RESTORATION MANUAL
FOR
NATIVE HABITATS OF SOUTH TEXAS

South Texas Natives

CAESAR KLEBERG WILDLIFE RESEARCH INSTITUTE
TEXAS A&M UNIVERSITY-KINGSVILLE

Table of Contents

PLANNING YOUR PROJECT

The success or failure of any restoration project will be directly proportional to the quality of the initial plan. Time spent carefully considering details beforehand will be the best investment you can make.

The following outline presents steps for successful completion of a revegetation project. The sequence will depend on the purpose of the project and current condition of the site to be re-vegetated.

Define Your Goal

Step 1: Determine your objectives

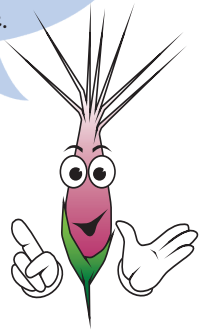
- Will the area be used for activities such as wildlife, livestock, or recreation?
- What is your expected timeline?

Step 2: Determine political or legal constraints to the project

- Ensure that appropriate public agencies have been contacted and regulatory requirements met.
- Contact neighboring property owners if they will be affected.

Step 3: Secure maps and aerial surveys of the site, if possible

- The United States Department of Agriculture - Natural Resource Conservation (USDA-NRCS) Soil Surveys for each county include critical information on soil types, vegetation communities, and individual plant species lists. They can be accessed at http://websoilsurvey.nrcs.usda.gov.
- Ecological Site Descriptions are currently being developed by the USDA-NRCS for each county; drafts are available at http://esis.sc.egov.usda.gov. A CD-ROM should also be available in the near future.
- Topographical maps are available through the U.S. Geological Survey at http://www.tnris.state.tx.us
- Private aerial photography services offer unique options that can be tailored to the objectives of your restoration project.



Step 4: Assessment

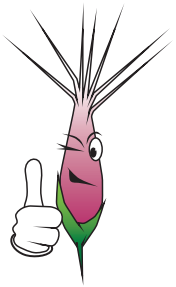
- Determine historical vegetation of the site.
  - This may be difficult to determine, but if local remnant vegetation patches exist in the area, try to model your restoration efforts after the species composition and distribution of these sites.
  - Visit the site during several seasons of the year; this will allow you to see the variety of plants (e.g. annuals) that appear at different times.

- Refer to the USDA-NRCS Ecological Site Descriptions for a list of plant species in your area.

- Assess the physical and biological characteristics of the site.
  - Identify and characterize soils
    - What is the soil texture? Fertility? Salinity levels?
  - Evaluate topography
    - Is the site rocky, steep, or in a floodplain?
  - Determine whether land use on surrounding boundaries will affect your site, such as erosion caused by oil and gas activity or off-road vehicle trespassing, and how you will manage this.
  - What are impacts from grazing/browsing animals (cattle, deer, rabbits, etc.)?
  - Determine present vegetation.
  - Determine if native plants exist on the site:

YES, native plant species exist on the site:

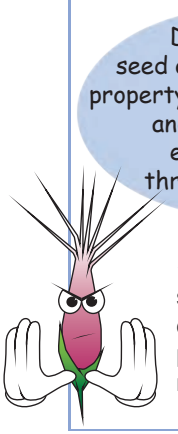
- Identify native plant species on site;
- Identify plants to be salvaged or harvested;
- Salvage and harvest seed;
- Salvage topsoil and subsoil, if appropriate;
- Replace salvaged topsoil;
- Eradicate/control weeds if present (a weed is a plant that interferes with management objectives for a given area of land at a given point in time);
- Prepare seedbed, amend soils;
- Replant salvaged plants or seeds, or purchase commercial seed adapted to your area, ensuring that plants are suitable for the site (shade, soil, water requirements);
- Control erosion, and mulch (if practical);
- Maintain and monitor (proper grazing management, weed control).



HELPFUL TIP

Many areas of South Texas have soils depleted of nutrients and organic matter, or are missing the upper layer of topsoil. It may be necessary to adjust the selected species under these conditions. Topsoil and subsoil is commonly salvaged on mining, and oil and gas drilling locations.

