

# TECHNICAL NOTES

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U.S. Department of Agriculture

Natural Resources Conservation Service

TN-PLANT MATERIALS-68

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## Guidelines for Native Plant Use

The purpose of this document is to provide guidelines to NRCS planners on recommending native plant materials. A major concern in any restoration or revegetation project is the objective of the planting. If erosion control is a prime concern, the most effective plant to control erosion (native or non-native) should be listed as an alternative to the landowner or decision maker (Bishop, TN-39, 1995). Planners are advised to review the introduction to the MLRA 17 Vegetative Guide (pp. 1-10) for planting guidelines, the Native Plant Policy (Part 406, Ecosystem-Based Assistance, CA406.3) and plant materials technical note 46 – Glossary of Terms For Use On Native Species Issues. Under the CA406.3 policy, native plants not listed in the Vegetative Guide may be suggested by a Field Office, but they must include the NRCS disclaimer:

*“The attached list of native species is to be considered for general use only. The Natural Resources Conservation Service does not imply or consent to the use of this information as a recommendation for species selection. Plant establishment success is not implied.”*

In regards to interim native plant alternatives, the policy also requires the Field Office to evaluate native plants not in the vegetative guide as field plantings so that recommendation status in the future may be considered.

More natives have been added to the new Vegetative Guide revision (MLRA 17 is completed at this time and all MLRA vegetative guides are being placed in an ACCESS database). Criteria for selection included: adaptability, hardiness, availability, ease in establishing, values for wildlife and for meeting conservation objectives. Also considered was the level of field testing of available plant stock. The most recent native cultivars released from NRCS Plant Materials Centers (PMC) have been included.

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Planners are encouraged to recommend PMC native cultivars, where appropriate, in terms of geographic suitability to the project site. Be aware that prior field testing does not guarantee a successful planting. However, the closer the project site conditions resemble field-test conditions, the higher the likelihood of success. The more adaptable a species is, the broader its utility will be (Bishop, TN-40, 1996; TN-59, 2000 and Dyer, TN-64, 2001).

Other native species which are widely available at nurseries, but for which cultivars aren't yet developed, have been included in the Vegetative Guide. These species will be identified with the footnote, "Use locally-adapted varieties". The species, not any one individual ecotype or cultivar, was evaluated using the same quality criteria listed above. Although such plants aren't official cultivars, they usually come from stock populations utilized year after year by nurseries due to their reliability of propagation. This represents some level of "field-trial" research that could form the basis of future cultivar development, and reduces some of the risk factor in the long term. Using the field planting program to evaluate these species is not required because they are in the vegetative guide, but is a good way to gain additional information (Slayback, TN-35, 1994).

Although wild seed collections are appropriate from a local adaptation standpoint, they are generally riskier and require more lead time. The risk factor is different depending on the type of plant and method of propagation. Wild collections of native grasses, graminoids and some forbs are often challenging to obtain and cultivate successfully, especially the first time, due to variances in seed production, germination, general viability and other factors. Native shrubs and trees are generally easier to propagate, making on-site collections of cuttings to be grown out by nurseries a very viable option. Seed collectors and nurseries are becoming increasingly experienced in dealing with wild collections. It is best to call several nurseries, ask if they have experience with the native species desired, and then determine the best and most feasible methods of propagation.

With the new Vegetative Guide revision, more species-specific information has been added through the use of footnotes. In addition to nurseries, planners are encouraged to consult other sources of information such as the PLANTS database (<http://plants.usda.gov>), Plant Materials Centers (<http://Plant-Materials.nrcs.gov/>), the FEIS database ([www.fs.fed.us/database/feis](http://www.fs.fed.us/database/feis)), Calflora ([www.calflora.org/](http://www.calflora.org/)) and other sources.

## **Logistics of Native Plantings**

Planting designs are constrained by time, money, available equipment, and experience of both the planner and landowner. It should be mentioned that, in some cases, vegetative goals are best achieved through management rather than revegetation. Although a good revegetation plan requires considerable thought and planning, it need not be complicated.

If time is short, consider planting in phases or focusing on weed eradication until the appropriate plant materials are ready for planting. Planting in phases may also be the best approach to establishing the desired species.

### **Site Evaluation**

Natives are appropriate for a variety of conservation practices from field borders and hedgerows to revegetating stream banks and wetlands. As in all plantings, a thorough site evaluation is necessary prior to developing a plan. This includes an inventory of existing plants, in addition to determining soil type and soil limitations, available precipitation, temperature (max/min, averages), aspect and hydrology. The evaluation also requires that a clear determination be made in regards to the intended primary use of the seeding. Presence and extent of any noxious weed populations should also be assessed, including the presence and amount of weed seed in the top soil after seed bed preparation (Dyer, TN-36, 1995). Any existing native vegetation to be conserved should be delineated. In addition to reducing the number of plants needed, it could provide propagative source material, in the form of seed, cuttings or transplants. All the site evaluation information should be considered along with landowner goals and objectives to develop the plan.

