

Ecosystem-based Vegetation Management Prescriptions for Federally-owned Land at Grapevine and Lewisville Lakes

Prepared in Conjunction with a Programmatic Environmental
Assessment on Allowable Adjacent Landowner Activities at
Grapevine and Lewisville Lakes, Texas

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Buttonbush



Blackjack Oak



Peppervine

Photos by
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Overview

There are three general vegetation communities on Federal land at Grapevine and Lewisville Lakes: grassland, savannah and woodland or forest. These three categories serve as habitat to a wide range of wildlife species, including many migratory songbirds and waterfowl. These vegetation communities border the shoreline of the lakes and hundreds of parcels of private property, with a range of elevations, flooding periodicity and soil types. As indicated by an intense wildlife habitat evaluation conducted by the University of North Texas in the spring and summer of 2004, there are several areas of high quality habitat on Federal lands at the two lakes, but the majority of those lands can only be classified as having moderate habitat value. Agricultural activities prior to Federal ownership, periodic impoundment of floodwaters and, to a more limited degree, the frequent mowing and removal of trees and shrubs by adjoining landowners appear to be the limiting factors on habitat quality at the two lakes.

In recent master plan supplements for Grapevine and Lewisville Lakes, the Corps of Engineers (Corps) adopted natural resources management objectives including the following objective which guides the management of vegetation on Federal land at the two lakes:

“In the absence of special habitat needs (such as for endangered species), woodlands and grasslands located on lands classified as wildlife management, low-density recreation and environmentally sensitive areas shall be managed to eventually reach a climax stage of vegetation typical of the Cross Timbers and Prairies ecological region of Texas. Woodlands and grasslands in intensive recreation areas should also be managed to achieve climax status to the extent possible while continuing to meet recreational needs.”

The Corps believes that implementation of the ecosystem-based vegetation management prescriptions set forth in the following pages will achieve this stated objective, increase the overall value of the land to wildlife, and also achieve the balance between resource protection and private uses of the shoreline that is required by the national Corps of Engineers shoreline management regulation, ER 1130-2-406.

