GRASSLANDS

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STRATEGIES FOR ESTABLISHING NATIVE GRASSES

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The ideal situation for establishing any perennial grass from seed is to have well-tilled, weed seed-free soil with moisture and temperature appropriate for germination, growth, and establishment. Unfortunately, the usual scenario is a non irrigated weed-infested field or roadside. Here summarized are techniques used to establish native grasses in the Sacramento Valley and adjacent foothills north of Winters in Yolo County. Average yearly rainfall is about 17 inches. Soil types vary from class 1 silty clay loam to class 4 gravely clay loam with underlying hardpan. All areas have undergone continuous or intermittent tillage over the past 20 years. Many of the techniques used follow basic agronomic principles used to establish other perennial plantings such as permanent pasture and sod. The following is a compilation of techniques found to be effective by the author; these are not necessarily recommendations for individual situations, but may serve as guidelines.

Before discussing techniques, it is important to stress the necessity of selecting appropriate species and, perhaps, even species accessions for the site. Over 30 species of native grasses are now available from commercial growers. Soil type, rainfall, exposure, and heat, cold, and flooding tolerance are some of the environmental and climatic factors that dictate where grasses grow. Sites with poor soil are the most critical in species selection with regard to survival. Species originally on the site would be the best choices. An adaptability guide is being prepared by CNGA; this will provide essential information. A first draft should be included in an issue of *Grasslands* this year. A number of consultants as well as past articles can aid in making appropriate recommendations.

Establishment characteristics of drought-tolerant perennial grasses, both native and non native, are important to consider in order to appreciate and understand the steps required for a successful outcome. Equally important are the characteristics of the weedy annuals which, above all, are responsible for establishment failure of native grasses from seed. Seedlings of many native grasses have low vigor and slow germination and growth; this is especially true of the long-lived and highly desirable *Stipa*. *Melic*, and *Festuca* species. Some species also have a prolonged germination time. By contrast, weedy annuals have short germination time, high seedling vigor and rapid growth following the first germinating rains in the fall. Additionally, seed density of weeds is usually very high, with some estimates as high as 10,000 plants/meter^2. Due to these characteristics weedy annuals overwhelm the hardiest of the natives even when densely seeded. In large acreages, high-rate seeding can be prohibitively expensive. In short, the slow-growing native seedling needs time, moisture, and nutrients to mature into a perennial plant. Standard agricultural techniques provide the methods and tools to accomplish these goals.

Establishment from seed is not a "quick fix". Two to three years are required to develop a mature stand. In weedy areas intensive or spot management for weed control is required beyond the third year. Finally, the reader is reminded of transplant technology which will not be discussed further in this article. Small restoration sites in which rapid results are desired can be effectively planted with transplants on 12-24 inch centers as an alternative to seeding. Transplants are now available at very cost-effective prices and the results when done properly are rewarding. A list of sources is available from CNGA, and will be included in our information packet soon to be completed and mailed to all members.

HERBICIDES

Many of the management strategies described in this article involve the use of herbicides. Herbicides can provide real and cost-effective solutions to serious weed problems that plague the grassland restorationist. They should be viewed as one of the important technological advances that will help restore many altered and exotic-infested ecosystems. Integration of all available technology will be essential to achieve a goal of widespread balanced and self sustaining environments.

Proper, knowledgeable, and safe use of herbicides should always be observed. Precautions include both safety to humans and to the environment. Use herbicides according to labels and observe all restrictions in accordance with county, state, and federal regulations. Permits are required for all large scale use. Information is readily available from county agricultural commissioners' offices and agricultural extension agents. In as much as this may sound like an unrealistic ordeal, it is entirely feasible and easy for an inexperienced person to acquire the knowledge and professional assistance to use herbicides. Licensed Pest Control Advisors (PCA) and licensed Pesticide Control Operators (PCO) can be contacted through local agricultural chemical distributors. Many landscape contractors can also perform the necessary services.

In This Issue:

SEED BED PREPARATION AND INITIAL STRATEGIES TO REDUCE WEED COMPETITION.

The goals of seedbed preparation are to decrease the weed seed bank and till the soil for seeding. Starting one year prior to seeding is ideal. A controlled burn in summer or fall decreases surface weed seeds and litter. This is followed by spring discing or tilling (March-April) before winter-growing weeds set seed. The area should be left fallow during summer and tilled or herbicided as necessary to eliminate late-germinating weeds. Another advantage of this spring-summer fallow technique is that deep soil moisture is conserved for the following fall planting. Finally, seedbed preparation may require smoothing with a land plane or scraper and roller if soil clods are large. Rolling with a ring roller provides compaction that will maintain good soil moisture following the first rains.

The seedbed is now physically ready to be seeded but control of a huge reservoir of weed seeds near the soil surface may be necessary. After germinating rains in October or November, weeds can be eliminated with glyphosphate at 8 oz/acre, very shallow harrowing or flaming. The goal is to reduce immediate weed competition without bringing weed seeds to the surface. Herbicide use or flaming is most effective. Glyphosphate is cost effective on large acreages and can be used for as little as $10/acre when applied with standard agricultural sprayers. If germinating rains are late, it may be necessary to plant before weeds have emerged, i.e. 7-10 days after germinating rains. In this case, seed can be incorporated and weed seedlings herbicided with glyphosphate prior to grass seed emergence. Germination of native grasses takes at least two weeks in late October or early November and up to 4 weeks if planted later. Planting an earlier "test" plot allows one to predict emergence of natives and thereby, timing of spray operations.