### **Plant Selection & Procurement**

It is common to plan for and list on a one to three year schedule the action items and dates to collect, grow or otherwise obtain appropriate plant materials and establish the plants. Obtaining plant material is often the greatest obstacle to using native plants and seed, especially where there are no local nurseries or seed companies. However, the nearest vendors are likely to have some appropriate material. Planners should assist landowners in starting this process as soon as possible into the project. Many resources are available to assist planners with selection of species (Bishop, TN-40, 1995). Planners should match values of plant species with conservation goals. Compile a long list of possible species since some may not be available. Nursery sources can be obtained on the Internet. The California Dept. of Conservation publishes a list of Nursery Sources for California Native Plants that is updated periodically (Showers, 1999). Plant Materials Centers, UC Extension, and County Agricultural Officers may also be able to refer landowners to sources for plants.

When buying seed or plants from a nursery that are already grown out, it is best to inquire the origin of the parent stock or population where collected. At a minimum, try to match the elevation, latitude and climate of nursery stock with the project site (Dyer, TN-64, 2001). Consider also the micro-environment such as aspect, light, soil type and plant associations (Knapp and Rice, 1994). Species can adapt to disturbance, so for

revegetating highly-disturbed sites, select species adapted to harsh conditions, or ones that compete well with non-natives (Knapp and Rice, 1994 and Bishop, TN-37, 1994).

The best method for using transplants is to harvest clumps and then have a nursery divide and grow them into smaller-sized, rooted plugs (Owens and Dyer, TN-42, 1996). This is an excellent way to deal with the low seed production typical of many native populations, while still using locally-adapted stock. The salvage of native sod for wetland restoration has been shown to be effective (Owens, TN-43, 1996). Also, the transplanting of willow clumps for stream restoration has shown to be effective (Owens, TN-44, 1996). Transplants colonize an area more quickly and densely than starting from seed. Again, nurseries should be consulted to determine the amount of lead-time needed to produce rooted plugs. Cool-season grasses, for example, require approximately 6 to 10 weeks to grow (Anderson, 1999). If the grasses are propagated in small containers or small cells in flats, they quickly become root bound, should not be stored and need to be planted immediately.

Contracted collectors need a *minimum* of 6 months to a year of lead time. The time must be added to the time needed to grow the seed or cuttings out into plants. It is extremely important for collectors to have experience, to know when and what they are harvesting. Testing for percent germination and purity of any wild seed collections is highly recommended (Slayback, TN-34, 1994). Wild seed collections will probably not occur for NRCS funded projects, but could be recommended when assisting RCDs with grant-funded projects. Refer to sources such as Knapp and Rice (1994) for more guidance.

When a major difference in climate exists between the nursery and project site, plants should be hardened off in the destination location for a brief time (2 weeks minimum to 1 month or more) before planting. Nursery-grown plants are usually given regular fertilizer treatments, so it's best to eliminate them and simply water during the hardening-off period. Inquire with nurseries as to the best location and conditions for plants during the hardening-off period.

### **Plant Size**

Planners should consider establishment goals, competition from other species, availability of water, and cost in determining what size plant is most suitable. Placing orders with nurseries as soon as possible will help ensure delivery of the sizes and quantities desired. Growth rates vary with species, but in general a minimum of one year is required for a very small plant, but preferably two is necessary to grow woody cuttings to a suitable size. Plugs require a minimum of 6 months to a year depending on the species. Frequently, native plants grown for restoration projects are grown in specialized containers (i.e. treebands, D-pots, treepot-4) that improve survival rate by promoting

deep, straight root systems. In general, the depth of these containers is longer than the width, with ridges that encourage straight vertical roots, and an open bottom to induce air pruning of roots.

### **Site Preparation**

The need for site preparation is evaluated similarly for both native and non-native plantings. Non-native species are valued for their ability to establish quickly and compete with weeds, which minimizes the amount of site preparation needed. Many native trees and shrubs can perform equally well to non-natives and not require additional practices to get them established.

Measures such as grading, soil decompaction, soil amendments, drip irrigation, plant protection, mulch, legume inoculation, seed treatment, weed control fabric and weed eradication require more work, lead time and expense, but they dramatically increase the chances for a successful planting. For the less competitive natives, one or more of these measures may be needed, in addition to continued maintenance. In almost all cases, some form of weed removal is necessary prior to and after planting. For native grass seeding to be optimally successful, multiple herbicide treatments should be required a year or longer before and after the seeding. Fertilizer can benefit tree and shrub plantings, but it is not generally recommended for native grass seeding because fast-growing weeds utilize it first and then out-compete the desired species. Provide for follow-up fertilization as needed. Compost, mulch or other organic amendments that improve soil structure and fertility are generally recommended. Protect from damage such as grazing, trampling and traffic during establishment.

