ABSTRACTS

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Thursday 18 January 2007

Welcome

1. HANSON, L.
Feather River Ranger District**,** Plumas National Forest, 875 Mitchell Ave., Oroville, CA 95965

Welcome to the first Northern California Botanists Symposium

In the early 1980's, I shared an office on the La Porte Ranger District with a wildlife biologist and a fisheries biologist. In the winter, they each went to their respective meetings – the Wildlife Society and American Fisheries Society meetings. As a botanist, I didn't have any such meeting to go to. I did help with the first Rare Plant Conference that the California Native Plant Society had in the mid 1980's but besides another Rare Plant Conference on the north coast in 2002 there haven't been conferences for botanists in Northern California. Our symposium is an attempt to change that. We hope to provide botanists with a forum to hear talks on a variety of subjects and to have time to socialize with each other. We have encouraged students to attend so please meet each other. I have hired quite a few students over the years from many universities for summer work. It has become harder to find students that have had the course work needed, especially plant taxonomy, to be able to be a productive botany field surveyor. It used to be that our surveys were focused on selected vascular rare plants but now they are floristic in nature and also include weeds. We also conduct bryophyte and fungi surveys as well. Our work is not decreasing but is increasing. Also, we agency botanists have lots of ideas for thesis projects that professors and graduate students may wish to talk to us about. Have a great symposium.

The Need for Botanists

2. PANEL: ANDERSON, J.[1], ENGSTROM, T.[2], NELSON, J. R.[3], SCHIERENBECK, K. A.[4], SHOWERS, M. A.[5], WILLOUGHBY, J.[6]
[1]D. V. M., Hedgerow Farms, Winters, CA [2]Wildlife and Botany Program Manager, Sierra Pacific Industries, Anderson, CA and Director, Western Shasta Resource Conservation District, Anderson, CA [3]Staff Environmental Scientist/Botanist (Retired), California Department of Fish and Game, Redding, CA [4]Professor of Botany, California State University Chico, Chico, CA [5]Staff Environmental Scientist/Botanist, Habitat Conservation Branch, California Department of Fish and Game, Sacramento, CA [6]State Botanist, Bureau of Land Management, Sacramento, CA

The Need for Botanists – Panel Presentations

Botanists can be found throughout conservation organizations, governmental resource agencies (managers to seasonal employees), academic institutions, and corporate entities. Panelists will provide a brief presentation of their perspective on the need for botanists in the following areas: 1) The native seed and plant materials trade is frequently asked to develop mixes and provide plant materials for many types of projects throughout California's diverse ecoregions. The expertise of botanists is often necessary to provide bioregional site information, evaluation of planting designs, and suggestions for species propagation; 2) The private sector, especially

companies that own large tracts of land, hires botanists to inventory their plant resources, devise protection and management strategies, and prepare environmental documentation for projects. Successful botanists must be well-trained in plant diversity and ecology and are expected to understand the dynamics of perpetuating these botanical resources. A basic understanding of business fundamentals and those professions associated with botany is essential. 3) Regardless of professional placement in the public or private sector, the conservation of botanical resources will be accomplished by individuals who are well-trained in the discipline. Botanists with additional skill and knowledge in communication, management, and law will be crucial to furthering botanical resources; 4) The creation of "integrated biology" departments in recent decades has weakened discipline-specific training in areas such as botany subsequently sending individuals without strong job skills into the market place. Pressure on academic institutions from professional organizations, corporations, and government agencies is required if strong academic programs are to be maintained; 5) Trustee responsibilities of governmental agencies include the management and protection of rare and endangered plant species. The number of botanists in state agencies is disproportionately low in contrast to the species in need of protection. Additional demands of state and federal environmental review and permitting provide additional burdens to a limited number of individuals; 6) Federal land management need botanists to manage endangered, threatened, and sensitive plant species; design, conduct, and analyze inventory and monitoring studies involving rare plants and vegetation; restore habitats; control and eradicate weeds; manage vegetation using prescribed fire and other tools; and classify and map vegetation. Although these agencies have employed more botanists in recent years than they did two decades ago, they need more botanists than they currently have in order to meet their statutory obligations and public expectations. Non-government groups such have recently lobbied Congress to appropriate more money for botanists in the Forest Service, BLM, and Fish and Wildlife Service. Even if these lobbying efforts fail, Federal agencies are expected to hire more botanists in the next few years to fill behind retiring employees.

