GRASSLANDS

The Newsletter of the California Native Grass Association — September 1992

Perennial Grasses for Roadside Weed Control

Ted Adams, Extension Wildlands Specialist, UCD
John Menke, Professor of Range Ecology, UCD

In the July 1991 issue of Grasslands, a study of perennial grasses for use in roadside weed control was breifly described. This study, funded by CalTrans, is being conducted by UC Davis. When the article was written (by John Haynes, Cal Trans), the study had been delayed because of drought the preceding winter. However, last winter's (1991-92) rains provided the window needed for initiation of the study.

After completion of seedbed preparation in December, 5 blocks, each containing the same eight species, were seeded during January 1992 in the I80/State Hwy. 113 interchange near the UC Davis campus. The species included were: Bromus carinatus, Elymus glaucus (two cultivars), Festuca ovina (non native cultivar) Dactylis glomerata (exotic cultivar), Stipa Pulchra, Thinopyron intermedium ssp. barbulatum (exotic cultivar), formerly in the genus Agropyron. Hordeum brachyantherum, and Festuca idahoensis. The number of replications (5) in this study will premit recorded observations to be analyzed statistilly and thus provide objective information on performance.

By limiting the number of species and cultivars, a comparison between seeding rates will be possible. And, because of great differences in seed size (and vigor), different rates allow direct comparison between species seeded at the same number of seeds (potential seedlings) per unit area.

The techniques used for seedbed preparation were standard farm practices. Following removal of the crop aftermath (weeds) by mowing and raking, discing was used to turn under the dead stubble and hasten oxidation (decomposition) of the remaining material. Firming of the seedbed was accomplished with a ring roller.

Following the first January rains, seeding was accomplished by hand broadcasting seed mixed with rice hulls for visibility. Seed was covered using hand-pulled, weighted drags made by attaching tire chains to one-inch boards to which 20-pound concrete building blocks were fastened.

Prior to seeding, 2 of the blocks required harrowing to loosen the surface, and this procedure also destroyed some annual competion that had emerged before seeding. Additional control of weeds in these 2 blocks was achieved by use of an herbicide before perennial grass emergence.

Presidents Message

Membership. We are now an organization of more than 500 persons throughout California. The educational program conducted by CNGA has, to a large extent, been responsible for this growth. Our influence on the use of native grasses in California grows with our numbers.

The CNGA brochure has been revised and updated by the Public Information and Education Committee. Copies are available from our Dixon address.

Appropriate Use of Ecotypes.

With the great interest in native grasses and the desire of many folks to plant these wherever possible, there is a tendency to overlook or ignore available ecotypes when seed is purchased for a project. A species may occur over a wide range, but the genetic makeup of plants growing in one location (an ecotype) usually limits survival of progeny at a distant site. The science of ecology includes the study of adaptive characteristics and is the foundation on which breeding and selection programs are based.

As an example, red festuce occurs widely in California. It is found in meadows and moist places from the seashore to 8,500 ft. in elevation. A commercial seed source recently suggested the inclusion of a coastal variety of red fescue in a mix to be used by a public agency in a droughty, montane setting. However, it is unreasonable to expect that a collection from the coast could be a source of seed for restoration projects in the mountains. Failure to appreciate ecotypic limitations can be both discouraging and expensive.

Both sellers and purchaser must provide the source of seed with site information so that errors of omission are not made. The seller must know the geographic limitations of the product so that errors of omission do not occur.

Education. One of the Association's most important objectives is education for members and others about California native grasses. In pursuit of this objective, CNGA sponsored three events in May. David Amme deserves kudos for promoting, organizing, and helping to conduct Revegetation After Fire in Southern California (May 8) and the Native Grass Identification Workshop for Southern California (May 9-10). These highly successful programs addressed important needs expressed by our southern California members. On May 16, a technical conference, Restoring the Land: The Native Grass Connection, was held at Elkhorn Ranch near Moss Landing. Interest in this event was high; nearly 200 members attended. The success of this event was defined by the numerous positive comments made during the day; the subject matter presented, the organization and the speakers all were acclaimed. The Public Information and Education Committee, chaired by Patricia Gouveia, and Clarence and Patty Tighe, who hosted the Conference, deserve thanks and praise for creating an outstanding program.