Other potential amendments include mycorrhizal and microbial inoculants. Mycorrhizae are said to enhance plant establishment, increase productivity, reduce transplant shock and the need for fertilizers, lower a plant's water requirement, increase resistance to weed invasion, reduce soil erosion and increase soil aeration and drainage (Peters, 2002). In spite of the perceived benefits, results of plantings incorporating mycorrhizae appear mixed (John Anderson and Scott Stewart, Conservaseed, personal communications; Peters, 2002). Some of these sources believe a mycorrhizal inoculant isn't critical where soils are basically healthy, but feel they can be helpful in poorer soils. The literature suggests that not adding a mycorrhizae inoculant would not necessarily mean a failed planting, but adding it could promote establishment and reduce the amount of maintenance required.

One caveat regarding site preparation measures is that grading, excavating, fertilizer application, and soil erosion can disrupt or destroy existing mycorrhizae populations. Given this, minimal soil disturbance and retention of existing topsoil are recommended practices where possible. However, if used in seeded areas, mycorrhizae inoculant must be incorporated into the soil to a depth of six inches to be most effective. In order to decide whether an inoculant is warranted, sampling may be done to detect presence or

absence of mycorrhizae and estimate quantity. Peters (2002) recommends collecting several samples throughout the growing season and provides guidance and references for lab analysis. Although cost issues could prevent mycorrhizal inoculation in most NRCS projects, it may be a useful and feasible tool on severely degraded sites that are small in scale (Dyer, TN-62, 2001).

### **Planting Guidelines**

Planting methods will vary with each project. This document cannot cover the gamut of methods but it provides some tips applicable to most projects. Similarly, general guidelines and logistical concerns are provided in this and the next section for native grass plantings.

NRCS guidelines for planting container plants already exist and are appropriate for native species. It is important to protect new plants from browsing or other damage. A simple chicken wire cage usually suffices. Bending the wire at the top of the cage to close it off discourages browsing, but leave enough space for the growing tips to eventually fill out. Mulch mats, tar paper or landscape fabric placed around the base of the plant reduce the need for weed control the first few seasons. A 6" layer of wood chips on top further suppresses weeds and protects the barrier underneath. This method is effective and relatively inexpensive, especially when you consider that less weed maintenance will be needed. If the plant is previously hardened off and planted at the right time, this method is preferable to plastic plant tubes commonly used, since plants are forced to acclimate and have more space to grow.

Supplemental irrigation should be given to all tree and shrub plantings in areas that aren't naturally moist until plant roots reach the water table. Native species often need irrigation at first, but are generally more drought-tolerant once established. Supplemental water reduces the time needed for establishing healthy plants. Drip irrigation systems are effective, versatile, and inexpensive. One lesson learned is that secondary tubing off a primary drip line should be avoided because it falls off easily and requires constant maintenance. For best results, put emitters directly into the primary drip line. Where irrigation is not an option, construct a berm around each plant to retain water.

For native grass seedings, the drill-seeding method is preferable because less seed is needed, seed placement is more accurate and seed can be placed without disturbing adjacent vegetation (minimizes erosion). However, drills can't be used in steep or rocky terrain. Native grass seed planting depth is shallow and should be no more than 1/8-1/2" depending on the seed size. More seedings are lost due to seeding too deep, than seeding too shallow. When broadcast seeding, ensure that the soil is in a roughened condition and always broadcast onto a fresh seed bed. Be sure to rescarify old, settled seed beds. Obtaining good soil-to-seed contact is critical when broadcast seeding; Moreover, many landowners use a ring roller cultivation packer to obtain soil-to-seed contact.

Many seedings cannot be irrigated, making mulches a valuable tool for minimizing moisture loss (Sandifer, TN-49, 1997 and Owens, Christensen and Dyer, TN-51, 1997). Imprint seeding is an effective method for addressing this because it creates furrows around the seeds, funneling water to them. Other ways of producing a similar effect using traditional equipment can be explored. Where irrigation is not possible, the seeding must be timed to take full advantage of seasonal precipitation.

Seeding after wildfires and planting in wildfire prone areas requires an evaluation of fire intensity, soil seed banks and careful plant selection (Dyer, TN-36, 1995; Bishop, TN-39, 1995; Dyer, TN-41, 1996; Dyer, TN-57, 1999; Dyer, TN-61, 2001).

### **Maintenance**

Maintenance is the key to successful plantings whether using native or non-native plants. Measures might include watering, weed treatment, and replacement of dead or diseased plants. Maintenance practices and schedules obviously vary with each project and type of planting (seeding vs. tree/shrub planting etc.). A minimum of 2 to 3 years of maintenance should be planned.