Rare Plant Conservation

3. LAZAR, K.
California Native Plant Society, 2707 K St., Suite 1, Sacramento, CA 95816-5113

The California Native Plant Society (CNPS) and its Role in Rare Plant Conservation

The California Native Plant Society (CNPS) is a non-profit organization dedicated to the understanding and appreciation of California's native plants. CNPS strives to conserve native plants and their natural habitats through education, science, advocacy, horticulture and land stewardship. A key part of the mission of CNPS is achieved through the CNPS Rare Plant Program. Through this program, rare plants in California are identified, their status is researched and, if they are determined to be rare, the species is given a CNPS rarity ranking and placed on the CNPS list of rare and endangered plants. The Rare Plant Program, and its list of rare and endangered plants of California, has developed a reputation for scientific accuracy and integrity due to the rigorous review process that each nominated species must go through in order to be on the CNPS list. This information on rare plants is subsequently used by thousands of professional and amateur botanists throughout the state. In the future, the Rare Plant Program would like to

expand its influence in rare plant conservation to include a wider range of activities, such as the rediscovery and monitoring of rare plant populations.

4. LABANCA, T.
California Department of Fish and Game, 619 Second Street, Eureka, CA 95501

Botanical Resource Conservation on Redwood Forest Timberlands in Northern California

Redwood forests are not traditionally known for a diverse vascular plant flora or a large number of sensitive plant taxa. Approximately 90 percent of redwood forests are privately owned and most are managed for timber production. Historically, information on sensitive plants in the redwoods has been scarce because few sensitive plant surveys were conducted on public lands, botanists have typically not had access to private lands, and no botanical survey data was requested in the permitting process for projects on managed timberlands. Prior to 1999, most of the information available on sensitive plants in redwood forests was based upon early Twentieth Century herbarium specimens. In the late 1990's, state agencies began requesting sensitive plant survey data for projects conducted in managed redwood stands. Data on sensitive plant surveys and occurrences have improved understanding of the ecology and distribution of many sensitive taxa. For taxa whose distribution and ecology have become better understood, landscape-level approaches to conservation are being developed, tested, and modified based on implementation and effectiveness monitoring.

5. WITHAM, C.
Carol W. Witham, Consulting, 1141 37th Street, Sacramento, CA 95816

Following in the Footsteps of California's Pioneer Plant Collectors

Monitoring and managing for rare plant populations requires some basic information such as life form, blooming period and potential threats. But you cannot be effective at either if you don't know where the rare plant occurs. This talk covers nearly a decade of field work and research to locate the historic collections of the rare Webber's Ivesia (*Ivesia webberi*), endemic to the east slope of the Sierra Nevada and the intermountain ranges of northwestern Nevada. With only a handful of known collections, and with vague label descriptions such as "Sierra Valley, California", finding this plant within the vast basin and range was much like looking for a needle in a haystack. Finally realizing that the vast majority of plants are collected along well beaten paths such as roadsides and travel routes, most of the populations were eventually located through researching the travel and social patterns of the plant collectors of the late 1800s, particularly John Gill Lemmon. The talk will conclude with examples of modern day pioneer plant collectors – those that have discovery species new to science just by adventuring away from the beaten path, sometimes by only a few hundred meters.

6. PAVLIK, B.*[1] and STANTON, A.[2]
[1]Department of Biology, Mills College, Oakland, CA 94613 [2]BMP Ecosciences, 156 South Park Street, San Francisco, CA 94107

Doing Adaptive Management: Science-driven Restoration of a Species with Metapopulation Dynamics

Tahoe Yellow Cress (*Rorippa subumbellata*, or TYC), a plant endemic to the shores of Lake Tahoe, has been a candidate for listing under the Endangered Species Act since 1999. In 2001 a Conservation Strategy (CS) was developed to direct restoration and management of the species, to preclude listing, and to provide grounds for down-listing in CA and NV. Implementation is being carried out by a multi-agency and private interest group task force composed of an Adaptive Management Working Group, a Technical Advisory Group and a Committee of Agency Executives. The CS used 20+ years of monitoring data to detail the metapopulation characteristics of TYC, to rank sites for conservation and restoration activities, and to suggest concrete actions that ensure persistence despite fluctuations in lake level and recreational impacts. The CS also outlined a process that integrates new information immediately into management direction. A "key management question" (KMQ) framework was developed to guide research and fill gaps of our understanding of TYC restoration. Each KMQ has both scientific and management implications leading to the development of specific hypotheses that have been experimentally tested. The resulting research program directly addresses the applied problems faced by land managers, agency regulators, and restoration biologists. The attempt is to harness the power of a scientific approach while keeping the emphasis on generating information for decision-making. We will present the structure of this successful program, along with select data from experimental reintroductions of TYC conducted during 2003-2006 to illustrate how KMQs keep science focused on solving management issues.