Other elements of the educational program are being implemented by the Research and Development Committee. The Committee has initiated preparation of a publication with the following working title: Preliminary Guidelines for Establishment and Management of Native Perennial Grasses. A draft should be ready by the end of the year.

Completion of the review of SCS Plant Materials Center Technical Reports, initiated last year, is scheduled. This review, conducted by Cynthia Brown (a U.C. graduate student) and supported by the R&D Committee, focuses on *Elymus glaucus* and includes information on the several other species of native perennial grasses tested. A summary of information developed by the review last year was published in the February 1992 issues of *Grasslands*.

Annual General Membership Meeting. The Program Committee for our second Annual General Membership Meeting, scheduled November 13 in Sacramento, has developed an outstanding agenda. The tentative agenda, presented in the last issue of *Grasslands*, has been refined and emphasizes genetic issues that will govern use of native grasses. Highlights include: principles of collecting, testing and selecting native grasses; use of case studies to illustrate integration of genetic considerations; and the process of bringing seed to market. A series of descriptive presentations will cover the CNGA Grass Garden Project, production and establishment of native perennial grasses, restoration projects in northern California, native grasses in sustainable agriculture, and more. Registration information will be mailed in September.

A Vendor's Program will be a concurrent part of the Annual Meeting. Commercial displays and educational posters will be include. More information on this important part of the Annual Meeting will be included with the registration information.

The venue for this year's Annual Meeting in Sacramento, the Holiday Inn-Northeast, provides an opportunity to visit historical sites in and around Sacramento. Old Sacramento and the California State Railroad Museum in Old Sacramento are great attractions. Proximity to the Gold Country will give attendees a chance to visit Mother Lode sites. These opportunities provide additional rationale for attending the 1992 Annual Meeting.

Letter to the editor:

I would like to reply to Stephen Edwards letter that appeared in May, 1992 *Grasslands* about my February letter regarding grazing of bunchgasses. Our bunchgrass survey 1991, covering 5,120 square miles in nine San Fransico Bay area counties, recorded 108 small stands, 99.99% of which occured along roadsides where the bunchgrasses had been protected from cattle and sheep grazing. Our observations mirrored those made by another ninty years ago, botanist Joseph Burtt Davy (1902, Stock Ranges of Northwestern California: Notes on the Grasses and Forage Plants and Range Conditions. (USDA Bureau Plant Industry Bulletin No. 12; 81 pages).

Davy found healthy bunchgrass stands only in fenced-off areas protected from grazing ... "luxurient growths of native clovers, grasses, and other plants which have been somewhat protected from their natural enemies, range stock."

The complete extermination of bunchgrasses by cattle and sheep grazing over thousands of square that I observed in 1991 brought to mind a toxicological concept known as LD50 — or the lethal dose of poisonous substance that kills 50% of a population. Statewide, we and our associated herbivores over the last 200 years have been "poisonous" to the buchgrasses, our activities having a lethal and toxic effect, and the lethal dose is approaching 100%.

Because of their proven lethal activities, I cannot conceive of a future where Eropean grazing animals and bunchgrasses can coexist.

Another bunchgrass researcher called recently and we discussed this eventuality, and her question was —- if cattle and bunchgrasses can't coexist, why should we revegetate with bunchgrasses? My answere was that introduced humans and their domesticated animals now make up 97% of the animal biomass in California, so restoration of bunchgrass area could be done to benefit the remaining 3% of the indigenous wildlife; and could be done as a way of "paying our rent" in exchange for the land occupied by our farms, houses, and grazing animals.