### **Native Grass Plantings**

There are many benefits of perennial, native grasses, but they require 3 or more years to establish and additional effort to maintain. Native seed is more expensive and not as available, but this is gradually changing. Additional practices are usually warranted. Such practices might include tilling prior to planting, pre- and post-planting weed treatments, controlled burning or grazing. In areas where rainfall is low and irrigation isn't an option, establishing natives can be even more difficult. Thorough research and planning are necessary for successful native grass plantings. All of the factors cannot be covered in this document and planners are encouraged to seek additional information and training (CNGA - California Native Grass Association, workshop handbook, 2002; Sandifer, TN-49, 1997; Espinosa, T., TN-59, 2000 and Dyer, D., TN-60, 2001).

In selecting species or ecotype, planners should consider characteristics such as seedling vigor, environmental range, genetic diversity within a species, susceptibility to frost, drought and disease, and if it is a short- or long-lived species. (Bishop, TN-37, 1994; Bishop, TN-40, 1996 and Dyer, TN-64, 2001). Considering this information, it may be sensible to do a phased planting where, for example, a slower growing species, such as melic grass is planted a year before a more aggressive species, like slender wheatgrass or California brome. Any mixes used should contain a balance of fast-growing, short-lived species with slower-growing, long-lived species. Another situation where a phased planting might be appropriate is with riparian shrubs, where the more drought and sun-tolerant species are planted first with the less tolerant species planted later.

The knowledge base for understanding the biology of native grasses and their utility in

management is growing. Available information on species varies but is generally limited so each field planting is an opportunity to further increase what we know. Native grasses represent one alternative that can be presented to NRCS cooperators. Public demand for developing this technology is increasing. NRCS has the opportunity to serve new clientele, while still serving its traditional customers, many of whom might also consider natives if they are proven effective and economical.

## **Botany Books and Other Resources For Native Plants**

Barbour, M.G. & J. Major. 1995. Terrestrial Vegetation. California Native Plant Society Press, Sacramento, CA.

Review: This seminal work has been around awhile. The original work had a vegetation map to go with it. Subsequent editions lack the map. The book gives detailed descriptions of the floristic provinces of California, covering different vegetation communities within each province. It is a classic work and gives excellent background information.

*Price: Around \$60. Available from the California Native Plant Society (CNPS).*

Barns, R.M and B.H. Honkala. 1990. Silvics of North America: Volume I: Conifers. USDA Forest Service, Agricultural Handbook 654, Washington D.C.

Review: This is a big book that gives lots of great information on the ecology, reproduction, and much more of North American conifers. There is also a volume on hardwoods, but these books are out of print and is extremely hard to get. However, it is worth trying.

*Price: Free if you can find it. Try calling the Forest Service's publishing offices directly and be persistent!*

Becking, Rudolph. 1982. Pocket Flora of the Redwood Forest. Island Press. Covelo, CA.

Review: Again, a paperback that has photos, great line drawings, keys, plant description and range, and written & pictorial glossaries on plant characteristics. It provides a lot of information, covering the major taxa of the redwood forest. It would be helpful to those working in the north coast redwood forests, and further south also, as many of the same or similar species are present.

*Price: Inexpensive (under \$20).*



Blackwell, L.R. 1999. Wildflowers of the Sierra Nevada and Central Valley. Lone Pine Publishing.

*Price: \$15.95 softcover, CNPS*

Bossard, C. ed. 2000. Invasive plants of California wildlands. University of California Press, Berkeley, CA.

Review: Similar in concept to Weeds of the West. Has more information on weed reproductive biology with control techniques and good literature citation.

*Price: around \$25.*

California Native Plant Society. 1994. Inventory of rare and endangered vascular plants of California: Fifth Edition. Published by CNPS.

Review: Contains a listing of all threatened, rare and endangered plants of the state; their habitat, the counties where they occur etc. CNPS has their own ranking system which is widely recognized by agencies (even if the agencies have a different nomenclature) throughout the state. The inventory is revised periodically so make sure you have the most recent version.

*Price: Around \$25. The inventory is also available as a computer software program and costs approx. \$200.*

Chatfield, K. 1997. Medicine from the Mountains: Medicinal Plants of the Sierra Nevada. Range of Light Publications, South Lake Tahoe.

Review: Written by an herbalist. This is not a book on how to identify plants but gives the uses and properties of 33 common plants. It is organized by plant common name. Each plant is beautifully illustrated. Great for those working with tribes as book gives traditional uses of native Americans. Many of these plants are not unique to the Sierra Nevada in terms of their value as medicinal. Small paperback.

Clark, C.B. 1977. Edible and Useful Plants of California. University of California Press, Berkeley, CA.

Review: Paperback—again uses in terms of early native Americans. Contains line drawings and photos and recipes for use of the plants.

*Price: Inexpensive.*

Crampton, B. Grasses of California. University of California Press, Berkeley, CA.