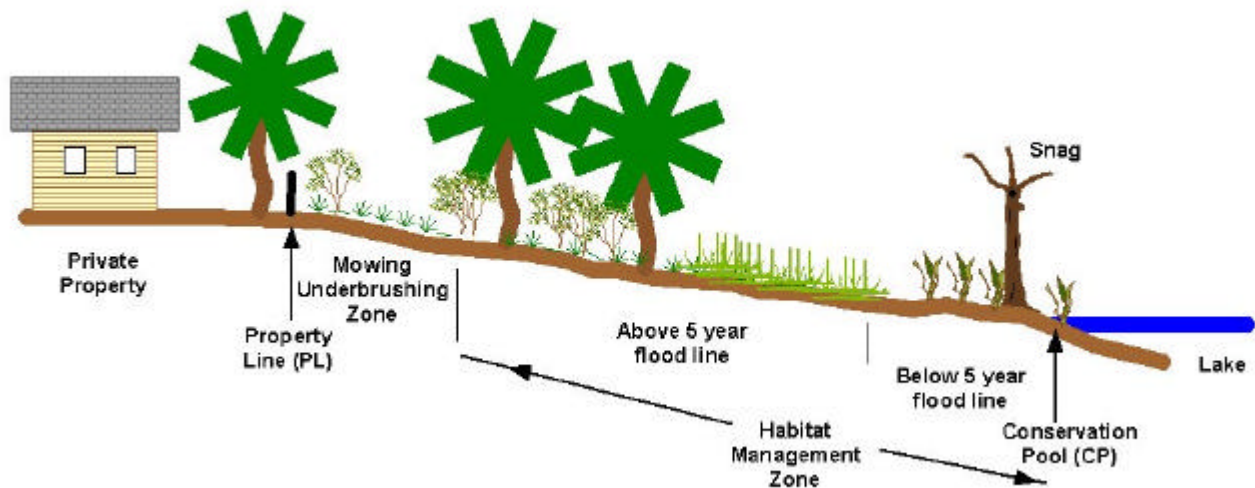
Vegetation Management Types

There are three general types or associations of vegetation within the Cross Timbers and Prairies region: grasslands, savannah and woodland. The grasslands are open areas with annual and perennial grasses and forbs dominating the landscape. The larger grasslands at the two lakes are found growing on dark, heavy clay soils. Woodlands are dominated by a mixture of trees of various heights, species, and ages with an “understory” of shrubs and herbaceous groundcover. There are two general categories of woodland in this area – upland hardwood forests and bottomland hardwood forests. Upland forests generally fall into the post oak - blackjack oak alliance whereas bottomland forests are dominated by more water tolerant species

such as pecan, bur oak, hackberry, elm and ash. A third and minor woodland type is often referred to as gallery forests or riparian woodlands. These relatively narrow woodlands closely follow creeks and streams running through predominantly grassland areas. Upland woodlands generally grow on sandy loam soils underlain by heavy red clays while bottomland and gallery woodlands grow on dark, heavy, and poorly drained soils. The third vegetation type, savannah, is a mix of grassland and woodland types. It is characterized by herbaceous groundcover of grasses and forbs with individual or clusters of trees and shrubs providing shade and habitat in a patchwork across the landscape. Savannahs are generally located in areas where the previously mentioned soil types are interlaced on the landscape.

Vegetation Management Zones

The Corps of Engineers (Corps) has recommended that the area between the shoreline and private property be thought of conceptually in terms of two zones: the **Mowing Underbrushing Zone (MUZ)**, an area adjoining private property, and the **Habitat Management Zone (HMZ)**, the area that falls between the water's edge when the lake level is at the "normal" or conservation pool and the MUZ (the conservation pool elevation is 535 at Grapevine Lake and 522 at Lewisville Lake).. Some areas within the HMZ have been designated as Narrow Shoreline Variance Areas (NSVA). Special management prescriptions apply to these areas as explained in the section addressing the HMZ.



The two zones comprise three areas that serve three separate functions. The MUZ is an area of Corps land that serves as a buffer between private property and remaining Corps lands, the HMZ. The MUZ is viewed as a managed area, where adjacent property owners can obtain written permission to perform limited mowing, pruning, and removal of shrubs, vines, and other "underbrush". The Corps allows mowing and underbrushing within the MUZ to reduce the risk of wildfire and pest infestation on adjacent private lands.

The HMZ is an area specifically managed to maintain and improve habitat for the many birds, amphibians, reptiles and mammals that call the Cross Timbers and Prairies of North Central Texas their home or way station. Valuable habitat, vital to the continuing viability of many species, is rapidly disappearing in the north Texas region as human population growth is accompanied by road and home construction. The major goal of the HMZ is to maintain a refuge for wildlife as well as a diverse and ecologically adapted vegetative cover resistant to flood-induced erosion. The HMZ is discussed in terms of two areas based on elevation: land above the 5-year flood level and land subject to frequent flooding below the 5-year level (the 5-year flood elevation is 547.5 at Grapevine Lake and 528 at Lewisville Lake). The lower elevation area along much of the shoreline is a vegetated buffer consisting primarily of a “hedgerow” of buttonbush, around the shoreline. These rows of water-loving shrubs serve as a barrier against soil erosion caused by constant wave action, and in many areas provides exceptional habitat for fish, shorebirds, and other aquatic and terrestrial wildlife. These lower vegetated areas also protect the shoreline and the lake in general by maintaining soils in place, reducing sedimentation to the lake, and serving as a water quality buffer from run-off from adjoining properties. However, in shoreline areas exposed to extreme wave action (primarily from wind blowing unobstructed across large areas of the water surface), especially in areas where the buttonbush has been intentionally removed, it may be necessary to use structural means such as rip-rap to hold the shoreline intact. The HMZ also provides substantial natural-resource-based outdoor recreation opportunities such as hiking, fishing, horseback riding, bird watching, nature study, and hunting in select areas.