7. MARR, J.
California Department of Fish and Game, 1100 Fortress Street, Suite 2, Chico, CA 95973

Conservation of Butte County Meadowfoam (*Limnanthes floccosa* ssp. *californica)*

Butte County meadowfoam, *Limnanthes floccosa* ssp. *californica,* (BCM) is a small, white-flowered, annual herb in the false mermaid family (Limnanthaceae). First identified in 1914, BCM was listed as State endangered in February 1982, and federally endangered on June 8, 1992. Today, the 21 naturally occurring populations of BCM are found within a narrow 25-mile strip along the eastern flank of the Sacramento Valley from central Butte County to the northern portion of the City of Chico, between 50-930 meters elevation. The U.S. Fish and Wildlife Service 2006 vernal pool critical habitat designation distinguished 4 separate critical habitat units of approximately 16,000 acres for BCM in Butte County. Only 3,154 acres or 18.9% of this habitat has been permanently protected though a conservation bank and acquisition by the Department of Fish and Game. Presently, urban development and agricultural conversion constitute the primary and immediate threats to BCM, however, the elimination of any population may represent a significant loss of the total amount of genetic variability for the species. The unique life history characteristics, results of genetic analysis, BCM Primary Constituent Elements and the challenges associated with permanent protection will be discussed.

Botanical Ethics

8. BITTMAN, R.
California Department of Fish and Game, California Natural Diversity Database, 1807-13th Street, Suite 202, Sacramento CA 95814

Rare Plant Occurrence Reporting: How and Why?

The reporting of rare plant occurrence information is best done to a central place with a reasonable expectation of long-term archival capability along with the ability to redistribute the data to users in a useful manner. The California Natural Diversity Database (CNDDB) is the closest approximation to an organization able to fulfill these goals. Reporting rare plant data to the CNDDB also allows more accurate element ranks to be assigned to species, resulting in more refined priority-setting for conservation. Some private landowners may initially feel hesitant to allow rare plant data from their property to be shared, but there are some good reasons for them to share the data. Data can be submitted to the CNDDB in several different ways from submission of paper field survey forms to digital datasets.

9. NELSON, J. R.
California Department of Fish and Game (Retired), Redding, CA 96003

Ethics – A Moral Compass for Botanists

Ethics, the study and application of values, provides the basis of choosing behaviors and of evaluating the behaviors of others. For many professions (e.g., medicine and law), a code of ethics provides the standard for professional behavior. These are enforceable through licensing and various review processes. Unlike other professions botanists have not organized into professional organizations and have no enforceable standard of behavior. Guidelines and recommendations provided by CNPS and other related organizations provide some guidance. Yet many ethical dilemmas do exist and the ethical standards to which botanists are held vary by group and by individual. While not advocating licensing, the author believes ethical standards could provide benefits for botanists, helping them achieve the things that they value most.

10. WARNE, E.
U. S. Fish and Wildlife Service, 2800 Cottage Way, Rm. W-2605, Sacramento, CA 95825

Botanical Ethics and Protection of Federally-listed Plants

11. GERLACH, J.
Environmental Science Associates, Sacramento, CA 95826

Integrating the Ecological, Political, Economic, and Legal Causes of Biological Invasions: Contrasting Case Histories Using Yellow Starthistle and Russian Knapweed

Biological invasions are fundamentally a propagule dispersal problem and human political, economic, and legal activities are the drivers of invasion dispersal dynamics. By using historic forage crop production and shipment records from both source and receiving regions, I have reconstructed 150 years of the invasion dynamics for many of the worst invasive plant species in the western US. This was possible because these crop seed records also document the weed floras that were unique to each seed production region and quantified the weed seed content and species identity of weed seed of commercial forage seed for each region. Here I use the original documents to present contrasting case histories of the invasion dynamics of Russian knapweed and yellow starthistle. In some cases I have been able to establish the exact fields where the

invasive species originated and where they were first introduced. I also show that that both Russian knapweed and yellow starthistle were intentionally introduced despite the fact that the Bureau of Plant Industry/USDA had already identified them as problematic weeds.

12. KNAPP, E.*[1], SCHWILK, D.[2], KANE, J.[2], and KEELEY, J.[2]
[1]USFS Pacific Southwest Research Station, 3644 Avtech Parkway, Redding, CA 96002 [2]USGS Sequoia and Kings Canyon Field Station, 47050 Generals Highway #4, Three Rivers, CA 93271

Prescribed Fire Effects on Forest Vegetation: Does Fire Severity or Burn Season Matter More?

Although the majority of fires in the western U.S. historically occurred during the late summer or early fall when fuels were dry and plants dormant or nearly so, early season prescribed burns are often ignited when fuels are still moist and plants are actively growing. In order to determine the effect of such early season burning, we established replicated early-season burn, late-season burn, and unburned control units in mixed conifer forest in Sequoia National Park and collected data on fuels and vegetation before and after treatment. Due to higher fuel moisture, early season burns consumed less fuel and therefore likely caused less soil heating. Early season burns were also patchier, with 27% of the ground surface remaining unburned vs. only 12% for late season burns. Vegetation generally recovered rapidly after either season of prescribed burning. However, late season burns resulted in a temporary but significant drop in cover and a decline in species richness at the 1 m^2 scale in the following year. These same variables were not significantly altered following early season burns. In addition, frequencies of several common taxa were reduced by burning and for two, the reduction was greater with late season burning. Overall, our results suggest that when burned under high fuel loading conditions, many plant species respond more strongly to differences in fire intensity and severity than to timing of the burn relative to stage of plant growth.