Weed identification on the site is important in planning management strategies. Annual grasses such as wild oat (*Avena fatua*), ripgut brome (*Bromus rigidus*) and annual ryegrass (*Lolium multiflorum*) are some of the most widespread and troublesome. They germinate early and grow very rapidly. High densities of other annual grasses such as soft chess (*Bromus mollis*) and annual or rattail fescue (*Vulpia myuros*), can be equally aggressive and suppressive. Selective herbicide for weed grass control is limited during establishment as native perennial grasses will also be susceptible; when grasses predominate the weed flora it is very important to adhere to the preplant strategies. Broadleaf weeds can be managed with a wide variety of selective herbicides that do not affect the grasses. Yellow starthistle (*Centaurea solstitialis*), prickly lettuce (*Latuca serriola*), mustards (*Brassica* spp.), knotweed (*Polygonum aviculare* , *P. erectum*), and many more can be effectively managed with broadleaf herbicides such as 2,4-D, MCPA, dicamba (Banvel), and triclopyr (Garlon).

SEEDING TECHNIQUES AND TIMING

The "best" time to seed is not well understood. The standard is to seed prior to mid November to maximize growth before summer dormancy, which may not occur if rains are late. In 1991 and 1992, several late December and January seedings were successful, especially on good soils. One advantage of later seeding is better control of weeds. With a later planting date, more surface weeds will germinate prior to seeding. In late December, 1991, two sites in Yolo County were seeded either by drill or broadcast-and-harrow; glyphosphate was applied 20 days later, just prior to native grass seedling emergence. Monitoring by digging up weed seeds and watching for germination is critical; as soon as a radicle begins to emerge from the native seed, it is time to spray.

Seeding between November and late December is not without risks. Wet, cold soil conditions can rot seed and a hard freeze can cause high mortality in young seedlings. This past wet winter *Stipa cernua* and *S. lepida* failed after being seeded in late November into heavy, class 1 soil. On the same site, seeded at the same time, *S. pulchra, Melica californica, Elymus glaucus,* and*Hordeum brachyantherum* germinated and were actively growing as of late February. *Poa scabrella* and *Festuca idahoensis* had intermediate success due to damp-off. The last two weeks in January are probably the best time to seed, but wet conditions may prevent access to the fields. Another risk of late seeding is the potential cessation of rains before the grass has enough growth to establish. If an area can be irrigated in the spring or soil will hold deep moisture well into June, a late January or early February seeding may be best. Newly-germinated seedlings will not be subject to a slow growth phase in December when significant mortality occurs.

Seeding techniques depend on terrain, size of the area and seeding equipment available. The two basic techniques we use are broadcast seeding and precision drilling. Hydroseeding and spreading of native grass straw can be effective. The details of seeding techniques will be covered in a subsequent issue. Long awns of many native grass seeds (*Stipa, Hordeum, Elymus, Bromus, Aristida*) may cause bridging in standard seeding equipment. Many standard range drills as well as broadcast seeders are not satisfactory unless additional mechanical agitation is supplied. Equipment designed to handle fluffy, "chaffy" seeds is available for most large acreage seeding (Truax, Inc., Great Plains Manufacturing, Inc.). For small areas, hand-broadcasting, followed by shallow harrowing or cultipacking is effective. No-till technology will dominate large-scale seeding in the near future. No-till drills are designed to seed directly into untilled soil, providing that compaction isn't significant. Ground work cost and soil erosion are reduced and precision drills plant more accurately, requiring less seed.

A CASE STUDY

A no-till planting was performed this year in a Central Valley, retired agricultural field dominated by wild oat, foxtail barley (*Hordeum leporinum*), and brome. The soil had not been tilled or grazed for more than 10 years and a deep layer of thatch was present. A hot late summer burn removed the thatch and glyphosate was applied after the first germinating rains. A Truax drill was used to plant in late November, followed by a second glyphosate spray before native seeds germinated. As of late February there was a good stand of native seedlings and few weeds. A heavy layer of charred wild oat seed provided evidence of the burn's effectiveness. Native *Brodiaea* in many swales had not been affected.

An alternative method used in the Carmel Valley (Stromberg, Menke and Kephardt), employed a sprayer directly mounted on the drill. Planting and spraying were performed simultaneously. An advantage to this method is that the herbicide spray pattern can be adjusted to narrow bands covering the drilled seed, eliminating weed competition for the native seedlings. Unsprayed bands can conserve desirable seed banks, provide livestock forage that would decrease grazing pressure on native seedlings, and might provide a microclimate enhancing seedling survival. Initial results of this trial will be available this summer.

CONTINUED WEED MANAGEMENT

YEAR 1: By March , grass seedlings should be up and growing but so will a new flush of weeds. Many of these weeds may be insignificant or, perhaps, even be desirable forbs, but others could pose threats to establishment. Starthistle, bull thistle (*Cirsium vulgare)*, and mustard will grow quickly and if abundant, can overtop and eliminate slow-growing perennials. Knotweed is a very common low-growing annual that starts germinating in late February. If not controlled, it may smother perennial seedlings by June. Late-germinating grasses such as annual ryegrass, oats, canary grass (*Phalaris minor*), and others can do the same. The management options include selective herbicides, wick herbicides, and mowing. In range situations grazing is also an option.

Selective herbicide spraying for broadleaf weeds is most effective when the weeds are small, generally by mid March. Perennial grasses must be past the 3- leaf stage before application. Most effective broadleaf herbicides are restricted-use chemicals. Wick application of glyphosphate consists of wiping a concentrated solution on the tops of tall weeds while leaving shorter perennials untouched. The wick is an absorbent material or rope that is in contact with a reservoir of herbicide solution. This technique works especially well with weedy grasses but can also be used for broadleaf weeds. Hand-held wick applicators are available through many garden suppliers. Tractor-mounted wick applicators for large acreages are available from distributors of agricultural spray equipment.

