# Range Planting

## Conservation Practice Standard 550 Guidance

**Natural Resources Conservation Service (NRCS) October 2008**

**Mesic flatwoods range site showing typical combination of bluestems, saw palmetto, and pine.**

## PURPOSE

The purpose of this guidance is to provide additional information for range planting outlined in Florida NRCS Conservation Practice Standard Range Planting, Code 550.

## Rehabilitation and Restoration of Native Range Systems in Florida

In Florida, the plant communities most often associated with the term rangeland are the flatwoods, dry prairie, and upland pine forest. At the time of European settlement, these communities were estimated to occur on approximately 24 million acres or 70 percent of the total land area of the state (Abrahamson and Hartnett, 1990; Sprott and Mazzottii, 2001). According to the 2003 USDA, NRCS National Resource Inventory (http://www.nrcs.usda.gov/technical/NRI/2003/statereports/2003summaryreport.pdf), there are only about 4 million acres of non-federal rangeland and grazed-forest land left in the state. This means that 20 million acres of rangeland habitat in the state have been converted to cropland, pastureland, commercial timber, urban uses, etc. Recent concerns over habitat loss and water availability and quality, along with changes in social attitude to the value of native communities and open space, and the need to enhance the sustainability of grazing enterprises has resulted in a reversal of the historic trend in rangeland conversion.

The first step in rangeland restoration is for the land manager to outline and prioritize their restoration objective(s). Their objectives could include providing and/or improving forage for livestock, feed and cover for wildlife, and water quantity and quality. The restoration of a plant community to its historic climax may also be desired. Next, the manager should arrange for a resource inventory of the restoration site to be conducted to determine the structure and composition of the plant community present. By having a clear idea of the restoration objectives and the current condition of the plant community at the site, the manager can

then decide on the best management steps to achieve the desired vegetative outcome.

Experience in Florida has shown that, for mesic or drier sites that still have >15% by weight of desired plant species, appropriate management practices such as burning (see Table 1), chopping, and/or prescribed grazing can restore the desired balance of grasses, forbs, and woody species. On more hydric sites, desirable species composition can be as low as 10% by weight and still be restored by appropriate management practices. Consult with your local USDA, NRCS Field Office for more details on use of differing conservation practices to rehabilitate degraded rangelands.

When the desirable community is below threshold levels, such as would occur in a reclaimed mineland, old agricultural field, or bahiagrass (*Paspalum notatum*) pasture, replanting is most appropriate. Due to limited seed and poor germination rates of Florida ecotypes, transplanting of desired species such as wiregrass (Beyrich threeawn, *Aristida beyrichian,* or pineland threeawn, *Aristida stricta*) is a common practice, particularly in areas where erosion is a concern. This practice is limited to small areas due to cost. Direct seeding of native grasses and forbs is the only practical method for establishing large areas of native vegetation. There are many challenges to direct seeding of native vegetation in Florida. These challenges include availability and cost of seed of adapted ecotypes, lack of specialized planting equipment, and undesirable vegetation that is difficult to eradicate. Additionally, there have been relatively few studies conducted in the state determining such basic information as seeding rates and dates. Information on planting native rangeland vegetation presented in this guidance is based on work conducted at the USDA, NRCS Brooksville Plant Materials Center, applied experience from the staff of the Florida Fish and Wildlife Conservation Commission, and reference literature. Any information regarding herbicide application is based on current availability and labeling. If herbicides are to be used, refer to Florida NRCS Conservation Practice Standard Pest