13. MARTY, J. T.
The Nature Conservancy, 13501 Franklin Blvd., Galt, CA 95632

Using Large-scale Experiments to Inform Management Decisions in California Vernal Pool Grasslands

On conservation lands, rangeland managers face an incredible challenge in their daily jobs of maintaining a working landscape while ensuring that biodiversity is also protected. This challenge is made even more difficult by the amount of uncertainty and lack of data available on which to base their operational decisions. Often, research projects are met with justifiable skepticism by these managers who need quick answers to management questions that affect multiple rare species and dozens of natural communities on their property. I will describe how I attempted to bridge this schism between research and management at the Cosumnes River Preserve using carefully planned research and monitoring projects to answer the big-picture questions that I faced as both the land manager and research scientist responsible for over 20,000 acres of rangeland habitat. I will discuss the 1) political impetus driving the need for the research projects, 2) how I decided what to study and why, 3) the general outcome of these projects, and 4) lessons learned from the process.

14. PARKER, V. T.
San Francisco State University, Department of Biology, San Francisco, CA 94132

Evolving Issues in Chaparral Management

Chaparral is a fire-type vegetation maintained by relatively high intensity canopy fires. Many chaparral species depend on persistent soil seed banks, stimulated by high intensity wildfire, to maintain their populations. Fires characteristically result in dramatic composition shifts in the first few years following fire, with annuals and herbaceous perennials dominating while shrubs recover. A high proportion of rare, endangered, or threatened species are found in the persistent seed banks, particularly in the genera *Arctostaphylos* and *Ceanothus*. Management of vegetation in which a primary management tool literally kills individuals of populations being 'enhanced' suggests significant potential for difficulties in management. Prescribed burning, for example, has not proven to be an ideal replacement for wildfires. Chaparral also presents managers with considerable conflicts in management objectives. Currently, two ongoing processes, climate change and human population increases and development in areas with chaparral, will considerably limit current and future management options. The abundance of rare plants, the influence of warming climates and the encroachment of humans in the context of management will be the focus of this talk.

15. MERRIAM, K. E.*[1], KEELEY, J. E.[2], and BEYERS, J. L.[3]
[1]U.S.D.A. Forest Service, Sierra Cascade Province, Quincy, CA [2]U.S. Geological Survey, Biological Resource Division , Sequoia and Kings Canyon Research Station, Three Rivers, CA
[3]U.S.D.A. Forest Service, Pacific Southwest Research Station, Riverside Fire Laboratory, Riverside, CA

The Influence of Fire and Fuels Treatments on Native and Non-native Plant Species in California

Since 2000, federal land management agencies have treated over 6 million hectares (15 million acres) to reduce hazardous fuels across the United States (U.S. Department of Agriculture 2006). These treatments, including mechanical thinning and the construction of fuel breaks, are designed to reduce fire hazard in the wildland-urban interface, to facilitate fire suppression activities, and to improve the health of forest ecosystems. We studied fuel breaks at 24 sites with differing fire histories across California, and evaluated native and nonnative plant species diversity and composition. We found that nonnative plant abundance was over 200% higher on fuel breaks than in adjacent wildlands. There was a significant increase in relative nonnative cover with increasing proximity to the fuel break, particularly in areas that had experienced more numerous fires during the past 50 years. However, we also found that native plant diversity was significantly higher on fuel breaks than in adjacent wildlands. Almost 20% of the native plant species observed occurred only on fuel breaks. Our findings suggest that both native and nonnative species diversity may be promoted by fuel treatments, and that nonnatives may invade surrounding areas after disturbances such as fire. In fire-suppressed forests in California, unnaturally long fire-free periods may have decreased native plant species diversity, particularly in the herbaceous understory. Management aimed specifically at restoring natural disturbance processes such as fire will likely be most effective at maintaining native plant diversity. However, these efforts must include measures to prevent concurrent invasion and spread of nonnative species.

Keynote Speaker

16. POTTER, D.
Department of Plant Sciences and Center for Plant Diversity, University of California, Davis, CA 95616

By Any Other Name: How Phylogenies Affect Taxonomy, with Examples from the California Flora