Mowing, either alone or in combination with herbicides, can give excellent control of late-season weeds, depending on weed type, density and location. Some species, such as annual ryegrass, starthistle, and introduced annual wild barley can produce seed heads low to the ground following mowing. Mowing alone has been successful in cooler coastal areas (Kephardt and Kaplow, personal communication), but we have experienced mixed results in the Central Valley, and little success when weeds are dense. Mowing in late March and April reduces the height of weeds, giving young perennials access to light. Mowing should not be lower than 3-4 inches. If mowing alone is used, a second mowing is usually needed in May or early June. Haying (cutting and baling) the site removes annual weed seed that would contribute to the soil seed bank as well as biomass that would shade growing perennials.

Grazing the establishing grassland in spring of the first year can help reduce fast-growing competitive annual grasses. It both mows and removes potential thatch and when animals are managed properly, results can be very successful.

YEAR 2: Second-year management is still a battle against annual weeds. Weed seeds remain in the soil and many are viable for many years. Yearling native grasses don't yet have the competitive biomass to inhibit weed growth. Management practices include pre-emergent herbicides, post-emergent herbicides, mowing, grazing, and, possibly, fire. Pre-emergents prevent seed germination and seedling establishment. Applied in fall to a first-year stand of native grasses, pre-emergents can aid weed control. Pre-emergent use is especially important where annual ryegrass, ripgut brome, foxtail barley, and wild oat have been previously present in high density for a number of years. There are many pre-emergents available and we are in the process of testing their efficacy for native grasses. First-year native grasses, unlike second- and third-year stands can be easily injured and it is important to use the proper material. Oreyzalin (Surflan) has been used successfully in many of our trials and we are comfortable recommending its use at 2#/acre for the native species listed in this article. First-year *P. scabrella* and *M. californica* demonstrate reduced tolerance to Surflan, but will grow through it. Chlorsulfuron (Telar) is another useful product that is effective for annual ryegrass control even after germination. *H. brachyantherum* and *H. californicum* are sensitive to Telar; do not use it if these species are in a seed mix. *Stipa, Elymus, Aristida,* and *Agropyron* are very tolerant of Telar. Seedling *Melica* and *Poa* sustain some injury, but second-year plants are minimally affected. Telar is a potent broadleaf agent, and although useful for controlling many broadleaf weeds such as starthistle and mustard, should not be used adjacent to desirable woody vegetation.

Pre emergent herbicide use has tradeoffs that need to be considered, especially when using those with activity over a wide range of species, such as Oreyzalin. Seed that is produced by the establishing native grasses will not germinate and gaps in the planting will remain. Similarly, reseeding or additional seeding will not be possible. If the restoration site has a seed bank of native annuals, pre emergents may be contraindicated. Every site and project needs to be evaluated in order to decide what practices are appropriate.

Post emergent herbiciding, mowing, and grazing during the second year are similar to the first. Trained persons with 4 gallon backpack sprayers can cover large areas and eliminate hot spots of weeds while not effecting surrounding flora. Warm season perennial weeds such as Johnsongrass (*Sorghum halepense*) and bermudagrass (*Cynodon dactylon*) can be controlled by spot spraying.

Fire is a post establishment management tool that has exceptional value. Our native grasslands evolved with fire and established perennial grasses rebound after fire while weed seed is destroyed. Midwestern prairie restorationists rely heavily on fire as a management tool. Frequency and timing are important questions to answer in our California bioregions. We have burned stands of *Elymus glaucus*, *Hordeum brachyantherum,* and *Stipa pulchra* in September. Young *Hordeum* plants may have been damaged in some of the hottest areas. Established plants of all 3 species rebounded with what appeared to be enhanced vigor. The burn research at Jepson Prairie clearly illustrates the value of fire. We plan to use fire regularly in many of our established plantings.

YEAR 3: A frequently-asked question is how long newly established, weedy sites require intensive management before they become self-sustaining. Right now we don't know, but a reasonable guess would be 3-6 years. Periodic management will always be required. Certainly, intensive herbicide use will not be necessary over time, but grazing, mowing, and burning will always be essential.

Species used in the Central Valley in the author's studies included: *Elymus glaucus, Hordeum brachyantherum, H. californicum, Stipa pulchra, S. cernua, Poa scabrella, Melica californica, Leymus triticoides, Aristida hamulosa, Festuca idahoensis, Agropyron trachycaulum* var. *majus, Sitanion jubatum,* and *Bromus carinatus.*

The author wishes to acknowledge significant contributions to this work by Robert L. Bugg, David Amme, Wendy S. Halverson, and W. Thomas Lanini.

PRESIDENT'S MESSAGE

Ted Adams

1993 Board of Directors. The election for the 1993 Board is history, (see the list of officers and Members at Large at the end of this issue.) Although the election was complicated by a belated request for signed ballots, the results were not affected; the election's outcome was the same whether total ballots cast or signed ballots only were counted.

Commercial Interests on the Board. Over the last year, several members have questioned the propriety and legality of permitting commercial interests to participate in the governance of CNGA. This concern is addressed in the bylaws. Article III, Section 1 defines eligibility for membership in CNGA; eligibility includes commercial interests. Article IV, Section 1 addresses eligibility for membership on the Board of Directors and states that "...the Board shall represent a cross section of the diverse affiliations of the Association membership...." Legally, no member can be excluded from running for election to a position on the Board.

Legal review supports the bylaws and points out that potential conflicts of interest are common in governing bodies of such organizations as CNGA. If a potential action by the CNGA Board will affect a Board member, that member abstains from discussion of the action and voting on it. The record of the Board action includes the abstention and protects the Board, the member and the Association.

***Grasslands* Editor.** Editorship of *Grasslands* has transferred from Paul Kephart of Elkhorn Ranch, to Dr. Kitren Weis of Capay. As a volunteer, Paul provided outstanding service to the Association in his capacity as newsletter editor as well as in other ways. I know Paul's future contributions will be equally important.

As the new editor of *Grasslands,* Kitren will be responsible for our most important communication medium. *Grasslands* is a respected source of information that reaches many people outside CNGA.