**Wiregrass transplants at Eglin Air Force Base.**

**Table 1. Recommended fire frequency and timing for different resource concerns (adapted from Tanner et al., 2002).**

| | Ecological communities (see Appendix 1) | | | | |
|---|---|---|---|---|---|
| | HFW/MFW/ SFW/DPR | UPF | IXF | WPR/MPR | FWM/SWM |
| Resource concern | Frequency Season | Frequency Season | Frequency Season | Frequency Season | Frequency Season |
| Restore/maintain ecological sites | 2-4 yr Year round | 2-4 yr Year round | 10-60 yr Year round | 2-5 yr Year round | 2-5 yr Year round |
| Control undesirable vegetation | 2-4 yr Nov-Feb | 2-4 yr Nov-Feb | 10-60 yr Nov-Feb | 2-5 yr Nov-Feb | 2-5 yr FWM Nov-Feb |
| Improve or maintain quail habitat | 1-3 yr Year round | 2-4 yr Year round | 10-60 yr Year round | 2-5 yr Year round | |
| Improve or maintain habitat for deer and turkey | 2-4 yr Year round | 2-4 yr Year round | 10-60 yr Year round | 2-5 yr Year round | |
| Improve or maintain habitat for waterfowl | | | | | 2-3 yr Year round |
| Improve quality/quantity of forage for livestock, improve livestock distribution, and stimulate seed production | 2-4 yr Dec-May | 2-4 yr Feb-May | 10-60 yr Feb-May | 2-5 yr Dec-Feb | 2-5 yr FWM Dec-Feb 2-3 yr SWM Sep-Dec |

Management, Code 595; follow current Univ.Florida, IFAS recommendations (http://edis. fas.ufl.edu/WG006); and adhere to label instructions.

## Site Preparation

As with any agricultural operation, site preparation is an important step in successful establishment of rangeland species. This is particularly critical with native species since many are relatively slow at establishing. Due to the long and wet growing season in Florida, re-establishment of surviving perennial vegetation or encroachment of introduced and native weeds can be a significant problem on restoration sites.

**Moderate to heavy cattle grazing can help prepare a bahiagrass site for establishing native species by reducing bahiagrass seed loads on the site.**

Research studies (Kosel et al., 2001) and applied experiences have shown that tillage alone usually will not result in satisfactory establishment of native grasses and forbs. A combination of herbicide and tillage is often necessary to control existing vegetation, particularly the non-native sod forming pasture grasses such as bahiagrass and bermuda-grass (*Cynodon dactylon*). Even when combinations of herbicide and tillage are used, up to 2 years of site preparation is often necessary prior to planting.

Any combination of standard agricultural practices that result in a clean, weed-free seedbed can be used, assuming these practices do not involve the use of herbicides with soil residues that inhibit native seed germination. Suggested herbicide and tillage combinations for site preparation based on the experience of the Florida Fish and Wildlife Conservation Commission (FWCC) are:

1. Initial Herbicide:
    1. If bahiagrass is the only grass species to be eradicated, use a 2% solution of glyphosate.
    2. If bermudagrass or torpedograss (*Panicum repens*) is present, use mixture of imazapyr at 1% solution and glyphosate at 1.5% solution.
    3. If using glyphosate alone, make the initial herbicide application in the fall with a follow-up in the spring. Apply glyphosate once more in the summer/fall at least one month prior to planting seed. If the non-native grass is not completely dead after this treatment, another year of herbicide application is recommended.
    4. If using a glyphosate/imazapyr mixture, make the initial herbicide application in the spring, while the plants are still actively growing, with a follow-up of glyphosate only in the fall. Apply another application of herbicide mixture the following spring, and then another follow-up of glyphosate only the second fall prior to planting.
    5. The goal of any site preparation is to eliminate competition and provide direct mineral-soil contact for the native seed. Tilling/disking may not be necessary and is not advisable if the thatch can be burned off or if there are erosion issues to consider. If the residual dead thatch has not decomposed well and cannot be burned off, then disking will be necessary. **Prior to disking, it is important that all non-native grass be completely dead, otherwise it will return quicker than the planted seed and choke out the native seedlings.** When disking is necessary, the site should be disked with a heavy disk followed by a finishing or leveling disk to smooth out the site. The final operation prior to planting is cultipacking or rolling to produce a firm mineral-soil seedbed.

**A good rule of thumb for checking seedbed firmness is that a footprint leave an impression no deeper than ¼ inch.**

**Plant materials staff flail vac harvesting native grass seed at Avon Park Bombing Range.**

## Seed Sources

The type of seed or planting material used is dependant on a combination of factors, which include the objective of the restoration project, seed availability, and cost. In a true ecosystem restoration project, as might be undertaken by a public entity, the species planted should mirror some reference community and the seed or vegetative planting material come from locally sourced wild stands. Restoration ecologists promote this type of planting as the method for best preserving genetic diversity, but issues arise as to how to define "local". Information on genetic considerations in ecological restoration can be found at http://www.centerforplantconservation.org/ASP/CPC_GCERBRefTopicList.asp.