Recent advances in our understanding of organismal phylogenies have led to changes in taxonomy, sometimes with striking, even jarring, results. For example, in the forthcoming edition of The Jepson Manual, some botanists will be surprised to find *Mimulus* listed under Phrymaceae and *Penstemon* under Plantaginaceae, rather than the familiar, long-maintained classification of those genera in Scrophulariaceae. Most such changes result from application of the principle that only monophyletic groups should be given taxonomic recognition and the acknowledgement that traditional taxonomic systems have recognized some groups now believed to be para- or poly-phyletic. Although there is some debate among systematists over the importance and desirability of strict adherence to monophyly, the prevailing view, to which I subscribe, is that taxa should be circumscribed so as to reflect monophyletic groups based on current evidence. Monophyly provides an objective criterion for determining which groups should be named and, while the resulting changes are inconvenient in the short term, they serve everyone's best interest in the long term by offering a more accurate and predictive tool for addressing ecological and biogeographic questions in an evolutionary context. A separate, but related, controversy surrounds the issue of how taxa should be named based on phylogenetic evidence. Like many systematists, I am opposed to replacing the current Linnaean system with rank-free phylogenetic nomenclature. Examples of how phylogenetic evidence affects taxonomy will be drawn from a new infrafamilial classification of Rosaceae and from several changes, primarily at the family level, that are being incorporated in The Jepson Manual.

Friday 19 January 2007

Revegetation and Restoration

17. GRIGGS, T.
River Partners, 580 Vallombrosa Ave, Chico, CA 95926

The Importance of Local Genetics for Riparian Restoration Projects in the Central Valley of California

Quality restoration should include the use of locally adapted genotypes. Plant material – seeds and stem-cuttings – should be collected from on site or at a nearby reference site. Over the past 15 years riparian restorationists in the Central Valley have discovered several examples of genetic-controlled differences in phenotypes and phenology within the same species. Some examples will be presented. First, genetic pollution of native populations by hybridization. Hybrids of California sycamore with London plane-tree are potentially destructive of native sycamore as a species through back-crossing. Black walnut in the Sacramento Valley is a hybrid swarm population composed of the genetics of several species of Walnut. Second, regional

differences in the phenology of a species, such as Valley oak and Oregon ash, warn us of the different flowering times and consequent seed-set inefficiency. Third, gross morphological differences at a regional scale of the same variety of a species, such as *Grindelia camporum var camporum* that grows in both the Sacramento Valley and the San Joaquin Valley. However, the plants in the San Joaquin typically grow 3 to 4 times taller (Sac = 60 cm; SJ = 200 cm). Nevertheless, both plants key to the same variety in the Jepson Manual! If seeds are planted from one valley into the other serious performance and ecological problems could arise in the restoration.

18. PICKART, A.
Humboldt Bay National Wildlife Refuge, 6800 Lanphere Rd., Arcata, CA 95521

Vegetation Mapping as a Precursor to Restoration, Humboldt Bay, CA

Alliance-level vegetation mapping is an important precursor to restoration, and should be carried out at a scale relevant to restoration goals. Such mapping provides a high resolution baseline of vegetation condition, and facilitates the prioritization of estuary restoration vegetation goals as well as suitable sites. Image analysis software such as Spring (open source), Ecognition, or Feature Analyst is used in tandem with field-based knowledge of the area to identify sample polygons in which to collect vegetation cover data. The plot data are then analyzed using ordination and classification software to define alliance types which are then assigned to polygons. After removing evaluation polygons, the remainder are used to "train" the software, which classifies the imagery. During this period, GIS staff work closely with botanists through iterations of classification until accuracy is deemed adequate. If necessary, taxonomically or functionally related alliances can be lumped in order to increase accuracy. The final evaluation polygons are used to demonstrate a minimum of 80% accuracy as dictated by National Vegetation Classification standards. The resulting GIS-based vegetation inventory can then be used to prioritize restoration targets and suitable locations by using vegetation distribution to generalize abiotic characteristics, rank rarity of vegetation types, and characterize the level of invasive species impact. Our experiences with this process emphasized the need for involvement by an ecologist or botanist familiar with the vegetation throughout the entire process, working closely with GIS staff.

19. WOOD, D.
Department of Biological Sciences, California State University, Chico, CA 95929-0515

Developing Metrics of Success in Restoration across Ecological Scales

20. LENNOX, M.*[1], JACKSON, R.[2], LEWIS, D.[1], STOKES, D.[3], HARPER, J.[1], LARSON, S.[1], KATZ, R.[1], and TATE, K.[4]
[1]University of California Cooperative Extension, 133 Aviation Blvd. #109, Santa Rosa, CA 95403 [2]University of Wisconsin-Madison, WI [3]University of Washington, Bothell, WA [4]University of California, Davis, CA.

Riparian Habitat Trajectory on North Coast Ranches

We are researching the efficacy and trajectory of riparian restoration on the north coast of

California. We measured biophysical attributes at 102 riparian project sites located along tributary stream reaches in Marin, Sonoma, and Mendocino Counties of California ranging from 4 to 40 years since restoration. Measured floristic outcomes at project sites are being analyzed for correlations with project age and restoration methods, which included conservation, enhancement, and rehabilitation. What is the long-term fate of these efforts and how do sites change over time? The validation of restoration method effectiveness has shown to be challenging in disturbance-dependent communities. A common riparian management objective was the establishment of tree cover to sustain watershed functions (stability, complexity, diversity) that are resistant to hydrologic disturbance and stochastic events. Plot scale results show significant effects of restoration method for the nine tree genera similarly analyzed. Individual tree abundance was affected by revegetation treatments which included herbivore management, the decision to plant, and bioengineering. Patterns in the response over time of tree, shrub and herbaceous lifeforms will be discussed for the purpose of adaptively managing the intended and unexpected outcomes of riparian restoration projects in northern California.