Management of the two major zones requires different approaches, depending upon the purpose of the zone, soil type, flooding regime, and elevation. The following sections are prescriptions to assist adjacent property owners, civic groups, and Corps personnel in managing Federal properties in a manner that is ecosystem-based, environmentally sustainable, aesthetically pleasing, reduces risk of wildfire, and promotes habitat for diverse wildlife populations. **The following guidelines and prescriptions do not cover the entire range of possible guidelines and prescriptions, but are intended to cover the major aspects of managing the MUZ and HMZ on an ecosystem management basis. Upon completion of the Programmatic Environmental Assessment process, the Corps of Engineers will revise relevant chapters in the Shoreline Management Plans and prepare new shoreline management brochures which reflect the findings and conclusions in the Environmental Assessment.**

VEGETATION MANAGEMENT GUIDELINES

MOWING UNDERBRUSHING ZONE (MUZ)

Federal land adjacent to private property, the MUZ, is a great challenge for management. Vegetation types within the MUZ may be natural grassland, savannah or woodland, or may be highly managed turf grass. There are a variety of management techniques that can be used to maintain the MUZ in a manner that is both visually attractive, meets adjacent landowner needs for reducing fire and pest hazards, and is, to a limited degree, compatible with ecosystem-based vegetation management. The application of any management technique by an adjacent landowner requires written permission from the Corps. The written permission granted by the Corps to implement management techniques grants no rights to use Federal land for any other purpose.

GRASSLAND

- **Preferred Species** - Native grass species such as little bluestem, sideoats grama, buffalograss, Indiangrass, big bluestem, and associated wildflowers will be favored over non-native grass species such as Bermudagrass, fescue, or St. Augustine. Areas currently dominated by native grass will not be converted to non-native species. Areas currently dominated by non-native species may remain as such, but adjacent landowners will be encouraged to convert these areas to a mixture of native grass and wildflowers. Techniques for making this conversion, and for long-term management of native grasses, are described in later sections addressing the HMZ.
- **Mowing Guidelines** - In the name of fire hazard reduction, and with written permission from the Corps, the MUZ may be mowed on a regular basis, but may not be mowed shorter than three inches. Adjacent landowners will be encouraged to voluntarily avoid mowing in spring and early summer to reduce disturbance of ground-nesting birds and to reduce noise. Adjacent landowners will also be encouraged to voluntarily reduce the overall frequency of mowing to encourage the establishment and health of native

grasses. Adjacent landowners should also be aware of the level of air quality as predicted by the Texas Commission on Environmental Quality, and should restrict mowing activities accordingly. Adjacent landowners may mow the MUZ only in the area fronting their respective private property by projecting private property lines onto Federal land. Mowing equipment shall be lightweight equipment designed for managing turfed areas. No heavy, farm-type tractors or mowers will be allowed.