ETHICS OF HARVESTING WILD SEED



It is critical to obtain landowner or land manager permission if collecting on property other than your own. In particular, most state or federal agencies require special permits to collect seed.

While restoring or improving another site, ensure that the source population is not damaged by over-harvesting seed. If a source site is scheduled for clearing by development or cultivation activities, seed can be opportunistically collected from the source before it is destroyed. On other areas, however, it is best to avoid harvesting all, or even most, of the seed for each species on the site because many native species do not set viable seed every year, and may have low germination. When choosing a collection site, look for a well-established plant community of your target species. It is best to consult a restoration ecology professional, or thoroughly research the species you plan to collect to ensure the population will not be adversely impacted.

Many native species have indeterminate inflorescences where the flower stalk continues to grow with prolonged flowering; it may require several collecting trips to effectively collect seeds for these species. It's important to pick mature seeds from healthy plants to help ensure superior offspring with similar qualities.

Seed Maturity

Shortspike windmillgrass (Chloris x subdolichostachya Muell.)

Grasses

Mature seeds are typically dry and hard, and have separated from the rachis or stalk.

Indian blanket (Gaillardia pulchella)

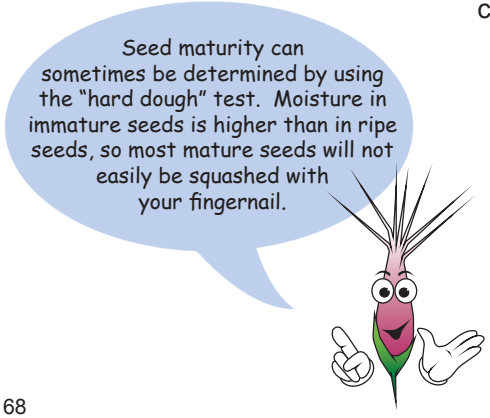
Broadleaf Herbaceous Plants

Mature seeds are typically dry and hard, and loosen easily from the pods, capsules, or flower heads.

Desert yaupon (Schaefferia cuneifolia)

Shrubs & Trees

Fleshy seeds should be fully ripe, and should be easy to remove from the stem.



Checking a coma (Bumelia celastrina) seed for ripeness

Seed Quantity

Before going into the field, decide how much seed to collect. Some of the factors to consider are
- Size of the area you wish to plant;
- Number of container-grown plants you wish to grow;
- How much seed is available for collection;
- Available equipment and labor;
- Time available for collection;
- Availability of storage space.

Because wild harvested seed often has low seed viability, collect more seed than has been calculated for the restoration plan. Collect seed from a number of different plants to ensure diversity.

If collecting seed for *South Texas Natives* or one of the USDA-NRCS Plant Materials Centers, it is best to collect approximately 1/4 pound of seed, if possible, but smaller collections are accepted. If possible, seeds should be collected from a minimum of 30–50 plants.

HELPFUL TIP

If harvesting mechanically for a mixed collection of seed, it's easiest to select for the predominant species desired for the mix, and harvest when the majority of the seed is ripe. Because mixed seed is difficult to separate and clean, the mix will have to be planted as a combined mix, or sent to a seed-cleaning facility.

Mechanical Seed Collection

Mechanical harvesting can be economical for large-scale collection efforts of both single species and mixed collections. Machines that are used to harvest prairie seed can be categorized into 2 general groups: (1) small machines such as portable seed strippers, and (2) large machines such as combines.

Hand-held seed stripper

Native Seed Strippers

Hand-held Seed Stripper: This machine utilizes a rotating reel that combs or sweeps seed heads off stalks, and then collects and contains seeds in a detachable "hopper." This type of equipment is lightweight, and has a minimal impact on the prairie landscape because it leaves the plant stalks intact for bird nesting cover and prescribed burns. It is useful for collecting seeds from selected patches of plants in areas of limited access, or on rough terrain. These machines are relatively inexpensive, efficient, and simple to operate.

Harvested seed mix

PROPAGATING AND TRANSPLANTING

WHY PROPAGATE NATIVE PLANTS?