Review: A small paperback that, for its size, contains good information on the conspicuous California grasses, both native and non-native.

*Price: Inexpensive.*

Cronquist, A., et al. 1994. Intermountain Flora: Volumes I-VI. Reprinted by the New York Botanical Garden, New York.

Review: This comprehensive series is expensive but worth it. Each volume covers a number of plant families. These books contain detailed line drawings, good keys, species descriptions and geographic range. Intended to cover the northern Great Basin including most of Nevada, se Oregon, southern Idaho, and most of Idaho, it is of most utility to folks working in eastern California since many of the same species occur there but it also includes many wide-ranging, yet predominant pacific northwest. This is a great reference--highly recommended as a tool for identification. A few major families are missing like the Brassicaceae or mustard family. An additional volume is supposed to be completed in 2003-2004.

*Price: It's cheaper to buy the whole series than piecemeal. They used to offer a deal for all 6 volumes for \$275.*

Dir, M.A. and C.W. Heuser, Jr. 1987. The reference manual of woody plant propagation: from seed to tissue culture. Varsity Press, Athens, Georgia.

Review: This book has very good introductory sections giving the big picture on plant propagation. Many of the species are east coast in origin, but you can often make some inferences about similar species or groups of plants.

*Price: Approx \$40. It's a soft cover available through Amazon.*

Dole, J.W. & B.B. Rose. 1996. Shrubs and trees of southern California Deserts: An amateur botanist's identification manual. Footloose Press.

*Price: \$14.95 soft cover, CNPS*

Emery, D. 1988. Seed Propagation of Native California Plants. Santa Ana Botanic Garden, Claremont, CA.

Review: This little book is still touted as a great source of information on how to treat native seed. Many of the species covered are cosmopolitan, others more specific to discrete regions within the state.

*Price: Inexpensive.*

Faber, P.M. 1996. Common wetland plants of coastal California: A field guide for the layman. Pickleweed Press, CA.

And.....

Faber, P.M. 1996. Common riparian plants of California: A field guide for the layman. Pickleweed Press, CA.

Review: These two books are somewhat useful. The pictures are photocopies of herbarium specimens. They give a brief species description, notes on habitat and range, and a habit key. Each book talks at length in the introduction about the importance of wetlands and riparian ecosystems. These are good books for beginners and while not comprehensive, contain some of the major species.

*Price: \$18 each, soft cover or the pair for \$32 through CNPS*

Ferris, R. 1968. Native Shrubs of the San Francisco Bay Region. University of California Press, Berkeley, CA.

Review: A little paperback that covers the major plants of the area. It contains line drawings, photos, a taxonomic key, and species descriptions

Hickman, J. ed. 1996. Jepson Manual of Higher Plants of California. University of California Press, Berkeley, California.

Review: Successor to Munz and the earlier Jepson Manual as the comprehensive flora of the vascular plants of California. In addition to the plant keys, species descriptions, habitat and range of species found in the earlier floras, the Jepson Manual also contains more pictures, culture information, simplified taxonomic terminology, and a glossary that includes some pictures. It was intended to be more user friendly to lay people than previous works, which it accomplishes, however, it can still be difficult to use for people without much botany background.

*Price: \$80, hardcover, CNPS.*

Hitchcock, A.S. 1971. Manual of the grasses of the U.S.: Volumes I & II. Dover Publications, New York.

Review: Standard textbook in agrostology classes. Not the best pictures but these are included for many species. They include decent keys, species descriptions, and habitat & range.

*Price: Both hard and soft cover available.*

Hitchcock C.L. et al. 1964. Vascular Plants of the Pacific Northwest. University of Washington Press, Seattle, WA.

Review: This is comprised of several volumes. It is similar to the Intermountain Flora in terms of scope, how organized, and level of quality. Another great resource. They can be picked up used occasionally, at least separate volumes can.

*Price: Expensive but worth it.*

Horn, E. 1995. Coastal Wildflowers of the Pacific Northwest. Mountain Press Publishing Co.

Review: Small paperback picture book. A great book for beginners. It has lots of photos, plant descriptions, and species geographic range. It covers the most conspicuous families and species. The biomes covered include beaches & dunes, wetlands, cliffs & grasslands, and coastal forests.

*Price: Inexpensive.*

Hotchkiss, N. 1972. Common marsh, underwater & floating-leaved plants of the U.S. and Canada. Dover Publications, New York.

Review: This book may no longer be in print. It is a paperback book geared to the beginner. It has the usual species descriptions, keys and illustrations. The pictures are not very detailed but they do provide the basic information for identifying some groups of plants.

*Price: Expensive*

Hurd, E.G., Shaw, N.L., Mastrogiuseppe, J., Smithman, L. and S. Goodrich. 1998. Field guide to the intermountain sedges. USDA General Technical Report RMRS-GTR-10, Rocky Mtn. Research Center, Ogden, UT.