Invasive Species

21. SCHIERENBECK, K.*[1], ELLSTRAND, N.[2], and BLOSSER, G.[1]
[1]Department of Biological Sciences, California State University, Chico, CA 95929-0515.
[2]Department of Botany and Plant Sciences, Biotechnology Impacts Center, and Center for Conservation Biology, University of California, Riverside, CA 95921-0124

Spatio-temporal Patterns in the Non-native Flora of California

Economic and ecological problems brought by the invasion of non-native species can be prevented in part by identifying patterns in the invasion process. We tested hypotheses that address variation in the spatial, taxonomic, and temporal distributions of non-native floras in the large and diverse geographic area defined as California. Analyses reveal that in time, 79% of all non-native species will occur in disturbed habitat; polyploidy is not correlated with geographic spread; the Poaceae and Brassicaceae are the most broadly represented families across elevations; introductions increase from all geographic regions from 1925 to 1969, but more recently from Asia, Australia, Africa, S. Africa, and S. America; and more than 50% of all alien taxa recorded prior to 1925 have become widespread. Although somewhat equivocal, based on published floras, it appears that not one of the alien plant taxa recorded prior to 1925 has gone extinct in the state. Some taxa without native representatives contain some of the worst invaders in the flora, thus we suggest that control efforts should be directed to recent arrivals without native representation. Our conclusions support the need to control the spread of non-natives early in the invasion process but also emphasize the need to control invasions from a floristic perspective, both locally and regionally.

22. SCHOENIG, S.
California Department of Food and Agriculture, 1220 N St., Rm. 341, Sacramento, CA 95814

Stopping the Spread and Establishment of our Worst Invasive Plants in Northern California through Strategic Containment Projects

California benefits today from the aggressive early detection-rapid response (EDDR) campaign

waged in the 20th century by the county agriculture departments, the California Department of Food and Agriculture, and local land owners/managers. Keeping out invasive non-native plants was primarily in the interest of agriculturists until the 1970s. The general environmental movement and the California Native Plant Society brought about a wider concern for the impact of invasive weeds to native California species and communities. The state EDRR campaign was responsible for the total statewide eradication of 18 species of noxious weeds totaling only a few thousand hectares, but more importantly, hundreds of populations. Furthermore, hundreds of pioneer infestations of many A-, B-, and C-rated weeds underwent "regional" eradication. Despite these successes and the new Weed Management Areas, the state is probably more at risk than ever to being over-run by invasive plants. Three major factors increasing this risk are: 1) dramatically lower funding for the agricultural partners, 2) increased horticulture, intra-state commerce, roadways, and land development, and 3) opposition to the use of herbicides. In order to prevent each California region from gaining many new ecosystem-altering plants we must map infested and uninfested areas within each region. With gross spatial distributions, regional groups can prioritize their targets and focus scarce resources to detecting and eradicating new invaders. GPS, GIS and volunteer programs are tools that make this more feasible. Examples exist in the state of formalized containment programs and local eradication. These programs give me renewed hope.

23. GREWELL, B. J.
USDA-ARS Exotic & Invasive Weeds Research, University of California, Davis; Department of Plant Sciences MS-4, 1 Shields Ave., Davis, CA 95616

Creeping over California Wetlands: Water Primrose (*Ludwigia* spp.) Invasions

Recent aggressive spread of exotic *Ludwigia* species (water primrose, primrose-willow, Uruguay seedbox) has impacted sensitive wetlands in the Great Valley and North, Central and South Coast floristic regions of California. These perennial, creeping emergent weeds can rapidly form dense floating mats that displace native vegetation and open water habitat, degrade water quality, increase flood risk, and inhibit effective mosquito control. *Ludwigia* species are phenotypically plastic in response to environmental conditions. Variable growth forms have complicated species identification and prompted taxonomic revisions. We have initiated ecological, cytological and genetic studies to confirm species identity in California invasion sites, exotic origin, introduction pathways, and to assess factors influencing invasion success. Development of effective management strategies for *Ludwigia* control requires information regarding weed tolerance and response to a range of environmental conditions. To inform weed managers, we are evaluating *Ludwigia* establishment, growth, nutrient allocation, and decomposition dynamics across hydrologic and nutrient gradients in field and mesocosm experiments. Results suggest that hydrologic manipulations and reduced sediment inputs will facilitate weed control some systems. Experimental evaluations of restoration-based integrated weed management strategies are underway for re-establishment of native plant communities. To support habitat restoration, we are studying exotic *Ludwigia* interactions with native species and testing community assembly strategies for restoration of biogeochemical function and plant community structure.