Aside from genetic considerations, proponents of wild harvested seed also say one of the benefits is that you get a single seed source that is a mixture of the different species found on the site. Unfortunately, differences in seed ripening times usually means wild harvested seed has relatively few species in the mix. (See **Tips for Harvesting Wild Seed** on next page.) Such mixes must therefore be augmented with other species, often individually hand- harvested, to approach the complexity of the donor site.

Regardless of the benefits of using wild seed, harvesting this type of seed is an expensive and time-consuming undertaking. Using wild seed may not be biologically or economically justifiable for private landowners whose goals could be satisfied with the less diverse plant community associated with planting simple mixtures of commercially available native seed.

When using commercially available seed, NRCS recommends using adapted, certified, named germplasm or cultivars. This type of seed is recommended because the material has been developed through field testing, proved its superior performance under a range of conditions, and is produced by growers who ensure genetic purity. If this type of seed is not available, the second choice would be to use adapted non-certified, named germplasm or cultivars. This type of seed is less desirable because quality control and genetic integrity of the seed fields are not maintained by the state seed certification agency. The last choice for planting would be field raised common local ecotypes because nothing is known about the performance of the material.

Having explained the rationale for this recommendation, the fact is there is no certified production of native seed based on Florida ecotypes at this time. Certified seed, developed from ecotypes from other areas of the country, is available for such widely adapted species as switchgrass (*Panicum virgatum*), yellow indiangrass (*Sorghastrum nutans*), or little bluestem (*Schizachyrium scoparium*). Some of this material is recommended for planting in northern Florida (see Appendix 2), but their adaptation declines as you move south in the state. For a list of currently recommended germplasm or cultivars and sources of supply, see the publication "Florida Plant Materials Resource List" on the Brooksville Plant Material Center webpage (http://www.fl.nrcs.usda.gov/programs/pmc/flplantmaterials.html)

Limited supplies of Florida ecotype seed are available on the Florida market. Most of this is from wild harvesting and little or no information on seed viability or seed content (i.e., number of seed per pound, species present, etc.), is available to the consumer. Nor are there any standardized procedures for post-harvest handling (e.g., drying, cleaning, storage conditions, etc.). As a consequence, it is easy to understand variable stand success when this type of material is used.

Due to demand, seed of field grown Florida ecotypes is becoming available. Producers purchasing this type of seed should always ask:

- what is the source of the parent plants (e.g., was the material developed through the USDA, NRCS Plant Materials Program or a state university testing program);
- what was the geographic source of the parent material (generally, the closer to your latitude the better);
- how was the seed processed after harvest; and
- what is the germination rate of the seed

Generally, seed suppliers that provide you with the most information will have the "cheapest" seed.

Regardless of seed source, do not use seed lots that contain noxious or weed seed in excess of that permitted by state seed law. If you plan on harvesting wild seed, sites need to be inspected for noxious weeds or invasive species prior to harvest.

## Planting

### Equipment Options

Planting is the operation by which propagation material, usually seed, is metered out (planting rate) and specially distributed (broadcast or placed in the soil at a predetermined depth) in a given area. For seed, broadcasting (by ground or aerially) or planting/drilling are the normal methods used.

Rotary spreaders, those pieces of equipment used to spread crop seed, fertilizer or granular product, can be used to broadcast plant all types of native

**Tips for Harvesting Wild Seed**

**Harvest Timing**

- Many native plants are fall seed producers. Check sites regularly when harvest time approaches. Seed of grasses such as the bluestems or indiangrasses shatter (fall off) easily when mature resulting in very short windows for harvesting
  - Lopsided indiangrass (*Sorghastrum secundum*) produces seed in mid-October. Once ripe, it will fall off within 3-4 days.
  - Wiregrass and bluestems produces seed between mid-November through mid-December. Usually the week or two around Thanksgiving has been the peak time throughout the state.
- Numerous wildflowers and legumes produce seed in the summer. Much of the summer seeders are hand collected so as not to disturb the fall seeders, which are machine collected.