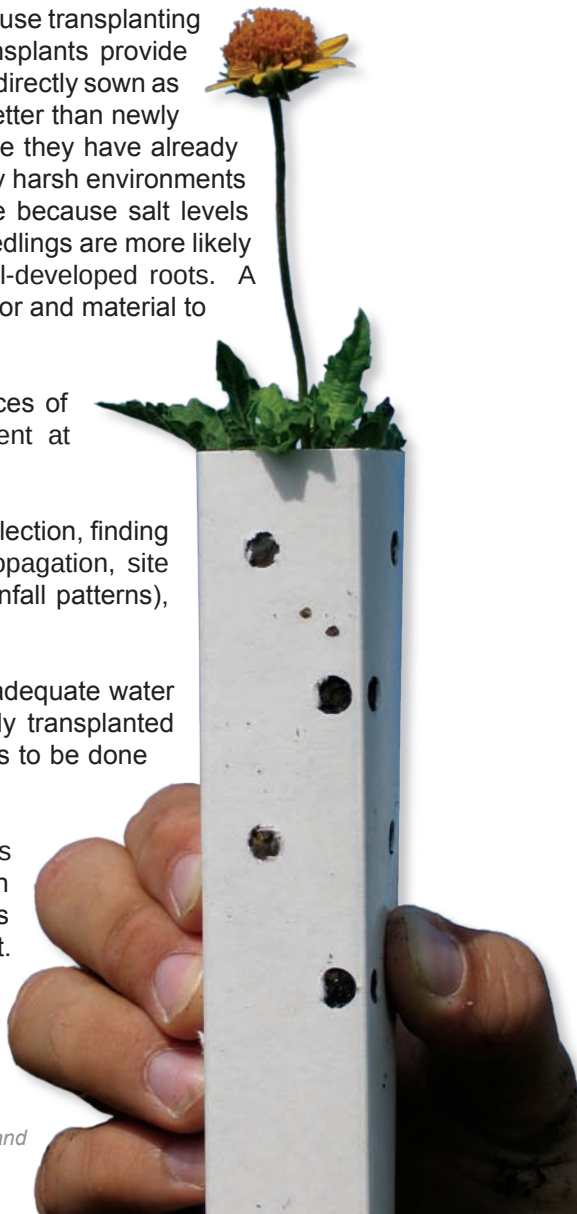
Most native seed, especially those for shrubs and trees, are not readily available on the commercial market. Because most seeds must be collected by hand or by crude mechanical means, prices are high and availability is low. Growing your own transplants, purchasing transplants from a nurseryman, or contracting an experienced commercial grower requires less seed than direct sowing. Seedling establishment risks are also lower because transplanting can be optimized to avoid the South Texas heat. Transplants provide uniformity, and often grow faster than seedlings that were directly sown as seeds. Furthermore, propagated transplants compete better than newly germinated seedlings against aggressive weeds because they have already developed root systems. For restoring vegetation on very harsh environments such as saline sites, transplanting can be very effective because salt levels may be too high for germinating seeds. Transplanted seedlings are more likely to tolerate existing salt conditions because of their well-developed roots. A drawback to transplanting is the potential high cost of labor and material to grow and transfer the seedlings into the field.

Several processes are necessary to increase the chances of native seedling survival and successful re-establishment at restoration sites:

- **Plan Ahead:** Planning efforts should focus on seed collection, finding suitable space, and a safe environment for initial propagation, site preparation, timing of planting (weather, especially rainfall patterns), planting techniques, and seedling maintenance.

- **Water:** One key factor to successful transplanting is adequate water availability and conservation of soil moisture for newly transplanted seedlings. Planning and installing field irrigation needs to be done well in advance of transplanting.

- **Be Familiar with the Species Requirements:** It is important to understand the specific environment in which native species naturally grow. Restoration sites must be as similar as possible to a species' native habitat. Duplicating this environment will involve knowing the light (sun vs. shade), soil type, soil moisture, and soil pH requirements of the species you are transplanting before you start.