Review: This pocket field guide is most appropriate for those working in northeastern California, although many of the species occur in other areas too. It has great photos of important taxonomic traits and line drawings of the whole plant, a picture-glossary, species description, habitat and range, and special identification tips.

*Price: Free government publication while supplies last.*

Lenz, L. & Dourley. California native trees and shrubs. Rancho Santa Ana Botanic Garden, Claremont, CA.

Lenz, L. Native Plants for California Gardens.

Martin, A.C. et al. 1951. American wildlife & plants: A guide to wildlife food habits. Dover Publications, New York.

Review: This small paperback attempts to distill a lot of field data that was collected on wildlife food preferences. It can be used to establish generalities in plant values for wildlife, but not necessarily definitive relationships. Sometimes the book only refers to plants on the generic level, or the plant species are from the east coast, so be cautious about extrapolating relationships. The concept of the book is sound though. It lists all the known parts of the plant used and ranks them in terms of preferences by wildlife. You can either look up the plant or the animal you are targeting.

*Price: Inexpensive paperback.*

Mason, H.L. 1957. A flora of the marshes of California. University of California Press, Berkeley, CA.

Review: One of the few comprehensive books covering the flora of marshes which includes plants found in other types of wetland habitats as well. It contains taxonomic glossaries, keys, species descriptions, and line drawings.

*Price: Approx. \$60 for a hardcover copy.*

Moore, M. 1979. Medicinal Plants of the Mountain West. Museum of New Mexico Press.

Review: Covers all of California—the central valley, northwestern CA, and the southern deserts, which have fewer representatives than the rest of the state but there are definitely some from these areas. It is indexed by plant common name, includes line drawings and some photos.

*Price: Inexpensive.*

Munz, P. 1963. California Wildflowers. University of California Press, Berkeley, CA.

Review: Another small, paperback picture book that focuses on wildflowers. It has some photos and line drawings. The area covered is “roughly the yellow pine belt and upward

through red fir and sub-alpine forests to the peaks above timber line.” Possibly too high elevation for most NRCS clients. It could still help someone trying to learn the main attributes of conspicuous genera.

*Price: Inexpensive.*

Munz, P. 1963. A California Flora. University of California Press, Berkeley, CA.

Review: Less user-friendly than the Jepson Manual and undoubtedly some of the information is dated. However it is still a useful reference. It has very minimal pictures but it does give flowering timeframe for species and has an extensive glossary.

*Nakemura, G. and J. Nelson, ed. 2001. An illustrated guide to selected rare plants of northern California. University of California, Agriculture and Natural Resources Publication 3395.*

Review: This book covers many, but not all of the currently listed species. Although the listings will change over time, making this work outdated, a majority will probably remain listed, making it a useful reference for a long time. It has good species descriptions that include habitat description, best window for identification, and presently known locations (at the quadrangle level). It has good diagnostic traits for ease in identification, plant photos, habitat and range.

*Price: Around \$15-20.*

Petersen, V. and V. Petersen Jr. 1975. Native Trees of the Sierra Nevada. University of California Press, Berkeley, CA.

Review: A small, paperback pocket guide. Includes both evergreen and deciduous conifers and hardwoods. Another good book for beginners. It packs a lot of information in and has some nice drawings.

*Price: Inexpensive.*

Sampson, A.W. and B.S. Jespersen. 1963. California range brushlands and browse plants. University of California Publication 4010. University of California, Division of Agriculture and Natural Resources.

Review: Useful little book that has species description, keys, illustrations and geographical range, and use as forage.

*Price: Approx. \$20.*

Sawyer, J.O. and T. Keeler-Wolf. 1995. The Manual of California Vegetation. California Native Plant Society Press, Sacramento, CA.

Review: This work attempts to create a uniform classification for the vegetation of California. It focuses on the lower floristic levels, the series or association level. The information on each series includes: description of the type and the habitat in which it occurs, its distribution (geographic regions within the state follow the nomenclature of the Jepson Manual), a list of species associated with the series, other names for the type from past classifications, and bibliographical references. The book also includes some nice photos of selected types. This is a collaboration of CNPS, federal and state agencies.

*Price: Around \$50-60. Available from CNPS.*

Schmidt, M.G. 1980. Growing California Native Plants. University of California Press, Berkeley, CA.

Review: This was a fairly comprehensive book for its time even though it's a small paperback. There aren't many good books on growing natives. This one has both general and specific culture requirements depending on species, and some genera are given more attention than others.

*Price: Approx. \$10-\$15.*

Seeds of Woody Plants in the U.S. 1974. USDA Forest Service, Agricultural Handbook 450.

Sheley, R.L. and J.K. Petroff, eds. 1999. Biology and Management of Noxious Rangeland Weeds. Oregon State University Press, Corvallis, OR.