The tiny fragments of bunchgrass area that we found in 1991 usually contained bunchgrass allies: members of the *bean family* supplying nitrogen, members of the *sunflower family* creating firebreaks, and members of the *lily family* inhibiting the growth of annual grasses. Those scattered fragments of bunchgrass stands are biological Roseta stones. They contain interesting stories of a whole biological system, and how it formerly functioned. Without those fragments intact, we may never know how to put the pieces back together, so we need to locate them and aggressively protect them from grazing and other human activities. Those few fragments of biological Rosetta stones are what exite me most about bunchgrass restoration, because *as long as they exist, they can survive to tell us their stories; they are awaiting at this very moment for us to protect them and listen.*

Sincerely,
Craig Dremann
Redwood City
Seed Company

Newsbriefs and Trends

Loss of Remnent Grassland

Eastern Ventura County projects would destroy prime remnent of the states vanishing prairie grassland.
Jon Keely, environmental consultant, L.A. CA is leading opposition to the destruction of about 400-430 acres of native grass prairie.
Ventura County officials are expected to issue draft environmental reports with public hearings schedueled this fall. The supervisors are expected to vote on the project before the end of the year.

Letters of inquiry to:
Ventura County Board of Supervisors
County of Ventura
800 S. Victory
Ventura, CA 93009

Ms. Maggie Erickson Kildee, chair
Ms. Susan K. Lacey
Ms. Maria E. Vanderkolk
Ms. Vicky Howard
Mr. John K. Flynn

Classified Ad

California Native Grass Association Annual General Membership Meeting

Using Our Native Grasses - A Genetic Perspective
Holiday Inn - Northeast, Sacramento November 13,1992

Morning

8:15 - 9:00 **Registration**
9:00 - 9:10 **Welcome and Highlights**
Ted Adams, CNGA President

9:10 - 9:50 **Principles of Collecting, Testing, and Selecting Native Grasses**
Dr. Calvin Qualset, Agronomist and Geneticist.
Director, Genetic Resources Conservation Program, University of California, Davis

9:50 - 10:30 **Recognition of Genetic Variability in Land Restoration**
Dr. Kevin Jensen, Research Genetisist, USDA-ARS Forage and Range Research Laboratory, Utah State University, Logan

10:30 - 10:50 **Break**

10:50 - 11:30 **Bringing Seed To Market**
Robert Ball, Executive Secretary California Crop Improvement Association, University of California, Davis

11:30 - 12:00 **CNGA Business Meeting**
Ted Adams, CNGA President

12:10 - 1:30 **Lunch**
Concurrent Committee Meetings

Afternoon

1:30 - 1:50 **Genetic Architecture and the Conservation / Restoration of California Native Grassland**
Dr. Kevin Rice, Ecologist,
Dept. of Agronomy and Range Science, University of California,Davis

1:50 - 2:10 **CNGA Grass Garden Project**
David Amme, Technical Manager,
CNGA Reasearch and Development Program

2:10 - 2:30 **Importance of Weed Control in Establishing Native Perennial Grasses**
Dr. John Anderson, Hedgerow Farm, Winters, CA

2:30 - 2:50 **Production of Native Grasses**
Scott Stewart, ConservaSeed, Rio Vista, CA

2:50 - 3:10 **Break**

3:10 - 3:30 **Restoration Projects in Northern California**
David Kaplow, President, Pacific Open Space Petaluma, CA

3:30 - 3:50 **Native Grasses in Sustainable Agriculture**
Dr. Robert Bugg, Restoration Ecologist and Entomologist, U.C. Sustainable Agricultural Research and Education Workshop

3:50 - 4:10 **Grazing with Native Grasses**
George Work, Work Ranch, Monterey County

4:10 **Adjourn**

California Native Grass List Evaluation Catagories

I. Grasses for Initial Collection and Evaluation: Grasses not available on the market and require evaluation.

Aristada hamulosa	Poa compressa
A. oligantha	P. douglasii
Bromus arizonica	P. macrantha
Calamagrostis nutkaensis	Sporobolus airoidies
Deschampsia danthoniodies	Stipa columbiana
D. elongata	S. comata
Festuca elmeri	S. lemmonii
F. arizonica	S. speciosa
Koeleria macrantha	Trisetum canescens
Leymus condensatus	Vulpia microstachys
Muhlenbergia microsperma	V. octoflora

II. Grasses for Field Evaluation. Grasses have been collected and propagated but need initial evaluation and trials.

Agropyron spicatum	F. occidentalis
Agrostis diegoensis	F. rubra
A. exarata	Hordeum californicum
Bromus marginatus	Melica californica
Elymus trachycalus	M. imperfecta
Danthonia californica	M. torreyana
Deschampsia caespitosa	Muhlenbergia rigens
D. holciformus	Poa scabrella
Distichlis spicata	Sitanion jubatum
F. idahoensis	Stipa lepida