**Harvest Equipment**

- Forage harvesters can be used to collect "green chop" which contains the seed. This type of material has a high moisture content and must be spread out to dry or applied to the planting site quickly before it goes through a heat. There is a lot of inert material with this type of harvest and consistent seeding rate is hard to obtain.
- Conventional combines do not work with native seeds that have awns, bristles, etc . Tractor-propelled, seed stripping harvesters with rotating brushes and vacuum systems (e.g., Flail Vac) are used with those types of seed. Good information on different types of seed harvesters used for native seed can be found at: http://reveg-catalog.tamu.edu/11-Seed%20Harvesting.htm
  - Harvest seed with this type of equipment after the dew has dried off, during the portion of the day when humidity is lowest.
  - Low brush speeds often result in only ripe seed being harvested and allowing for second harvest on a site.

**Seed Drying**

- Seed should be dried completely if it is going to be stored for more than one week. Commercial seed drying facilities spread the seed on fine mesh screens and blow forced air through the seed. If the air is heated, it should be not exceed 104$^{o}$ F. If seed drying facilities are not available:
  - Place seed on plastic sheeting in a covered area where wind, rain, and dew will not accumulate on the seed.
  - Turn seed every day for 7 to 10 days and do not pile more than 6 inches deep.
- Store dried seed in woven polypropylene seed bags in an air-conditioned building.

**Seed Cleaning and Conditioning**

- Conditioned or cleaning seed is the process of separating the seed from the stems, leaves, seed pots, etc., that are collected with mechanical harvesters. Additionally, awns or beards are removed from the seed to prevent clogging planting equipment. Using cleaned seed usually results in better stand establishment and lower seeding costs.
- Not all seed handles extensive cleaning operations. Germination rates of wiregrass seed is often reduced by de-awing.
- When cleaned seed is not available, seed needs to be broadcast planted or native seed planters with smooth drop tubes need to be used.

seed. This planting method is usually easiest because the equipment is relatively inexpensive and tractor-mounted, ATV-mounted, or hand-operated equipment is readily available. Most of the light, fluffy types of native seed can be planted this way without debearding or conditioning. The disadvantage of broadcast planting is that the seed placement is not as precise in terms of uniformity of distribution or planting depth. Generally, this means seeding rates need to be 2 to 3 times higher. Mixing seed with an inert filler will help improve distribution and uniformity (Surrency and Owsley, 2006).

Other options for broadcast planting, particularly with seed that has not been conditioned or cleaned, would be using a straw or mulch blower. This would probably be practical only for small areas, and uniformity could be an issue.

Many different types of planters/drills can be used to plant seed of native grasses and forbs, but not all types of equipment will plant all types of seed. Slick seed, such as partridge pea (*Chamaectrista fasiculata*) or switchgrass can be planted with standard crop drills. Light, fluffy, bearded, or chaffy seed can bind up and not flow evenly through standard drill feed mechanisms. Specialized planters/drills that have a semi-circular seedbox, an auger agitator, and a pickerwheel have been developed to handle fluffy seed. Additionally, since fluffy and slick seed will not flow out together evenly, these planters/drills have separate seed boxes to handle different seed types, fertilizer, or pesticides.

Both planters and drills have some form of attachment (e.g., double disks, steel runner openers, etc.) that opens up a shallow furrow, tubes that drop the seed in place, and a device to cover the seed (e.g., press wheels, cutlipackers, etc.). The distinction between a planter and a drill is based on the length of drop tube that delivers the seed into the furrow. Drills most often have long, narrow drop tubes that place the seed well down in the open furrow. This results in the most uniform seed placement and initially results in clearly visible rows (see figure above), which may not be desirable in some restoration situations. Additionally, due to the narrow, long drop tubes, the seed must be debearded

**Rangeland drill in operation showing press wheel rows and typical stand configuratoin.**

and fairly clean to prevent the tubes from clogging.

On fairly clean seedbeds without rocks or trash, regular cropland drills can be used. Most rangeland sites have rougher terrain, and drills designed specifically for rangelands have a heavier construction and require large horsepower tractors to pull. Additionally, due to weight constraints and need for better maneuverability, rangeland drills are usually smaller, between 6 and 15 feet wide, than those used for cropland.