Review: This book has several introductory chapters that give a good overview on the problem of noxious weeds. It profiles about 25 species or groups of plants individually. There is a lot of good information in each profile. Since there are some weeds that aren't in the other books that are in here (such as scotch thistle), it is another good resource to have. Although the book comes out of Oregon, California has many of the same noxious weeds.

*Price: Approx. \$20-25.*

Showers, M. 1999. Nursery Sources for California Native Plants (DMG Open File Report 90-04). California Dept. of Conservation, Division of Mines and Geology, Sacramento, CA.

Review: The list includes sources for 1600 native California plant taxa. It includes

sources for bare root plants. Gives the address, phone, and in some cases email address of sources. One thing it doesn't give that we need to make sure we inquire about is the general location information of the parent stock. Nurseries may act like this information is proprietary, but if they are informed, they will know it's appropriate for planners to ask, and at least give you general information (eg. county, elevation, type of habitat). Don't be shy in insisting to have this information. The publication will become out of date, but hopefully revisions will follow. Its definitely, a good resource.

*Price: \$10.*

Stuart, J.D. and J.O. Sawyer. 2001. Trees and shrubs of California. University of California Press, Berkeley, California.

Review: This paperback field guide just came out. It has beautiful line drawing illustrations, some color plates, individual species descriptions & identification tips; maps of species distribution; keys to genus and species. The book delineates ecological regions throughout the state and cross-references with individual species range & habitat. It is a great little resource.

*Price: \$22.50 soft cover, CNPS*

Taylor, R.J. 1992. Sagebrush Country: A Wildflower Sanctuary. Mountain Press Publishing Co.

Review: A small paperback picture book—not comprehensive but can help with some of the major genera.

*Price: Inexpensive, \$15*

Thomas, J.H. 1961. Flora of the Santa Cruz Mountains: A Manual of the Vascular Plants, Stanford University Press, Stanford, CA.

Review: This book is a well-known standard for the Santa Cruz Mountains. The drawings included are very good, no photos. The style is typical for its era. It has a great description of the area covered, taxonomic keys and plant descriptions. Better for the intermediate to advanced plant enthusiast.

*Price: Soft-bound, may be available used.*

Van Dersal. Native Woody Plants of the United States. Published by USDA.

Weeden, N. 1986. A Sierra Nevada Flora. Wilderness Press, Berkeley, CA.



Review: Small paperback pocket guide that is basically a key. No photos, line drawings are not very good and the region covered is typically above 3500 ft. on the western side of the SN and above 8000 ft. on the east, so it is probably not appropriate for most NRCS clients.

Whitson, T.D. ed. 1996. Weeds of the West. University of Wyoming, Jackson, WY.

Review: About 50 common weed species in the west are covered in this book. It includes several photos for each species, species descriptions including their negative effects, and geographic range. A disadvantage is it doesn't give any advice on control methods but it is still a good resource. Paperback.

*Price: Relatively inexpensive.*

Weeds of California, State of California

The Grower's Weed Identification Handbook

Western Wetland Flora: Field Office Guide to Plant Species. USDA NRCS publication. Western region, Sacramento, CA.

Review: This comprehensive book has photos, map of geographic range, species description and field identification tips.

*Price: Free of charge.*

Harrington, H.D. 1977. How to identify grasses and grass-like plants. Swallow Press/University of Ohio Press, Athens, Ohio.

Review: Nice little book for those wanting to venture into identifying grasses—basically a glossary including line drawings and text description.

*Price: Inexpensive.*

Other floras available for specific areas (can buy from the CA Native Plant Society)

- Flora of Sonoma County
- A Key to Vascular Plant Species of Kern County, CA, and A Flora of Kern County, CA
- Manual of the Vascular Plants of Butte County, CA
- Illustrated Field Key to the Flowering Plants of Monterey County

Other book suggestions:

- Peterson Field Guides
- Audubon Field Guides

Journal Articles/Technical Reports:

Beetle, A. 1947. *Distribution of the Native Grasses of California* in *Hilgardia* 17(9):309-357.

Review: In this seminal paper, the author divides the state into floristic units (eg. northern coast ranges, southern coast ranges, high elevation etc.) and reviews the major grass taxa within each unit. Species distribution maps are also included, although distributions have likely changed and more information is known now than when it was written. A good general resource.

## Web Sites

CalFlora: [www.calflora.org](http://www.calflora.org)

Review: Contains plant species information (habitat, distribution, legal status, wetland code, name synonyms), species occurrence data, and photos. A great resource.

California Native Plant Society: [www.cnps.org](http://www.cnps.org)

*California Native Grass Association*: [www.cnga.org](http://www.cnga.org)

*The Nature Conservancy*: [www.tnc.ucdavis.edu](http://www.tnc.ucdavis.edu)

Review: weed abstracts

*CALPHOTOS*: <http://elib.cs.berkeley.edu/flowers>

Review: Has photos of many plants, animals, fungi.