III. Grasses for Field Demonstrations:
Grasses currently available for demonstratrion trials.

Bromus carinatus	Leymus triticoides
Elymus glaucus	Stipa cernua
Hordeum brachyantherum	S. pulchra

SAMPLING SCHEME
for
GERMPLASM CONSERVATION
and
ANALYSIS OF GENETIC VARIATION
in
CALIFORNIA NATIVE GRASSES:
A SUGGESTED STRATEGY

STAGE 1. BULK SEED COLLECTION- MAXIMIZE VARIABILITY WHILE MINIMIZING COLLECTION TIME AND LABOR

ADVANTAGES:
1) immediately available seed source for restoration
2) preservation of large portion of available gene pool
3) ease of collection and storage

DISADVANTAGES:
1) provides large random sample of gene pool in a given population but little information as to how the genetic variation is structured- i.e. no info with regard to breeding system, outcrossing rates, gene flow, etc.

METHOD OF HARVEST:
At the time of seed maturity, one or more collectors criss-cross the area occupied by the population, randomly stripping from seeds/seedheads from plants throughout the area and placing them into paper bags (if collected in plastic bags, seed should subsequently be transferred to paper bags or else the water vapor given off during respiration will cause the seed to rot). Bags should be labeled as to locality and date of collection.

METHOD OF STORAGE:
Field collected material should be stored in paper bags open to the air (as noted above, plastic bags will retain humidity and seed will mold) in a cool dry place. Once dried, material may be threshed and stored at 4°C to maximize seed longevity and germination.

POTENTIAL USES:
1) restoration and revegetation
2) germination trials
3)long-term germplasm conservation
4)initial survey of genetic variability in local populations

GENETIC CAVEATS:
Bulked seed collections, especially if the seed is outcrossed rather than selfed or apomictic, sample the recombination potential of the population; since the genotypes within the seed pool have not undergone selection they are not necessarily adapted genotypes.

STAGE 2. SINGLE SPIKE/PANICLE SEED COLLECTIONS - MAXIMIZE GENETIC INFORMATION THAT CAN BE OBTAINED ABOUT A GIVEN POPULATION

ADVANTAGES:
1) preserves the underlying genetic structure of a population and makes it accessible for further genetic analysis

DISADVANTAGES:
1) more time consuming and labor intensive to collect than bulked seed
2) requires more record keeping and more handling in storage than bulked seed

METHOD OF HARVEST:
At the time of seed maturity, single spikes or panicles are collected at maturity from 20-50 individuals scattered over the area occupied by the population of interest and each seedhead is placed in a separate coin envelope and labeled as site, individual number, and data of collection. All the seed from a single individual constitutes a progeny or family and this pedigree information must be retained and updated when the seed is subsequently grown out. An example of a coding system for labeling seed packets in a pedigree format is shown below:

This indicates that the seed was collected in the year 1991 at site 104 and the seed was from individual #33.

METHOD OF STORAGE:
Field collected material should be dried and threshed then stored at 4°C in labeled envelopes sealed inside air-tight moisture-proof pouches to maximize seed longevity and germination. Seal-meal-bags are a convenient and economical way to achieve this objective. Don Parfitt, USDA Germplasm Repository, UCD can provide helpful advice in setting up a permanent seed storage system. Each envelope should have a permanent label affixed with some of numerical ID that can be used to pedigree the seed with a minimum of bookkeeping.

POTENTIAL USES:
1) detailed genetic analysis of population structure and variation- e.g. breeding system, outcrossing rates, gene flow and neighborhood size, etc.

If populations can be visited prior to anthesis, it would be very informative to bag a single panicle/spike per individual for a representative number of individuals at each site. At seed maturity, both the bagged panicle and an open-pollinated panicle/spike can be collected from each individual. The bagged panicle will give measure of selfed seed produced per individual and thus the level of inbreeding occurring in the population. The open-pollinated seedheads will give an indication of outcrossing rates.