Rangeland planters have wider seed tubes which reduces the chance of fluffy seed bridging and clogging in the tubes. As a result, these types of planters can handle seed lots that have more trash and seed that has not been debearded. However, these planters do not place or “drill” the seed in the opened furrow because of the short length of the seed tubes (see figure to the left). Thus seed placement is not as uniform (both depth and surface area distribution) as with a seed drill. This does reduce the “row” appearance of the emerging stand, which can be an advantage in some settings. One issue with these types of planters is that fluffy seed can blow away before being covered. Many people using these types of planters in Florida have increased the length of the seed tube to overcome this issue. In addition, as a result of less uniform seed placement, these types of planters will require higher seeding rates than if a drill was used.

Another technique for planting native seed uses a silage or forage harvester to cut green chop from native stands (Bissett, 1996). This type of material contains a mixture of seed that is mature at the time the site is harvested. Because it is fresh or green, it must be handled promptly to prevent seed quality from deteriorating. Additionally, vegetative planting material of rangeland plants, such as rhizomes of maidencane (*Panicum hemitomon*) can also be used in some rangeland restoration projects. Most vegetative material can be broadcast planted by hand or with a standard slinger-type grass planter used to plant hybrid bermudagrass. Bermudagrass sprig planters are commercially available and can also be used to plant this type of material. Consult your local NRCS Field Office or county extension service for more information on these types of planters.

### Planting Depth

With the exception of eastern gamagrass (*Tripsacum dactyloides*), all the native grasses and forbs have a small to medium seed size, and planting too deep can be an issue. Small seeded species such as wiregrass need to be planted no deeper than ¼ inch. Indiangrass, which has medium sized seed, can be planted ¼- to ½-inch deep. Thus, when planting mixtures, adjust planter/drill depth so that **seed are planted no deeper, on average, than ¼ inch (a range of 1/8 to ½ inch).** In fact, with a drill, about 1/3 of the seed should be obvious on the top of the planting furrow (Pfaff et al., 2004; Surrecy and Owsley, 2006). Eastern gamagrass should be planted between ½- and 1-inch deep (Pfaff et al., 2004; Surrecy and Owsley, 2006) and thus cannot be planted in the same operation as other native species. Also, eastern gamagrass is the only seed that should be disked with a leveling disk with no offset after broadcast planting. This is necessary to ensure the seed is planted at a sufficient depth.

**"Pure Live Seed"** or **PLS** represents the percentage viable seed of the desired species in a bag. PLS is not shown on the seed tag.

PLS is determined by multiplying the percent of pure seed by the percent germination. (The % purity and % germination are listed on the seed tag.)

For example, a bag of switchgrass seed has 70% germination and 80% purity.

PLS = 70% germination X 80% purity divided by 100, or 56%. In other words, only 56% of the material in the bag is germinable seed.

The PLS is then used to determine the amount of seed to be used. The actual seeding rate is calculated by dividing the recommended seeding rate by the PLS.

For example: 10 LB/acre divided by 0.56 = 17.9 LB/acre. You will need to plant 17.9 LB/acre of the switchgrass seed to provide 10 LB/acre of pure live seed.

### Planting Rates

Because native species can have very low germination rates, and even cleaned and conditioned seed lots can contain significant mounts of inert material (e.g., stems, leaves, and other debris), most of the literature on planting native species expresses planting rates based on "pure live seed" or PLS basis (see box above.) If purity and germination rate are not known there is a risk of poor stand establishment due to under planting or wasting expensive seed due to overplanting.

When working with purchased seed of unknown germination and purity, use planting rate recommended by seed producer. If using wild harvested seed that has not been cleaned, the Florida FWCC recommends an 8 to 10 lb seeding rate.

**Regardless of the planting equipment used, all sites should be cultipacked or rolled after planting to ensure good seed soil contact.**

Since sparse grass stands with abundant forbs and adequate bare ground are beneficial for wildlife, particularly ground nesting birds, seeding rates are usually lower if wildlife management is the primary objective. Few or no forbs and denser native grass stands resulting from higher seeding rates are recommended if livestock grazing is the primary objective of the land manager. Table 2 has suggested rates for wildlife and livestock plantings.