24. AYRES, D. R.
Evolution and Ecology, University of California, Davis, CA 95616

Tumbleweed Species & Speciation in California: Implications for Management

Tumbleweeds are road side and rangeland pest plants throughout the western U.S. Three described tumbleweed species and two undescribed *Salsola* taxa occur in California. The known species are Russian thistle, *Salsola tragus*, introduced from Asia in the 1800s, barb-wire tumbleweed, *S. paulsenii*, which grows in the desert regions, and the recently identified *S. australis*, a species possibly native to Australia. Molecular genetic and cytological analyses indicated that one undescribed taxa is a new allopolyploid hybrid species between *S. tragus* and *S. australis*, and the other undescribed taxa is a complex hybrid involving all three described species. Distribution studies showed *S. tragus* and *S. australis* were widespread in the central valley and coast ranges, while the hybrid taxa were found primarily around Bakersfield and in the western Mojave. The invasion potential of the hybrid taxa is unknown. Tumbleweeds are the focus of biological controls efforts by the USDA; identifying suitable agents targeting hybrid taxa may be difficult or impossible.

Northern California Botanical Discoveries

25. NELSON, J. K.
USDA Forest Service, Shasta-Trinity National Forest, 3644 Avtech Parkway, Redding, CA 96002

Wanted – A Few Good Botanists: New Species Await Your Discovery in the Klamath Ranges of California

Despite global and national recognition as a hotspot of plant diversity, the Klamath Ranges of northwest California and southwest Oregon have yet to be fully explored for new plants; nor has a regional flora ever been published for this bioregion. A review of systematic literature shows a steady stream of new species, subspecies, and varieties published from the Klamath Ranges in the last six decades. Instead of dwindling over the last sixty years, the largest number of new Klamath Range taxa published in one year was for 2004 – 6 new taxa in the genera *Cirsium, Erigeron, Silene,* and *Eriogonum.* Plant families with the largest number of new taxa in the time period analyzed in this bioregion are Asteraceae, Caryophyllaceae, Liliaceae, and Polygonaceae. Most of the authors of these taxa are in their fifties or older. The time is ripe for a new generation of field botanists and systematists to join their ranks, and to produce a regional flora of the Klamath Ranges.

26. CASTRO, B.
California Department of Water Resources, Northern District, Red Bluff, CA 96080

Window on a Rare Mint: the Rediscovery of *Monardella douglasii* ssp. *venosa* (Lamiaceae)

Until its rediscovery in Butte County, the "window-pane coyote mint" (*Monardella douglasii* ssp. *venosa* – MODOV) was presumed extinct. This small annual had last been seen in California in 1935 and Butte County in 1883. During a May 1992 rare plant survey in central Butte County, it was discovered by Lawrence Janeway and Barbara Castro in an unexpected annual grassland habitat of heavy, volcanic-ash-derived clay canyon-bottom soils. The mint's

rediscovery was reported to CNDDB, summarized in Madroño (40)4, and its status changed from CNPS List 1A to 1B. Eight years of data gathered (1993-2005) on the plant's population numbers (over 50,000 individuals) and reproductive effort at one site indicate possible correlation of MODOV with annual precipitation levels; data are still being analyzed. MODOV's closest relative is *M. douglasii* ssp. *douglasii*, whose range is restricted to the Bay Area vicinity Inner Coast Range foothills, and is distinguished by smaller bracts. The historic Tuolumne County population of MODOV was rediscovered by Dean Taylor in 1998 in serpentine-derived clay soils. No other occurrences of this species are known. Current work in Butte County includes publishing population data, and efforts by ranch owners to establish a Conservation Easement. Future needs include further surveys in potential habitats between Butte and Tuolumne Counties, and long-term protection of both known California populations.

27. SHEVOCK, J. R.
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Moss Discoveries in California

There are approximately 13,000 species of mosses worldwide. Over 600 species of mosses are now documented for California, nearly half of the mosses known for all of North America. The first published reports of taxa new to science from California appear in 1868 primarily as the result of plant collections obtained by Henry Bolander under the auspices of the Geological Survey of California. The bryoflora of California is still in its basic inventory phase where state additions as well as species and even genera are being discovered and described as new to science. This species richness is in part a response to the diversity of habitats, geologic substrates, and elevation gradients within the state. The other primary influence on the California bryoflora is its Mediterranean climate defined by winter precipitation and prolonged summer drought. Many mosses in California are relatively rare and can be viewed either as holdovers from past climate change now restricted to isolated micro-habitats or as highly restricted endemics. Basic checklists and bryofloras have only been completed for a handful of counties or other administrative units. Herbarium acquisition of bryophyte specimens has been erratic and a systematic inventory approach remains to be implemented statewide.