WOODLAND

- **Tree and Shrub Removal and Pruning** – Adjacent landowners may, with written permission, perform limited removal of small trees and shrubs in the understory (the vegetation growing under the canopy of mature trees). Trees with a trunk diameter greater than two inches at a point 12 inches above ground may not be removed. Beneficial shrub species including, but not limited to, Mexican Plum, coral berry, deciduous holly, rusty blackhaw, and eastern redbud may not be removed. Photos and other information on these beneficial shrubs will be posted on the Corps website and listed on adjacent landowner brochures. Mature trees may be pruned to a height of 10 feet. In general, dead trees and tree limbs may be removed from the MUZ unless they are determined to be structurally sound and do not pose a threat to pedestrians or private property.
- **Removal of Non-Native Species** - Non-native species including Japanese honeysuckle, Chinese Privet, Nandina, Chinaberry, Crepe myrtle, Chinese tallow and others should be completely removed in favor of native species.
- **Vine Management** – Vines such as poison ivy, grape, greenbriar, and Virginia creeper are beneficial to wildlife, but have disadvantages in the MUZ. Poison ivy, for obvious reasons, can be totally removed in the MUZ. Green briar may also be removed although retention of one or two small clumps of greenbriar will be encouraged to provide valuable escape cover for birds and small mammals. Virginia creeper and grapevines should be removed or reduced in height periodically to prevent the vines from taking over the canopy of mature trees and possibly serving as a “ladder fuel” in a wildfire.
- **Thicket forming species** – Some native trees and shrub species, although providing some benefit to wildlife, have a natural tendency to form thickets to the extent that these species can become undesirable in the MUZ. Examples include Eastern redcedar which tends to dominate the understory in woodlands, and sumac, honeylocust and blackberry which can aggressively take over small openings in woodlands. While complete removal of these species is not warranted, periodic removal and heavy thinning is allowable within the MUZ. Mesquite trees that have become established in small woodland openings should be removed.

SAVANNAH

- These areas are a patchwork of open grassland and small woodland areas and thickets. Within the MUZ, the grassland areas should be managed as prescribed in the above section on Grassland with the possible exception of allowing some beneficial woody species to become established. For example, small clumps of Chickasaw plum should be voluntarily allowed to remain or to become established. Several beneficial shrubs, such as Mexican plum, roughleaf dogwood, and deciduous holly (sometimes called possumhaw holly) would also be desirable to retain or plant in savannah areas. Tree pruning and removal guidelines prescribed above for woodland areas also apply to savannah areas. Mesquite trees have invaded some savannah areas and should be removed.

MANGEMENT NOTES IN BRIEF

MOWING UNDERBRUSHING ZONE

- **MOWING and UNDERBRUSHING**
 - Apply for a mowing permit
 - Mow only within MUZ
 - Do not mow shorter than 3 inches high
 - Brush removal smaller than 2 inches at 12 inches above ground
 - Remove non-native brush species first (such as privet) and leave clumps or islands of native species for habitat
 - Remove heavy vines such as poison ivy or greenbriar by mechanical or chemical (glyphosate) means. Use of chemicals is by licensed applicator only
 - Obtain permit for chipping of underbrush and tree trimmings
 - Removal of snags with permit. Snags can be removed where they pose a danger to residents
 - Prune mature trees to a height of ten feet.
- **Grass Seeding (see full discussion in Grassland Section of HMZ)**
 - Apply for permit to plant native grasses
 - Choose grass species based upon soil type, soil moisture, pH
 - Suggested species include little bluestem, sideoats-grama, and plains bristlegrass

- Consider a combination of grass and perennial native legumes such as Eldorado Engelmann Daisy, Aztec Maximillian sunflower, Comanche partridge pea, or Sabine Illinois bundleflower
- Remove vegetation by mechanical and/or chemical means (with permit)
- Rake soil to loosen surface
- Broadcast seed or use seed drill (available for rent from seed supplier)
- Roll or press seed 1/16" into soil
- Plant wildflowers during the fall in full sunlight for spring germination
- Plant native grass seeds between January and April
- Mowing will be necessary during first two years to discourage undesirables
- Mow no shorter than 8 inches to reduce competition
- Full grass and wildflower domination may take 2 – 3 years.

HABITAT MANAGEMENT ZONE (HMZ)

The Corps of Engineers recognizes that practical considerations, such as limitations on the use of controlled burning, the effects of fluctuating lake elevations, and the absence of many native species over large areas, make it difficult to achieve an ecologically "pure" climax state of vegetation. Nonetheless, through wise stewardship and management, native vegetation that closely replicates an ecological climax state can be established. The benefit of achieving this objective is a natural landscape that is attractive, virtually self-sustaining, and is highly beneficial to a broad diversity of fish and wildlife. Guiding principles that must be followed to achieve this objective include:

1. Protection of existing plant communities that are at or near a climax state of succession.
2. Restoration of native vegetation through planting and / or encouraging the spread of existing and desirable native species, and by controlling the spread of exotic, non-native vegetation.
3. Management efforts such as, burning, thinning, mowing, and the selection of species to be planted or favored, must be appropriate for the type of soil on any given site.