1992 Annual Meeting. The second Annual General Membership Meeting in Sacramento last November was a resounding success! Nearly 200 members were present to hear 10 speakers address use of native grasses with an emphasis on the genetic perspective. The presentations are being prepared for inclusion in a Proceedings to be available in spring as a for-sale publication.

The Vendors' Program, included as part of the meeting, was very successful. Had it been more successful, there would not have been room for all the displays and posters! Credit is due Dave Gilpin, Pacific Coast Seed, for organization of this important element.

Development of the 1993 Meeting is already in progress. Restoration and management will be the focus of this meeting.

A highlight of the business meeting, another element of November's Annual Meeting, was presentation of 2 Outstanding Service Award. Our "office staff," Ruth Kleinen, and our Treasurer, Joni Janecki, were the recipients. Their outstanding service during a very dynamic period was especially appreciated by the President!

Membership. By early December, paid membership was well over 600 and included nearly 100 new members who had paid for 1993. CNGA is growing in strength, and this will translate into influence.

Financial Support. In 1992, more than $15,000 was donated to CNGA to support our programs. Our tax exempt status, acquired in 1992, has helped attract this support. Donations of $3000 each came from S&S Seeds of Carpinteria and David Packard. Mr. Packard hosted the Technical Conference at Elkhorn Ranch in May. In December, a generous gift of $9500 was received from Polly Anderson of Cupertino for purchase of a computer system that will be used to prepare *Grasslands*, support the Information and Education Committee chaired by Kitren Weis, and provide general assistance to all CNGA activities.

Polly Anderson

Native Grass Use Guidelines. Elsewhere in this issue of Grasslands is a discussion of Genetic Guidelineslines for Grasses in Region 5. These Guidelines appeared last fall in the US Forest Services Region 5 R5 BotNews. They are considered preliminary and advisory and address seed collection and transfer for restoration projects.

Because of the Guidelines' potential influence on existing programs and development of policy, CNGA has taken leadership to convene a meeting of representatives form key agencies and organizations. The expectation is that the participants will reach consensus on a suggested protocol that will reflect the following assumptions:

1. Collection and transfer guidelines should support and promote all conscientious restoration programs.
2. Guidelines should reflect the spectrum of public mandates represented in various public restoration activities because of the interwoven nature of many agency programs and management responsibilities.
3. Workable guidelines should: a) represent and respect restoration programs on both public and private lands in recognition of the artificiality of political boundaries, and, b) consider what too restrictive guidelines would mean in terms of cost and availability of seed.

1993 Events. Besides the Third Annual General Membership Meeting this year, 2 other major events are scheduled. On April 16th, ConservaSeed (near Courtland in the Sacramento River Delta), will host the Second Technical Conference emphasizing production and use of native grasses. Dave Gilpin, (Pacific Coast Seed), and Scott Stewart, (ConservaSeed), are organizing the Conference. A Grass Identification Workshop is scheduled for July. Classroom activity will be conducted in Quincy (Plumas County) with supporting field identification conducted in the nearby Plumas National Forest. Coordination of planning is being handled by the I&E Committee.

Information on Restoration Projects. CNGA has received several requests for information on current or established restoration projects. Schools are especially interested in these projects; they can play an important role in environmental education. We have also had a request for information on the use of native grasses in the roughs of golf courses. If you have information on a restoration project or a golf course with established native grasses, send it to our Dixon address.

COMMITTEE ACTIVITIES

RESEARCH AND DEVELOPMENT COMMITTEE directs literature reviews and the evaluation of plant materials for restoration and maintenance of native grasslands and helps promote sustainable agriculture. It encourages development of technology to support these objectives and research supporting the goals of CNGA.

SEED PRODUCTION AND MARKETING COMMITTEE is responsible for production guidelines, marketing standards, and foundation seed storage. This committee helps make available adequate quantities of native grass seeds and related plant materials for ecosystem restoration and maintenance.

PUBLIC INFORMATION AND EDUCATION COMMITTEE prepares and distributes information about CNGA and its activities and develops educational information on the values and uses of California native grasses for ecosystem restoration and maintenance.

ECOSYSTEM RESTORATION COMMITTEE, in cooperation with individuals and organizations, promotes and coordinates projects using native grasses for ecosystem restoration and maintenance and for sustaining agriculture. It makes recommendations to the CNGA Board of Directors concerning the donation of seed and other plant materials to proposed projects.

ROADSIDE MANAGEMENT COMMITTEE addresses the specialized vegetation management problems associated with roadsides. This it does cooperatively following Board approval of recommended projects. Information from projects initiated is incorporated in educational materials that identify recommended plant materials and their culture and management.

URBAN USE AND LANDSCAPING COMMITTEE promotes and coordinates use of native grasses in urban and other intense use areas. It recommends donation of seed and other materials for Board approval.

CNGA members are invited and encouraged to participate in any of these committees.

REPORTS BY COMMITTEE CHAIRS ON RECENT ACTIVITIES:

RESEARCH AND DEVELOPMENT COMMITTEE

In early January the R&D Committee met to discuss its plans for 1993. The native grass demonstration gardens which David Amme organized and installed last season will be ready for viewing this spring. The seven native grass gardens contain 30 native grass species collected from 95 different locations. The membership should try to visit at least one of the gardens later this spring. Locations and contact phone numbers are listed later in this issue.

The R&D Committee also discussed some of the research needs of native grasses. The committee will be developing a list of research questions in the near future that will be published in *Grasslands.* Once we have the questions identified, we will be able to seek funding from the appropriate sources. The R&D Committee also discussed the technical consulting role CNGA can perform in evaluating the success of native grass plantings around the state.