Awnless bush sunflower in 5"x1"x1" plant band

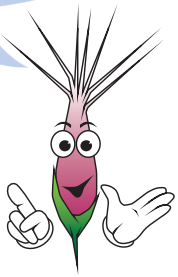
Germination

Heartleaf hibiscus (Hibiscus cardiophyllus)

Germination is the beginning of growth in a seed. Seeds remain in an inactive, non-growing state, until conditions are right for germination. All seeds need water, oxygen, and proper temperature in order to germinate; some seeds have special light requirements as well.

If appropriate facilities are available, seeds can be germinated on the premises; this can be somewhat labor intensive and costly, however. There are reputable companies that provide efficient and cost-effective services of germinating and preparing seedlings for transplanting. Most companies use planting trays or receptacles that will fit specific transplanting equipment, so make sure the trays will be compatible to the type of transplanter you will be using in the field. Techniques and receptacles used for transplanting grasses, forbs, and shrubs vary, and depend on transplanting methods, cost, or time and labor constraints.

You can find germination information on seed tags, at USDA-NRCS Plant Materials Centers, on the USDA website http://plants.usda.gov, on the Native Plant Network website at www.nativeplants.for.uidaho.edu/, or in Appendix F of this manual.



In order to determine how many seeds to plant, you will need to know the *pure live seed* (PLS) of each species being used. Most commercial seed has the germination rate information printed on the label, but if planting wild harvested native seed, germination tests can be conducted through a seed-testing lab. Most non-cultivated seed generally has a low germination percentage. To ensure the highest germination count possible, seed should be collected during peak maturity, and properly stored.

Seeds can be density graded to improve quality for growing transplants. This process sorts out heavier seeds, and removes lightweight, weak, and immature seeds that may have a low germination potential. Find out about and apply the specific germination and planting requirements for each of the species that you are transplanting.

Different species require different germination periods and growth times to reach appropriate transplanting sizes. While many seeds can be easily germinated directly in the soil, some seeds may require specific preparatory treatments to initiate the germination process. By becoming familiar with the requirements of each species or seed type, you will be able to incorporate the timing and special equipment needs into your plan.

Transplanting grass seedlings by hand

APPENDIX A
Glossary of Plant Basics

Much of the information published in this appendix was adapted from the Native Plant Revegetation Guide for Colorado - *Caring for the Land Series Volume III, Colorado Natural Areas Program, Colorado State Parks, and Colorado Department of Natural Resources, 1998.*

The Plant Kingdom is extremely diverse, and contains over 200,000 species. Taxonomists combine these species into a variety of groups and sub-groups on the basis of shared characteristics. The majority of plants discussed in this guide belong to the large category of plants that reproduce by means of seeds (i.e., spermatophytes).

Two broadly defined groups of seed plants are gymnosperms and angiosperms.

Gymnosperms
- Woody plants with needle-like or scale-like (imbricate, overlapping) leaves.
- Do not produce flowers.
- Fruits are cones or berry-like cones (the blue "berries" on junipers are modified cones).
- Includes pines, firs, Douglas-fir, spruces, junipers, and mormon tea from the primitive family of Ephedraceae.

Angiosperms
- Plants that produce flowers.
- Include species with obvious flowers such as ceniza and sunflowers (*Helianthus* spp.), as well as those that are not so obvious, like grasses, bulrushes, and sedges.

Deciduous
- Produce leaves through the growing season, and may drop leaves in the winter. Some plants, like whitebrush, may drop their leaves during drought.
- Pecan, hackberry, and honey-mesquite are examples of deciduous species.
- Deciduous plants in South Texas may retain their leaves during the winter due to our warm climate; deciduous plants in most areas of the country are bare during the winter.

Evergreen
- Produce green leaves throughout the winter.
- Guayacan, live oak, anacua, and evergreen sumac are examples of evergreen species.

Both gymnosperms and angiosperms may be either deciduous or evergreen.
Gymnosperms and angiosperms can be further categorized by life cycle, growth form, reproductive strategy, maturity rate, and other descriptive terms.

Life Cycles
This manual uses only the general life cycle terms annual, biennial, and perennial.