GETTING STARTED IN THE HMZ

Within the HMZ, the Corps is very interested in working with Homeowners Associations, Cities, Counties, and Conservation organizations such as Audubon, Master Naturalists, and others to implement ecosystem-based vegetation management. **A Master Naturalist ® or a professional ecologist familiar with the ecology of North Central Texas must lead groups wishing to participate in this effort.** For information on Volunteer Agreements, cost sharing programs, and other avenues of cooperation, please call the Corps Elm Fork Project Office at 972-434-1666 to schedule and on-site meeting.

During early coordination with the U.S. Fish and Wildlife Service (USFWS) and the Texas Parks and Wildlife (TPWD), Jonathan Davis, an urban wildlife biologist with TPWD, provided the Corps with a set of management guidelines that have been incorporated into the following habitat prescriptions. TPWD has recommended these guidelines to land developers in the Dallas-Fort Worth metro area for use in managing open space (undeveloped areas) within or near intensively developed areas. Dr. Don Smith, Professor of Botany at the University of North Texas, through contractual arrangement with the Corps of Engineers, provided much of the information included in the habitat prescriptions and guidelines for both the MUZ and the HMZ. Attached at the end of this document are various tables and plant lists provided by TPWD, Texas A&M Extension Service, and the Trinity Forks Chapter of the Native Plant Society listing native plants that are suitable for ecosystem-based vegetation management in North Central Texas.

WOODLAND HABITATS

Five basic concepts are necessary to manage woodlands in a way that is ecosystem-based. These concepts include: maintaining the natural growth patterns of native tree species, maintaining a healthy layer of understory vegetation, keeping leaf litter on the forest floor intact, maintaining a diverse community of trees including young, mature, declining, and even dead trees, and finally, non-native species should be eliminated. Each of these concepts is covered in more detail as follows:

- **Maintaining Natural Growth Patterns**

It is common practice for some land managers and property owners to prune trees in woodland areas to a height of eight feet or more. This pruning is done for numerous reasons such as clearance for mowers, air circulation, views, etc., but this practice is not necessary or desirable in a natural woodland. Allowing lower limbs to grow to the ground provides protection and feeding opportunities for those wildlife species moving between the canopy and the understory layers. Trees in natural woodlands will “self-prune” to some extent as a natural reaction to the shade from the tree canopy. Lower limbs die and, sooner or later, fall to the ground.

These dead limbs harbor wood borers, ants, and other insects that are an important source of food for many birds, such as chickadees, titmice, brown creepers, nuthatches and many species of woodpeckers. The larger dead limbs that may remain on the tree for several years may also be utilized by birds and small mammals as nesting cavities.

- **Understory**

Understory is a collective term used to describe those plants that live very well, and may even thrive in the shade of larger trees. In a natural woodland, the understory consists of shrub species, sapling trees, vines, and herbaceous ground cover such as Canada wildrye and sea oats. These understory plants provide a stair-stepped or layered vegetation community that is visually pleasing and functional for wildlife. Management of the understory within the HMZ requires little more than possible interplanting with species that may be missing from the plant community and the possible removal or thinning of overly aggressive vine growth and thicket forming species such as eastern redcedar. When planting, existing tree and shrub roots should be disturbed as little as possible. This can be done by planting smaller plants, generally 1-gallon pots or smaller. Supplemental watering will be necessary until the new plants are well established. Removal or thinning of excessive vine growth or thicket forming species may be necessary to favor the more desirable canopy-forming trees. Typical thicket forming species include eastern redcedar and overly thick stands of young cedar elm and hackberry trees. In general, thinning of these species is more desirable than complete eradication in order to maintain the desirable layering effect of the understory. Under natural conditions, periodic fires in woodland areas would achieve varying degrees of understory thinning. In the HMZ areas near homes, controlled burning is not feasible, but mechanical thinning can achieve the desired effect.