1992 Research and Development Program (Excerpts)

David Amme, Technical Manager, 1992

R&D Committee Goals: *To promote the development of technology to restore and/or rehabilitate ecosystems using native grasses and associated species.*

To accomplish these goals the 1991/92 R&D Committee developed 3 main objectives:

- to **collect** seed and plant material
- to **evaluate** the material in common gardens and regional field trial settings
- to **demonstrate** plantings and seeding performances

A fourth objective needs to be formally introduced:

- to **record** information in a comprehensive statewide native grassland database

The 1991/92 Grass Garden Project has been summarized in the Feb. and May 1992 issues of *Grasslands*. An adaptability table was drafted under the guidance of Dave Dyer, the Soil Conservation Service (SCS) Plant Material Center Director at Lockeford. While this rough guide included 10 common species, it may serve in the future to characterize native grasses in terms of regional climate, ecotype suitability, and plant characteristics. Adaptability and zonation are closely related.

A literature review of work conducted by SCS pertaining to native grasses dating back to 1944 was made by Cini Brown. Physical and cultural observations of 22 species were included in this report, but space prevents a complete copy here. For a complete copy of the Final 1992 R&D Report, or for further information, contact D. Amme.

PUBLIC INFORMATION AND EDUCATION COMMITTEE

On November 8-11 CNGA displayed a poster at the annual CARCD meeting in Ventura. This poster, which highlighted the role of California native grasses in roadside management, was debuted at the CalTrans press conference in September. CalTrans announced a program of integrated management of roadsides and reduced use of chemicals. The same poster was used at the Landscape and Gardening Expo in Sacramento in December and a similar show in Santa Clara in January. Its use in this forum was less than appropriate; a new display designed specifically for use in Landscape and Gardening shows is in the works. To that end, CNGA bought a professional display system. (Funds for this purchase were freed up due to the generous donation of our computer system by Polly Anderson.)

The I&E Committee is at long last putting together an information packet that will include species descriptions, planting and maintenance how-to's, and other pertinent facts. Phil Hogan has kindly offered his services. When the packet is completed, it will be sent to all members and will be available as a for-sale item to non members.

ROADSIDE MANAGEMENT COMMITTEE

The purpose of the roadside committee is to promote the establishment of native grass ecosystems into the vegetation management programs of California roadsides. On a statewide level we are communicating with CalTrans officials and expect to play an advisory role in their recently mandated vegetation management program. A number of CalTrans landscape architects and maintenance personnel are very interested in the native grassland concept.

The roadside vegetation research at Hedgerow Farms that is being orchestrated by Robert Bugg and Cini Brown of U.C. Davis is moving into its second growing season and the results are very encouraging. Sixteen species of native grasses, 7 species of native forbs, and 3 species of non native grasses have been planted in 3 replicated trials along a typical roadside in Yolo County. Single species as well as mixed species designs were included in the trial. Parameters that are being monitored include establishment characteristics, biomass, cover, height, flammability, aesthetics, flood tolerance, ability to suppress weeds and others. By this summer the trial

will provide good objective information on species performance for Sacramento Valley roadsides and we expect the results to be applicable in many other areas. What we're seeing at this writing are very healthy appearing stands of young perennial grasses that are likely to provide the performance we seek for roadside maintenance.

The grass species being tested in the trial include: (native) *Stipa pulchra, S. cernua, Melica californica, M. imperfecta, Hordeum brachyantherum, H. californicum, Bromus carinatus, Elymus glaucus, Leymus triticoides, Sitanion jubatum, Poa scabrella, Agropyron trachycaulum* var . *majus, Aristida hamulosa, Muhlenbergia rigens, Festuca rubra, F. idahoensis* (non native) *F. ovina, Agropyron intermedium,* and *Dactylis glomerata.* Forb species include: *Eschscholzia californica, Lotus purshianus, Lupinus densiflorus, Phacelia tanacetifolia, Sisyrinchium bellum, Asclepias fascicularis,* and *Achillea borealis.*

A **Field Day** for roadside management is scheduled for May 13 at Hedgerow Farms. The purpose of the field day will be to see, evaluate, and discuss the above mentioned trials as well as discuss other trials, techniques, and trends in California. This will also be the first official meeting of the Roadside Committee but anyone who is interested in roadsides is encouraged to attend. One topic of discussion will be how to initiate local roadside vegetation programs. May will be a perfect time to see the grasses at their best.

We want other **roadside data.** There are a number of roadside projects that have been initiated in California and we would like to enter them in a database. As a simple beginning we want to know where, what, when and whom to contact for information. Failures are just as important as successes. The successes should be used to promote the cause. Information will be periodically summarized in *Grasslands*. Send information to the *Grasslands* Editor, Kitren Weis, and include location (county, town, road), grass species, date planted, pertinent comments, contact person.

ANNOUNCEMENTS

TECHNICAL MEETING APRIL 16: A program of invited speakers, equipment, and field tours will address the topic of production and marketing of native grass seed and plant material. The meeting will be an all-day event with a catered box lunch at Holland Ranch near Courtland. The meeting coordinators are Dave Gilpin of Pacific Coast Seed and Scott Stewart of ConservaSeed.

CNGA COMPUTER SYSTEM GRANT: a generous donation by Polly Anderson of Cupertino made possible the purchase of a Mac IIvx, Real Tech Laser Printer, UMax flatbed scanner, Seiko color monitor, Supra FaxModem, and a versatile array of software. A CD Rom drive will be added when it becomes available. We are fortunate to have generous benefactors such as Mrs. Anderson, and we wish to express our gratitude!

CNGA MEMBERSHIP RE-UPS: This will be the **last issue** of *Grasslands* sent to those members **who have not yet paid their 1993 dues.** All new members who joined in November and December, 1992 are paid up for 1993 as well. If you have not yet renewed your membership, please do so in order to continue receiving newsletters and notices of meetings.