### Planting Dates

A general rule of thumb for planting anything without irrigation is to plant when rainfall is most predictable. However, in Florida, planting during the rainy season (June – August) has not proved advantageous for most native species mainly due to increased weed

**Some gayfeather (*Liatris* spp.) species need short days to germinate.**

competition. The winter and early spring period (December - March) has less rain, but cooler temperatures, reduced evaporation rates, and lower weed pressure. Additionally, species such as switchgrass or eastern gamagrass require cold stratification to break dormancy while others only germinate during short days.

Current recommendations, particularly if you are working with wild harvested seed that has not been dried and cleaned, is to plant as soon after collection as possible. If the harvest is completed by mid-December, then planting should be completed by the end of December or January. In south Florida, winter can be too wet and the site can be flooded, therefore seed will have to be completely dried and stored until the site is dry enough to plant.

**Table 2. Recommended seeding rate when using rangeland drill or planter[1] (Surrency and Owsley, 2006)**

| Wildlife[2] | Livestock |
|---|---|
| 4 -6 PLS/acre | 8-12 PLS/acre |

[1]Use highest recommended rate or higher on sites with unfavorable conditions for stand establishment. If using broadcast planter, double recommended seeding rate.
[2]20% forb, ≤10% switchgrass, 70 -80% other grasses (bluestem, indiangrass, threeawn, etc.)

## Stand Evaluation

Compared to tame or domesticated forages and crops, native species, particularly the grasses, can be very slow developing. Most native perennial grasses do not flower and produce seed until the second year after planting (Surrency and Owsley, 2006). Particularly when using planting rates recommended for wildlife plantings, grass seedlings should be sparse and bare ground should be readily evident the establishment year. In fact, unless plants are know to have emerged and died during the first growing season, stands should not be rated for establishment success until the end of the second growing season. Table 3 contains some suggested stand densities for rating establishment success. Consult your local

**Table 3. Criteria for Determining Probable Stand Success**

| Number of plants per square foot | Probable Success and Suggested Action |
|---|---|
| 0 - 0.05 | **Failure.** Replanting required. |
| 0.05 – 0.1 | **Probable failure.** Replanting recommended |
| 0.1 – 0.5 | **Questionable**. Consider vigor of existing plants, potential to spread, extent of competition, length of contract, weather considerations, adequacy of erosion control, and desires of producer to determine replanting decision. |
| >0.5 | Satisfactory. |

Florida NRCS field office or county extension service for assistance in determining representative stand densities using transects or quadrats.

## Post Planting Maintenance

When livestock grazing is an objective, do not graze areas during the first year following seeding/planting. Deferment may need to be extended into the following growing season to ensure establishment. Exceptions to this deferment regime may occur where flash or mob grazing is needed for weed control. Flash or mob grazing uses high concentrations of livestock to harvest palatable competitive plants, e.g. crabgrass, in a short period of time. This practice can be useful even for sites where the primary objective of rangeland planting is wildlife or habitat restoration. Cease grazing immediately if there is significant use or damage to seeded plants. In cases where repeated grazing is needed for control, the procedure should be repeated soon enough to prevent weedy vegetation from becoming tough or unpalatable.

Spot herbicide treatment of non-native perennial grasses such as bahiagrass, bermudagrass, and vaseygrass (*Paspalum uvillei*) on restoration sites is essential for the long-lived native grasses to become established. Glyphosate at 1.5% or imazapic at a 2% solution can be applied with a backpack sprayer directly to the non-native species.

Generally, when three weeds per square foot or a 50% canopy are observed, some form of field level weed control should be considered. There are relatively few herbicides that can be used on newly established mixtures of native grasses and forbs in Florida. Unless specified differently on the label, seeded species should have 3 to 5 leaves per plant before herbicides are applied. If desirable forbs are not present, 2,4-D formulations may be used to control broadleaf weeds.

