the sustainability of the forest.

In another project, he is working with a committee of academics and resource agency and non-profit organization people brought together by the California Native Plant Society to develop technical definitions for yet-unclassified California vegetation types. By describing plant communities, scientists hope legislation can then be written to give those communities needed protection.

Much of Michael's time is spent writing textbooks and journal articles. He is also co-author of *California's Changing Landscapes*—a popular book that describes both the diversity and conservation of California vegetation.

Several teaching assignments round out his professional duties at UC Davis. As co-teacher of *Intersections of Nature and Culture* and *Fieldwork in Nature and Culture*, he helps students examine the ways in which society's view of nature is framed by culture. "Although we live in a scientific age," explains Michael, "that's not the only way to look at nature." In the fieldwork

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Linda Dodge Staff Research Associate

In response to nursery industry needs, departmental faculty carry out studies in the areas of postharvest care, production, and plant nutrition. As Staff Research Associate for researchers Mike Reid and Richard Evans, Linda provides laboratory support for both field and greenhouse studies by setting up and monitoring experiments, analyzing data, and generally managing laboratory activities.

Often these activities include supervising graduate students in day-to-day research activities. Graduate student Rosa Valle, who is studying water uptake by cut roses, finds Linda's help invaluable, noting, "she is always there when I need information or guidance in the lab." A non-native English speaker, Rosa relies on Linda's patience and credits her with helping to bridge the communication gap that she and other non-native speaking students sometimes experience.

On a number of occasions, Linda has helped introduce high school students to departmental research facilities through two special programs. Each summer, the Junior Academic Summer Research Achievement Program and tne National Science Foundation Program for Young Scholars bring high school students to the UC Davis campus for several weeks of orientation activities. For those interested in horticulture, Linda identifies a research project, helps them set it up, and supervises their work. She also does her best to answer their questions about the Department and the campus.

Nursery professionals frequently rely on her for answers to questions about products. "Growers are bombarded with products and often don't know which ones to use, " she says, adding that testing the effectiveness of various products enables her to provide information that may be of help. One such product is a metallized polyester material similar to Mylar that is commonly used to preserve body heat in cold climates.

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(Barbour, continued)

course, students spend time in the Nevada City area of the Sierra Nevada to see how the succession of cultural groups such as Native Americans, gold miners, back-to-the-land folks and suburbanites have interacted differently with this landscape.

Other courses he teaches on campus are: *Concepts and Methods in Plant Community Ecology*, *Trees and Forests*, and *Survey of Plant Communities of California*. He is Chair of the Geography Graduate Group and an undergraduate adviser for the Plant Biology and EHUF majors.

Michael's enthusiasm for his subjects and for helping students learn earned him the UC Davis *Outstanding Teaching Award* for the 1988-89 school year. He attributes his success to encouraging students to think for themselves instead of just regurgitating information. "I can only take them so far," he asserts. "I'm most curious about what isn't known."

He received his B.S. in Botany from Michigan State University and his Ph.D. in Botany (with an ecology emphasis) from Duke University. Prior to joining the Department in 1993, he was a faculty member of the Botany Department here at UC Davis, where he held the position of Chair from 1982 to 1985. You may occasionally see him acting for community theater groups in Winters, Woodland, and Davis. "I'm a ham," he says proudly.

For more information about Michael's projects, contact him at (916) 752-2956, or (Email) mgbarbour@ucdavis.edu.

(Dodge, continued)

At the present time, she is testing how well it keeps cut flowers cool during transport from growers to retail outlets. "Since refrigeration is often inconsistent during transport, anything you can do to control the termperature is good," she explains, adding that, so far, the metallized polyester film has proven to be better than other packaging materials. She also tests vase preservatives or "fresh flower foods" that come on the market.

Faculty members routinely rely on her expertise with identifying plants and diagnosing problems. "She has a broad knowledge about plants and is usually the first person I ask when I don't know what something is," relates Jim Harding. Linda has agreed to share her plant knowledge via "News From the Ex Files," a question/answer column that begins with this issue.

She received a B.S. degree in Botany and an M.S. degree in Horticulture at UC Davis. Prior to coming to work in the Department, she worked for Northrup King Company as a registered seed technologist.

She may be reached at: (916) 754-6347 or (Email) lldodge@ucdavis.edu.

World Wide Web Site

www.tnews.com/text/f_house_3.html

This site includes the transcript of a speech given by Freeman House of the Mattole Restoration Council to the California Chapter of the Society for Ecological Restoration in 1994.

In his speech titled, *Restoring Relations: The Vernacular Approach to Ecological Restoration,* he offers a philosophy for the development of community-based ecological awareness and decision-making in which human inhabitants contribute to ecosystem planning and restoration. Examples of community participation in keeping ecosystems thriving offer support for his philosophy.

For those interested in restoration, this text provides a readable and interesting complement to the scientific studies presented herein.

Subscription Information

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