- **Overstory or Canopy**

Overstory is a collective term for the many tree species that form the canopy in native woodlands. These canopy-forming trees are considered to be the dominant vegetation in woodlands and little management is required to insure that they fill this natural niche in the ecosystem. Perhaps the greatest management challenge is to restore a healthy mix of these dominant trees where key species are missing in the landscape. Depending on soil types, it is frequently beneficial to interplant trees such as bur oak, pecan, Shumard oak, black walnut, red mulberry and others that may be missing. This can be accomplished by planting container grown or bare root nursery stock in small openings where sufficient sunlight is available. In the case of post oaks, blackjack oak, and hickory, nursery stock may not be available making it necessary to collect seed from these species for planting in areas where they are absent. In some woodland areas dominated by elms and hackberry, where the soil type would otherwise support oaks, hickory, and pecan, it may be necessary to create small openings for the planting of the latter species. These openings should be in the range of 1000 to 2000 square feet.

- **Leaf Litter**

“Leaf litter” is a generic term applied to leaves, twigs, bark, and other plant material that falls to the ground beneath trees. This material should be allowed to remain on the forest floor to fulfill its purpose. This material serves four very important functions. First and foremost, it prevents or reduces soil erosion on the forest floor. Secondly, it insulates the forest floor from dramatic temperature fluctuations and conserves moisture which, in turn, promotes the overall growth and health of the forest. Thirdly, as leaf litter decomposes, valuable nutrients are recycled through what can be described as a natural composting process. Lastly, leaf litter, as the lowest layer in the forest, provides a home to many species of invertebrates, reptiles, amphibians, and even birds and small mammals. The ever popular chuck-will’s-widow, a nocturnally active migratory bird, makes its nest in the leaf litter of the Cross Timbers woodlands.

- **Snag Creation / Retention**

In any natural woodland, natural processes such as wind, lightning, fire, drought, disease, and old age result in tree mortality, thus creating snags, another name for dead trees. Dead and dying trees in forested areas are a part of the natural landscape and provide many benefits to wildlife. Large snags and dead tree limbs provide nesting cavities for owls, raccoons, squirrels, bats, chimney swifts, and many other species. When dead trees and tree limbs fall to the forest floor, natural decomposition processes allow valuable nutrients to be recycled in much the same manner as leaf litter. These same logs and limbs on the forest floor can provide resting and escape cover for many animals that form much of the food web in an ecosystem. In “clean” or “highly maintained” landscapes, this natural cover is absent and so are the species that depend on it. When these species are absent, so are the hawks, owls, and other interesting predators at the top of the food chain. In areas where no snags are present, it is recommended that two or three snags per acre be “created” by carefully selecting living trees and killing the tree by “girdling” it. To girdle a tree, simply cut a ring around the circumference of the tree near the base to a depth of about one inch. Making two incisions about three inches apart is very effective and can be done relatively easily with a small chainsaw. When selecting a tree to girdle, consider those that are not native to the area (such as Chinaberry), are short lived (such as elms and hackberries), or are less desirable for some other reason. Obviously, snags should not be created, and existing unsound snags should be removed, where they might create a safety problem near access paths or where they may fall within the MUZ. Man-made nest boxes are also very effective in providing nesting opportunities for many species. Commercially constructed nest boxes and/or plans for constructing boxes are readily available from many sources.

- **Brush Pile Creation**

Brush piles are extremely valuable to wildlife as shelter from the elements and predators and as nesting areas. Natural brush piles exist in most woodlands, but with thoughtful design, exceptionally valuable brush piles can be created. The

Corps will provide design criteria for brush piles on their website and in public handout material.