With some native species, imazapic can be applied post emergence. In field testing, seedling bahiagrass (*Paspalum notatum*), natalgrass (*Rhynchelytrum repens*), crabgrass (*Digitaria* spp.), and nutsedge (*Cyperus* spp.) were controlled by imazapic (0.12 lb ai/acre) applied 5 to 10 months post emergence of December planted native grasses and forbs (Richardson et al., 2003). Native species that were rated as tolerant to this imazapic application rate and timing were wiregrass bluestem (*Andrpogon* spp.), lovegrass (*Eragrostis* spp.), blazing star (*Liatris* spp.), partridge pea, narrowleaf silkgrass (*Pityopsis graminifolia*), creeping bluestem (*Schizachyrium scoparium* var. *stoloniferum*) and wand goldenrod (*Solidago stricta*). Unfortunately, lopsided indiangrass was not tolerant of any herbicide application tested.

In some cases, mowing can be used to control weeds, particularly if desirable forbs are present. Mow or top when weeds are above the height of the planted species and about 6- to 9- inches tall. See Florida NRCS Conservation Practice Standard Pest Management, Code 595, for more information.

## Other plantings

As important as re-establishing native groundcover is in a restoration project, woody species are an integral component of all rangeland ecosystems. See Florida NRCS Conservation Practice Standard Tree/Shrub Establishment, Code 612, and its accompanying guidance for information on how to establish trees and shrubs in Florida.

Tips from Florida FWCC experience are:

- Shrubs and trees can be planted either by hand or mechanically once a prescribed fire can be successfully carried across the groundcover.
- Plant tubelings instead of bare root shrubs and trees to ensure survival.
- Plant shrubs and trees in a manner and at the lowest density possible to ensure that the ground cover that was just planted will not be shaded out.
- Long-leaf pines and ground cover have been planted together and then successfully burned after 2 growing seasons.

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| **Appendix 1. NRCS Ecological Site Descriptions (ESD) Organizational Hierarchy** | | |
|---|---|---|
| **Community** | **Symbol** | **Replaces in 26 Ecological Communities[1]** |
| Hydric Flatwoods | **HFW** | N. FL Flatwoods (7); S. FL Flatwoods (6); Cabbage Palm Flatwoods (8) |
| Mesic Flatwoods | **MFW** | N. FL Flatwoods (7); S. FL Flatwoods (6) |
| Scrubby Flatwoods | **SFW** | N. FL Flatwoods (7); S. FL Flatwoods (6) |
| Dry Prairie | **DPR** | S. FL Flatwoods (6) |
| Wet Prairie | **WPR** | Slough (26); Pitcher Plant bogs (23) |
| Marl Prairie | **MPR** | Slough (26) |
| Upland Pine Forest | **UPF** | Mixed Hardwood & Pine (5); Long Leaf Pine-Turkey Oak (4) |
| Upland Hardwood Forest | **UHF** | Upland Hardwood Hammocks (11); Oak Hammock (15) |
| Upland Mixed Forest | **UMF** | Mixed Hardwood & Pine (5) |
| Interior Xeric Forest | **IXF** | Sand Scrub (3) |
| Maritime Xeric Forest | **MXF** | N. & S. FL Coastal Strand (1 & 2),;Upland Hardwood Hammock (11); Sand Scrub (3) |
| Cutthroat Seeps | **CTS** | Cutthroat Seeps (10) |
| Rockland Pine Forest | **RPF** | Everglades Flatwoods (9) |
| Rockland Hardwood Forest | **RHF** | Tropical Hammock (10) |
| Wetland Hardwood Forest | **WHF** | Cabbage Palm Hammock ( 13); Oak Hammock (15); Wetland Hardwood Hammock (12) |
| Hardwood Forest Swamp | **HFS** | Swamp Hardwoods (21); Shrub Bogs – Bay Swamps (22) |
| Bottomland Hardwood Forest | **BHF** | Bottomland Hardwoods (20) |
| Cypress Forest Swamp | **CYF** | Cypress Swamp (17) |
| Dwarf Cypress Savanna | **DCS** | Scrub Cypress (16) |
| Mangrove Forest | **MGF** | Mangrove Swamp (19) |
| Freshwater Marsh | **FWM** | Freshwater Marsh (25); Sawgrass Marsh (26) |
| Saltwater Marsh | **SWM** | Salt Marsh (18) |


**Appendix 2. Florida climatic zone boundaries. From 26 Ecological Communities of Florida, 1989, p. 146, Soil and Water Conservation Society, Gainesville, FL.**