BACK ISSUES OF GRASSLANDS : Issues for April, July and October, 1991 are in very short supply; February, September and October of 1992 are still in ready supply. These issues may be ordered for $2.00/copy. May 1991 is available only as a photocopy and may be ordered for $1.00/copy. When photocopies for original newsletters must be substituted, the $2/copy price will be dropped to $1. Contact our Dixon office to order.

FILM LIBRARY: If you have photographs or slides of special value, they could be useful in our new film library. We are soliciting copies for use in development of displays or invited talks. We are occasionally asked to provide a speaker to regional groups such as the California Native Plant Society and could use your input!

POA SEED REQUESTED: I'm conducting research on *Poa* spp. taxonomy, seed endophytes, and interspecific hybridization and would appreciate it if fellow CNGA members could send a small sample of fresh seed from any native California *Poa* species that they may collect. The best representatives of a population would be the most desirable. I would be willing to pay $2/sample to cover postage and handling. Thank you. Tim Ford, P.O. Box 510, Huntsville, Utah 84317 (801-745-4609, fax 801-745-4610).

PROCEEDINGS OF SYMPOSIUM: Interface Between Ecology and Land Development in Calif.
Includes 41 papers by researchers, conservationists, consultants and policy makers dealing with land management, biodiversity, habitat corridors, buffer zones, rare species and community restoration. Edited by Jon Keeley. $26.00 including tax and shipping. Order from: Southern Calif. Acadamy of Sciences, 900 Exposition Blvd., L.A., CA 90007

BRINGING GRASSES TO MARKET

CALIFORNIA NATIVE GRASS ASSOCIATION FIELD-DAY
April 16, 1993

When: April 16, 1993
Set up 7:30 am-8:30 am
Break down 4:00 pm-5:00 pm
Coffee and donuts provided
Where: ConservaSeed—Holland Ranch
Courtland, CA
916-776-1676

Commercial Displays
David Gilpin
Pacific Coast Seed
7074-D Commerce Circle
Pleasanton, CA 94588
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Early reservations are encouraged. There will be no vendor registration at the door, however, participants may register at the door. Catered box lunches will be limited in number, so to be sure of reserving yours, register early! Vegetarian lunches will be available.

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PROGRAM

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8:30-8:45	PRESIDENT'S MESSAGE
8:45-9:15	CONSERVASEED'S OPENING ANNOUNCEMENTS (S. STEWART)
9:15-12:00	CONSERVASEED PRODUCTION FIELD TOUR
12:00-1:30	BOX LUNCH
1:30-2:00-2:30	SPEAKERS
2:45-3:15-3:45	SPEAKERS
4:00-5:00	CONSERVASEED'S RESEARCH & DEVELOPMENT TOUR
5:00	WINE TASTING AND BARBEQUE BY CONSERVASEED (COMPLIMENTARY)

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GENETIC GUIDELINES IN REGION 5

Connie Millar, Research Geneticist, PSW Research Station,
Albany, CA
Reprinted from R5 BOTNEWS, 1992, Issue 3

In the last few years, I have been emphasizing the importance of genetic source in restoration and reintroduction. The increasing use of native species for re vegetation makes this issue critical. For several reasons, this is a special concern for the California native grasses: Many species have broad natural distributions, wide ecological amplitudes, and considerable morphological variation, suggesting genetic complexity; remnant wild populations exist throughout the ranges, indicating that native gene pools may persist; grasses are commonly used and sought for re vegetation; and seeds of many native species (especially generic stocks) are increasingly available from commercial sources, increasing the potential for introduction of foreign germplasm into native genepools.

Several botanists and restorationists have urged that it is time to move beyond the conceptual discussion of genetics to establish some practical and specific guidelines for seed transfer in grasses. Without specifics, we risk the problems of overconservatism on the one hand (collecting seed more locally than necessary, resulting in a nightmare for seed tracking), and loss of genetic architecture on the other hand (paying little attention to origin, and moving germplasm widely).

I offer the following PRELIMINARY general considerations and specific collection and transfer guidelines for California grasses. These guidelines are based on observations of morphological variation in California grasses, experience from transplant situations, ecological inference, and experience with genetic transfer of tree germplasm in Califonria. Craig Dremann of Redwood City Seed Company was the prime motivator for taking this next step. He suggested many of the specific guidelines, basing them on his systematic observations of several native California grass species over a broad geographic area. Many others contributed. We assume that as genetic information becomes available, these guidelines will be tested and refined or changed.

GENERAL GENETIC CONSIDERATIONS:

The general objective for genetic management of any native species is to maintain or restore contemporary patterns of genetic diversity at population and landscape levels. This objective implies that any manipulation of native populations, including planting or removing individuals, be done in a way that maintains genetic diversity among individuals within populations and that maintains ecotypic variation among populations. Seed transfer rules and seed collection guidelines are based on this general objective. Exceptions may exist when managing species with severely degraded genepools or extremely rare and endangered populations. In such cases, specific genetic prescriptions may apply.

Developing practical guidelines for these objectives optimally requires species-specific studies of genetic variation. Occasionally it will be possible to get such information for wild taxa. If you do embark on a genetic study (or contract one), avoid the temptation, at least in families or genera that are little known genetically, to rely solely on biochemical markers (e.g., isozymes or DNA) when information from other traits is not available. Unless sophisticated statistical tools are used, marker data may underestimate or misrepresent important patterns of adaptive variation, and lead to inaccurate decisions about genetic management. When direct studies of genetic diversity are not available or are incomplete, general levels of diversity in a species can be roughly inferred in the following ways:

1. Use life-history traits, which correlate with patterns of genetic diversity within and among populations, to infer genetic diversity. Mating system seems to be the best indicator. Consult Harmrick, J.L. & J.W. Godt. 1989. Allozyme diversity in plant species. IN Plant Population Genetics, Breeding, and Genetic Resources. A.H.D. Brown, M.T. Clegg, A.L. Kahler, and B.S. Weir (eds.), pp. 43-63. Sinauer, Sunderland MA.