- **Flooding Considerations**

Through experience, the Corps has determined that only a few species of trees and shrubs will survive the relatively frequent flooding that occurs below the five-year flood elevations of 547.5 at Grapevine Lake and 528 at Lewisville Lake. When managing areas below these elevations, only those woody species that can tolerate frequent, and long-term inundation will survive. A list of those species is provided in the attached table of Recommend Species for Enhancement of Aquatic Areas in North Central Texas. Those species shown in the “Wet Soils” column are well adapted for survival in those areas lying below the five-year flood elevation. It is worthy to note here that buttonbush has colonized many shoreline areas at the water’s edge at both lakes. Protecting existing stands of buttonbush, and trying to establish it where absent, should be a top priority in the HMZ. In areas above the five-year flood elevations, the full range of upland species may be planted. Placement of man-made nest boxes below the five-year flood elevation must be done with caution to prevent the unnecessary loss of nest-bound young.

GRASSLAND HABITATS

The general objectives for managing grasslands in the HMZ is to control and eliminate non-native grasses, increase the diversity of native grasses and wildflowers, and establish a maintenance regime that controls the invasion of woody species and is conducive to the health of native grassland systems. As noted for woodlands, native wildlife depend heavily on native vegetation. Birds that overwinter here rely on the seeds of native grasses to survive the harsh winter months.

- **Controlling Non-native Grasses**

Many types of non-native grass have been brought to North Central Texas for agricultural purposes and, unfortunately, some of these grasses are aggressive and can eliminate our native grass species. Therefore, it is often necessary to control or eliminate the non-native species to allow our native grasslands to recover. Some of the more common non-native species that require control measures include Bermudagrass, Johnsongrass, King Ranch bluestem, and fescue. There are several means by which to remove well-established grasses before planting new seed. One involves mechanical, another chemical, and a third a combination of both. Continuous mowing to remove the tops of grass below the compensation point for two years is a common mechanical approach. For Bermuda grass the height should be below 2 inches, for Johnsongrass 6 inches. This regular mowing can be very time consuming and sometimes not practical.

Another method is to use an herbicide, such as glyphosate, to kill everything, and re-establish vegetation that is more desirable. This is expensive and leaves the land temporarily denuded and subject to erosion. Therefore it should practiced on

relatively small areas in any one growing season. Any use of herbicides on Corps' property must be done by a licensed applicator. A combination of the two methods is another approach. To eliminate Bermudagrass or St. Augustine, it must be done thoroughly; otherwise it will be back within a year or two. Mow it very short, essentially as low as the mower can be set, in early or mid September. Then let it grow to about 8" in height and spray it with a 2% solution of glyphosate. Repeat the spraying in the spring if there is any re-growth, then seed with a desirable species or mix using the directions for seeding outlined below.

- **Planting Native Grasses and Wildflowers**

Soil Preparation. Most instructional books and pamphlets on prairie restoration recommend burning as a first step. In the lakeside areas of Lake Lewisville and Lake Grapevine there are two problems with controlled burns: the proximity of homes makes it very difficult to do with sufficient safety, and the widespread incidence of smoke may pose respiratory problems for residents. In lieu of burning, if the ground is bare of vegetation, it is essential to vigorously rake the surface to allow openings for the seeds and better moisture penetration. If there is plant cover, mow it with a fairly low setting (2-3").