GENETIC CAVEATS:
Essentially the same as for bulked seed in the sense that only the gametes going into the seeds have undergone some sort of selection but the diploid genotypes that form the seed embryos are products of recombination and have not yet undergone a full round of selection so not all of them are necessarily adapted to the local environment.

STAGE 3. RAMETE OR CLONAL VEGETATIVE PLANT COLLECTIONS -
MOST CRITICAL FOR PERENNIAL SPECIES WHERE VEGETATIVE REPRODUCTION MAY BE THE MAJOR MODE OF REPRODUCTION AND NOT ALL ADAPTED GENOTYPES IN A POPULATION ARE NECESSARILY PRODUCING SEED IN ANY GIVEN GROWING SEASON

ADVANTAGES:
1) samples the adapted gene pool
2) plant material continuously available for observation and further sampling

DISADVANTAGES:
1) requires immediate transplant into a "nursery" —- preferably in same climatic area w/similar soils

METHOD OF HARVEST:
Plants are sampled at the stage when they are growing vigorously and producing tillers. A tiller with intact root/shoot meristems is removed from the parent plant and placed in a plastic bag labeled as the plant number, site and date of collection. The plants are then transplanted into a suitable nursery.

METHOD OF STORAGE:
Maintained as live material in a greenhouse or outdoor nursery. Once plants become established they can continue to be clonally propagated indefinitely.

POTENTIAL USES:
1) continuing source of clones for restoration and revegetation
2) long-term germplasm conservation
3) surveys of genetic variability in local populations
4) common garden and reciprocal transplant studies

GENETIC CAVEATS:
Rametes sample the variation in the adapted genotypes surviving on a site at the time of sampling.

STAGE 4. SOIL CORES/SEED BANK COLLECTIONS -
SAMPLE MULTIPLE GENERATIONS IF SEED REMAINS VIABLE MORE THAN 1 GROWING SEASON IN THE SOIL - MOST CRITICAL FOR ANNUAL SPECIES WHERE THERE MAY BE SIGNIFICANT YEAR TO YEAR VARIATION IN SEED QUANTITY AND QUALITY

ADVANTAGES:
1) samples are easy to obtain and maintain
2) samples are likely to highly to be highly variable if the environment is heterogeneous over time

DISADVANTAGES:
1) may be difficult to separate species on the basis of seed characters alone. In that case seed may have to be grown out, the plants identified to species and then seed harvested from these plants. This would interpose a generation of selection under off-site conditions.

METHOD OF HARVEST:
Soil cores are taken from a number of random locations within the site after the growing season is ended and the seedheads have shattered. Samples will be biased in favor of those species where the seed disarticulates readily.

Seed is recovered by washing the soil samples over a fine mesh screen or sieve. A screen mesh flour sifter works very well and can be readily obtained from the housewares section of most stores.

METHOD OF STORAGE:
Dried seed can be stored in the same way as bulk seed STAGE 1.

POTENTIAL USES:
1) restoration and revegetation
2) long-term germplasm conservation
3) surveys of genetic variability in local populations
4) common garden and reciprocal transplant studies

GENETIC CAVEATS:
Samples the "genetic memory" or genetic legacy of a population. If seed is relatively long-lived may contain genotypes adapted to prior environmental conditions but not present in the current generation.

STAGE 5. SEED COLLECTIONS FROM SAME SITE BUT OVER MORE THAN 1 GROWING SEASON

STAGE 6. COMPUTERIZED GERMPLASM DATABASE

Prepared by Margi Oard/Botany Department/UCD/March 25, 1991

Join the Native Grass Association!

Date_____

(Print)
Name _____

Title_____

Organization_____

Address_____

City/State/Zip _____

Phone/Fax_____

Membership Status

regular	$35.00/yr.
student	$20.00/yr.
life	$350.00/yr.
corporate	$500.00/yr.
associate	$100.00/yr.

To support CNGA in its efforts to Develop, Promote, and Restore,
I am enclosing a donation of $_____
Donations are tax deductible to the extent allowed
under federal and state law.

Detach and Mail To:
California Native Grass Association
P.O. Box 566
Dixon, CA 95620

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