2. Use known patterns of environmental and ecological diversity to infer genetic diversity. In many cases, your ecological instincts as to what constitutes significant physiographic breaks in geology, climate, vegetation, communities, etc., are probably the most reliable and conservative guides to inferring genetic variation in the absence of direct data.

For more general discussion, consult Millar, C.I. & W.J. Libby. 1989. Restoration: Disneyland or native ecosystem? Fremontia 17(2):3-10.

SEED COLLECTION AND TRANSFER GUIDELINES FOR NATIVE GRASSES IN CALIFORNIA

Using a combination of the above approaches, we propose the following guidelines as a starting point for seed transfer of native grasses:

1. Plant native species and avoid use of exotics. If appropriate germplasm of natives is not available, and exotics must be used, favor non-persistent, non-invasive species.

2. When planting natives, do not plant seeds of unknown origin or commercial stocks of non-local origin into native grass populations or native habitats on (sic) National Forests in California.

3. Collect native grass seeds within the National Forest where they will be used. Thus, the National Forests are the major geographic zones for grass seed transfer.

4. Within each National Forest, collect and keep native grass seeds within the same major vegetation types. In other words, collect and resow from oak woodland into oak woodland, from mixed conifer into mixed conifer, etc., within the National Forest.

5. Collect and keep native grass seeds more local where there are steep or discontinuous ecological or physical gradients, such as:
   - populations from extreme soils (serpentines, pygmy forest podsols, limestones);
   - populations that appear to be hybridizing with other species, or any populations where morphology is unusual or taxonomy confusing;
   - populations at ecological or distributional extremes for a species, especially areas of lowest precipitation

6. Within a seed collection area, collect from a large and diverse set of parents, equalize contributions from each parent, and collect from scattered populations.

These guidelines are intentionally kept simple in the hope that they will be adopted now as the minimum standards for seed movement. A longer term goal is to develop more specific and detailed seed zones and guidelines. The genetic guidelines of the R5 Base Level Tree Improvement Program (BLTIP) provide a model that can be used to further refine grass guidelines. The standard California tree seed zones and elevational requirements of the BLTIP are logical for further subdividing the National Forests when moving grass seed. Although these seed zones were developed for trees, they are based on natural ecological/physiographic divisions within the state, and, in the absence of other biological information, are probably a conservative system for grasses as well as trees.

Other specific guidelines of the BLTIP pertain to grasses, and the experience of the BLTIP should be consulted as grass guidelines are refined. For a recent discription of the R5 BLTIP genetic guidelines, consult Kitzmiller, J.H. 1990. Managing genetic diversity in a tree improvement program. Forest Ecology & Management 35:131-149. Reprints are available from Regional Geneticist Jay Kitzmiller: R05F08D52A.

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REFERENCE LIST

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LETTERS TO THE EDITOR

Editor-
I would like to see several paragraphs (each) from the presentations at the Nov. 13th meeting (I did not arrive in time to hear Dr. Rice). Longer articles by Dr. Bugg and Mr. Work, especially!
Steve K.

A Proceedings of the Annual Meeting is in preparation and will be made available for approximately $10.00, to be announced in the next Grasslands. An article by John Anderson with considerable input by Dr. Bugg is in this issue; we hope to include an article by George Work in Grasslands soon.

Dear Editor,

Upon reading my article on grassland restoration in California (*Grasslands*, Oct. 1992) I came upon a few statements that I feel need to be clarified. Under the fire discussion I stated that "Prescribed burning in *late spring* has resulted in the reduction of exotic annual plant seed production and the increase of perennial grass seedling establishment (McClaran 1981, Bartolome pers. comm.)." The time of burning referred to here is in *late fall or mid-winter* , <u>not</u> late spring. This research has recently been expanded by Hatch and Bartolome (Hatch *et al* 1990) as mentioned further in the same paragraph. In this research, the burn is conducted within a few weeks of the first initiating rain when the introduced annual grasses are 8-10 cm tall. The native perennial grass seedlings emerge more slowly after the annual grasses. Fire kills the introduced seedlings enabling the established native perennial plants and seedlings to have a strong show the next spring. Advantages are that the soils are moist, re vegetation is faster, and the burn is cool enough such that buried seed is unaffected. An additional advantage is that the summer herbaceous native forbs have also set and distributed seed before the burn. Timing of the burn allows enough rain to initiate germination coupled with a rainless period sufficient to dry out the litter layer. Fires remain small, slow and controlled when backed into a light wind. I do not know of any research that has shown that late spring burning promotes native perennial

grasses except in the case of burning in the inner coast range as indicated by Taylor and Davilla (1986). In this case the grassland is dry and dormant and the native perennial grass being enhanced is the early-maturing, early-dormant perennial, *Poa scabrella.*

Under the monitoring discussion I mentioned placing (stratifying) "permanent plots/transects on specific sites representative of the habitat being evaluated". In the interest of rigorous science, plots should always be placed randomly in order to fully evaluate treatment effects. Choosing "representative" sites without randomization and limiting sampling to those areas could mask the degradation of a particular area within a site. However, prior to establishing plots, it is important to "stratify" or subdivide the habitat into different vegetation/soil types.

I hope these clarifications help in the understanding of native grassland restoration.

Dave Amme
Resource Restoration and Management

Dear Friends:

Recently I was given a copy of the October 1991 issue of your excellent newsletter, *Grasslands*, and was pleased to see how well your activities complement the work of the California Native Plant Society. Of special interest was the piece on George Work, who has made an immense contribution here in Monterey County by demonstrating to other ranchers the value of native perennial grasses as forage.

A suggestion: please print your membership application or other coupons on the *back* of the address label so that newsletter articles are not dismembered when the coupon is used. A further benefit is provided by the label when penmanship is deficient.