PLANTS Database: <http://plants.usda.gov/>

ARS Noxious weeds of the US and Canada: [http://invader.dbs.umt.edu/Noxious\\_Weeds/](http://invader.dbs.umt.edu/Noxious_Weeds/)

UC Davis Weed Research and Information Center: <http://wric.ucdavis.edu>

Calif. Dept. of Food & Agriculture: <http://plant.cdfa.ca.gov>

Plant Material Centers: <http://Plant-Materials.nrcs.usda.gov/>

Fire Effects Information Database, U.S. Forest Service:

<http://www.fs.fed.us/database/feis/>

## **Training Courses**

*For instruction in plant identification:*

- Jepson Herbarium, U.C. Berkeley, CA. Offer 2 or 3 day intensive workshops to aid plant identification at family, genus, and species levels. Also offer crash courses in basic botany and overview of 50 common plant families. Cost ranges from \$175 for 2-3 day workshops and \$220 for 4 day courses. Slight discount for members.
- California Native Grass Association, Davis, CA.
  - a.) Offer 1 day grass identification course for the major grass tribes. Students will learn grass morphology, terminology, and how to use keys (Jepson Manual, Munz and others).
  - b.) Offer grass restoration workshop and prescribed fire workshops also.
- Friends of the Chico State Herbarium, Chico, CA. Offer 1 day workshops on select plant groups at a reasonable price (\$40-60) at the CSU, Chico campus.
- Society for Ecological Restoration Annual Conference
- Society for Range Management Annual Conference
- Plant Materials I & II

## **Resources for Plant Identification**

- University Extension
- University of California, Agriculture and Natural Resources Division
- University Herbaria
- California Dept. of Food & Agriculture
- Botanical Gardens
- Local CNPS chapter
- Commercial nurseries

## **Organizations**

- California Native Plant Society (CNPS)
- California Native Grass Association (CNGA)
- Society for Ecological Restoration
- California Exotic Pest Plant Council (CALEPPC)
- Friends of the Jepson Herbarium
- Friends of the Chico State Herbarium
- The Nature Conservancy
- Society for Range Management
- Soil & Water Conservation Society

## **Publications**

- *Fremontia* (CNPS)
- *Madrono* (California Botanical Society)

- *Noxious Times*
- *CALEPPC Newsletter*
- *Grasslands (CNGA)*
- *Restoration Ecology*
- *Restoration & Management Notes*

Note: This list is not exhaustive.

## References

Anderson, J. 2002. Mr. Anderson is owner/operator of Hedgerow Farms, a commercial farm specializing in production of native grasses. He has considerable experience in native grass planting projects.

Anderson, J. 1999. Using transplants to establish native grasses, sedges and rushes *in Bringing Farm Edges Back to Life!* Yolo RCD, Woodland.

Knapp, E. and K. Rice. 1994. Starting from seed: Genetic issues in using native grasses for restoration. *Restoration and Management Notes* 12:40-45.

Peters, S. 2002. Mycorrhizal inoculum: Evaluating need and performance in revegetation and reclamation projects. *Grasslands* XII, No. 4.

San Francisquito Creek (California) Bank Stabilization and Revegetation Master Plan. Section 5: Vegetation Restoration Guidelines.

Showers, M. 1999. Nursery Sources for California Native Plants. California Dept. of Conservation, Office of Mines & Reclamation. Sacramento, CA. Cost is \$10. To order, call 916-445-5716.

Stewart, S. 2002. Mr. Stewart is owner/operator of Conservaseed. In addition to selling native seed, he is a restoration consultant and also grows starts from seed. He is also researching and developing amendment products for use in restoration/revegetation projects.

Slayback, B. 1994. PLS – What is It and How Can We Use It. Plant materials Technical Note 34.

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Dyer, D. 1996. Review of Paper "Post-Fire Emergency Seeding and Conservation in Southern California Shrublands". Technical Note 41.

Owens, J. and Dyer, D. 1996. Propagation of Wetland Plants For Restoration in the Central Sierra Nevada Mountains. Technical Note 42.

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Owens, J., Christensen, K. and Dyer, D. 1997. Hand Crimping Straw Mulch on Critical Area Planting Sites Provides Superior Results. Technical Note 51.

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Espinosa, T. 2000. Review of "Know Your Natives – A Pictorial Guide to California Natives. Technical Note 59.

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Dyer, D. 2001. Soil Quality Improvement Using Mycorrhiza Inoculation and its Effects on the Propagation Of California Native Plants. Technical Note 62.

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California Native Grass Association, Davis, CA, 2002, Using Native Grasses and Graminoids in Restoration and Revegetation, A CNGA Training Workshop.