28. BISHOP, C., and BISHOP, J.*
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Hidden Fen Surprises: A Unique Ecosystem Comes to Light in the Northern Sierra

Systematic surveys are revealing the distribution and character of these previously unassessed peatland ecosystems. We now know of approximately 50 fens in the higher elevations between the middle and north forks of the Feather River – a little bit of "boreal habitat" retained in the montane northern Sierras, that probably dates to the close of the Pleistocene ice ages. The fens embody a unique combination of peat substrate, saturation, and openness to sunlight that yields concentrations of beautiful and fascinating plants, and plant communities not found elsewhere, free of non-native plants. We have encountered some very uncommon plants, both bryophyte and vascular – mosses new to California and Sphagnums that resist conventional classification; *Narthecium californica* and *Sparganium natans*. Interesting and unusual are the few wooded

fens we've discovered. A picture is emerging that reveals both common features of fen settings as well as locale-correlated variations. The fens are limited in geographic distribution, clustering mainly in two areas roughly 10 miles apart. In spite of that relatively small separation the two fen groups show interesting contrasts in physical character (elevation, substrate, temperature, and pH) and in plant communities. Those in the Bucks Lake Wilderness commonly have sphagnum mosses, while those in the Coldwater-Willow area to the south rarely have sphagnum. The Coldwater-Willow fens are dominated by *Narthecium*, but the Bucks Lake Wilderness fens have none.

29. PRESTON, R.
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New and Old Names in *Brodiaea*

Several recent and ongoing studies are revising the taxonomy of *Brodiaea*, with new taxa being described and circumscriptions of several other species being modified. *Brodiaea sierrae*, related to *B. californica* and *B. leptandra*, was described from the Sierra Nevada foothills of Butte, Yuba, and Nevada Counties. A reevaluation of *B. minor* placed *B. purdyi* in synonymy and resurrected *B. minor*, a diminutive species found in vernal pools along the east edge of the Great Valley from Butte County to Merced County. California populations of *B. coronaria*, as currently recognized in The Jepson Manual, actually consists of 2 or 3 distinct taxa, and their relationship to *B. coronaria* of the Pacific Northwest is unclear. Similar studies underway in southern California will also recognize new taxa.

30. PARK, M. S.
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Notes on the Rediscovery and Conservation of the Mount Diablo Buckwheat (*Eriogonum truncatum* A. Gray)

The Mount Diablo Buckwheat was rediscovered in Spring 2005. It had last been documented in 1936 and its status had been listed as "PRESUMED EXTINCT" in the Jepson Manual (ed. Hickman, 1993). Only a single population has been located. Observations of this site and historical locations suggest that habitat loss by invasion of introduced grasses may be responsible for the near extinction of the species. The Mount Diablo Buckwheat Working Group – comprised of representatives from Jepson Herbarium, University of California Botanical Garden, California State Parks, US Fish and Wildlife Service, CA Department of Fish and Game, and Save Mount Diablo – has begun work on: a) identifying the factors (e.g., disturbance, soil types) necessary for the continued proliferation of the species; b) establishing a conservation strategy (e.g., propagation in cultivation); and c) analysis of threats (e.g., land use, habitat loss, geomorphic factors) to its survival.

31. LINSTRAND, L.
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Habitat, Geologic, and Soil Characteristics of Shasta Snow-wreath (*Neviusia cliftonii*) Populations

The 1992 discovery of Shasta snow-wreath (*Neviusia cliftonii*), a shrub of the Rosaceae: Kerrieae, provided California with a new genus. The species is endemic to far northern California, in the vicinity of Shasta Lake, Shasta County. Based on the first group of Shasta snow-wreath populations found, the species was assumed to be associated with limestone substrates. Of the ten populations known by 1996, only two were located in non-limestone habitat. During 2003 and 2004, we discovered seven new Shasta snow-wreath populations, nearly doubling the number of known occurrences. Following these discoveries, we conducted a GIS analysis using location data from the new sites, and from all previously known sites to determine the habitat, geologic, and soil characteristics at each Shasta snow-wreath population location. Our analysis shows that 47% of all known Shasta snow-wreath sites occur in non-limestone geologic or soil types. Though these new occurrences have filled some gaps in the known distribution, they are still within the previously recorded species range. The boundaries of Shasta snow-wreath's geographic and elevational range have yet to be determined. Given our analysis of the geologic and soil characteristics at the known Shasta snow-wreath sites, previous assumptions regarding geologic and soil associations, and the fairly limited geographic extent of previous survey efforts, only a small fraction of potential habitat for this species has been surveyed. It is highly likely that additional populations occur in the Shasta Lake region of the southeastern Klamath Mountains. Our analysis of geologic and soil characteristics at the known snow-wreath population sites clearly shows that non-limestone substrates cannot be excluded as suitable habitat, and that field inventories for Shasta snow-wreath within the species' known and suspected range should include a wider range of substrates, aspects, and vegetation types than was previously thought suitable for the species.