Another suggestion: please consider having a "student/retired" membership category instead of just "student'. There must be a number of us retired types who would like to receive your newsletter so as to become more knowledgeable about native grass issues, but who are unable to participate actively. I believe it would benefit your organization if your dues structure recognized, as do most organizations, the need for such a category.
Mary Ann Matthews
Conservation Chairman
Monterey Bay Chapter, CNPS

We will attempt to place coupons for membership , meetings, or publications on 'expendable' pages. The "student/retired" membership category now appears on the membership coupon.

Dear Editor,

I would like other members of the Grass Association to join in a discussion about a proposed change in article format for *Grasslands.* What causes me to begin this discussion are the articles that have appeared so far, and I'll use one example—John Menke's controversial article that appeared in the October 1991 issue entitled Grazing and Fire Management. In the article I saw many conclusions but what I did not see was actual observed data, nor any mention where the data was available. What I am proposing are six standards that may help readers immediately separate the "wheat" of observed data from the "chaff" of speculations:

1.) ARTICLES ARE DIVIDED INTO AT LEAST TWO CATEGORIES, those titled EXPERIMENTS IN PROGRESS OR COMPLETED, and those titled SPECULATIONS THAT NEED FURTHER RESEARCH.

2.) ARTICLES ABOUT EXPERIMENTS IN PROGRESS OR COMPLETED shall be labeled as such and no other references shall be cited in the body of the article. The article shall contain only those observations from that single experiment that you are reporting. In that fashion readers can see the whole cloth of a single experiment rather than a patchwork quilt. Other references may be mentioned for "further reading" at the end of the article.

3.) Each experiment shall have its data at least abstracted within the article, with the following minimal data mentioned: Date(s) of experiment, site location, size of site, vegetation composition of site before experiment, site treatment, and vegetation composition after experiment.

4.) Conclusions or results shall not be published in articles without the minimal data listed in section 3.

5.) For every article mentioning an experiment, the name, address and phone number of the author(s) shall be included, plus the title and cost of a copy of the complete data including postage shall be published at the end of the article.

6.) Any discussions without data or speculations about grasslands shall be listed in separate articles and labeled as SPECULATIONS THAT NEED FURTHER RESEARCH, and any references or citations may be cited as part of the article.

Further, I hope that a future issue of *Grasslands* shall list the names, addresses and availability and cost of data that was used to support articles that have been published prior to the establishment of these standards. Data and observed, measured experiments are the only useful tools we have for successful restoration and management of native grass stands. Let's make them available to all.
Craig Carlton Dremann, proprietor
Redwood City Seed Co.

There are many good suggestions here and your comments/ suggestions are invited.

EDITOR'S NOTES: We apologize for the lateness of this newsletter, due to acquiring a new editor, computer system and software and the accompanying period of ajustment. Any material submitted for publication may be sent on disk, either 51/4" or 31/2", for either PC or Mac in virtually any word processing program. This newsletter was composed in Word for Mac, Times 10 point. This format is the most time-saving. Hard copy will be accepted but requires considerably more inputting time. Graphic material may be scanned into publications. Deadlines for contributed material are: Issue No. 1—Dec. 31; No. 2—Mar. 30; No. 3—June 30; No. 4—Sept. 30. **Deadlines in future will be strictly adhered to in the spirit of creating a professional publication made available to our readership on a predictable basis.**

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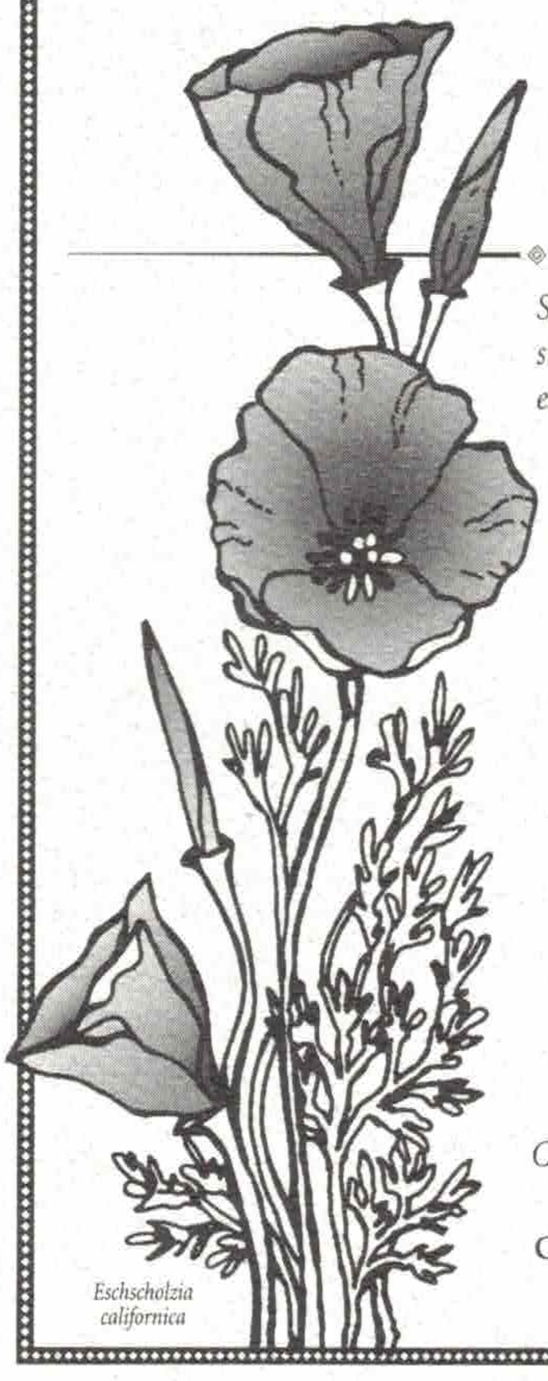
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