Seeding. For large areas (acres to dozens of acres) a no-till seed drill works well and is a serious advantage over spreading by hand. It may be desirable to calibrate the distribution rate with sand or perlite before using the expensive seed to insure the correct seeding rate is being applied. Native grass seed should be planted in Texas between September/October or February/March. Spring-blooming wildflowers should be sowed in the Fall, whereas Fall-blooming wildflowers should be sowed in the Spring. Another seeding option is to till the soil, smooth the surface, scatter seed on top of the ground, then drag a section of chain link fence over the area to lightly cover the seed. **Native wildflower and grass seeds will die if covered by more than ¼ inch.** Covering seed with leaf litter, mulched grass particles, or store-bought peat moss would also be beneficial. Finally, rolling the surface compacts the loosened soil and improves the ability of the new roots to extract water from the soil. Seed-to-soil contact is vital to germinating seeds, so this may be the most important ingredient in the process of helping the seed to survive.

Using Transplants

For small areas up to about one-half acre, it may be feasible to use commercially available individual plants. This is an expensive option but may be desirable where quick success is important. When planting grasses from commercial stock, it helps to apply corn gluten meal and mulch around the plants to inhibit the growth of competing vegetation such as ragweed. Corn gluten meal acts as an organic pre-emergent so it should not be used if annual wildflower seed has been planted or is being encouraged in the area.

Water. Germinating seeds and transplants require water. If there is sufficient rain this will provide, but frequently there is no rainfall when needed most. Plan to water

the seeds as needed for as long as a month after seeding. By this time the new seedlings should have at least a rudimentary root system, after which the frequency of watering can diminish. If the summer gets severely hot, watering as needed all summer may be necessary to preserve the money and effort already invested.

Maintenance. If the new planting is interspersed with established vegetation, especially Giant ragweed and Johnsongrass, mowing is essential to provide light for the new seedlings. Established vegetation should not be allowed to get more than 12-18" tall and should be cut back to a height of 8" as often as necessary. Be careful not to get so much cut vegetation that it shades the new seedlings. Raking and mowing are helpful in getting the seeds through the debris to the soil surface. Once established, native grasslands thrive if burned on a 3-5 year frequency. As pointed out earlier, if burning is not feasible, it would be desirable to mow grassland areas a maximum of one time each year in February. This periodic mowing, particularly with a mulching mower, is a suitable alternative to burning and will serve to reduce the buildup of dense fuels and the competition from invading species. The Texas Cooperative Extension suggests the following for warm season perennials such as big bluestem, Indiangrass, sideoats grama or switchgrass: "Grasses are classified as tall, mid, and short grasses based on plant height. Regardless of class, these grasses must be managed the same. Tall grasses require more time for regrowth and more leaf area to maintain photosynthesis. Tall grasses should not be harvested repeatedly below 6-8 in, mid grasses below 3-4 in., and short grasses below 2-3 in. or they may not persist."

- **Flooding Considerations for Grasslands**

Through experience, the Corps has determined that only a few species of native grass will survive the relatively frequent flooding that occurs below the five-year flood elevations of 547.5 at Grapevine Lake and 528 at Lewisville Lake. When managing areas below these elevations, only those species that can tolerate frequent, and long-term inundation will survive. A list of those species is provided in the attached table of Recommend Species for Enhancement of Aquatic Areas in North Central Texas. Those grass species shown in the "Moist Soils" and "Wet Soils" columns are well adapted for survival in those areas lying below the five-year flood elevation. It is worthy to note here that buttonbush has colonized many shoreline areas at the water's edge at both lakes. Protecting existing stands of buttonbush, and trying to establish it where absent should be a top priority in the HMZ.

AQUATIC AND SHORELINE HABITATS

These habitats occupy the low lying and immediate shoreline areas within the five-year flood frequency and generally include two zones based on elevation. A moist soil buffer zone is on the higher ground giving way to a wet soil zone at the water's edge. The wet soil zone extends into shallow water out to a depth of one to two feet. These areas, in an undisturbed setting, provide some of the most valuable wildlife

habitat on Federal land and serve a dual purpose of deterring shoreline erosion and acting as a filter for storm water running off of nearby developed areas.

- **Moist Soil Zone**

Shrubs, grasses and some trees grow well in this zone, although the number of species is limited due to the frequency of inundation by impounded flood water. Many species normally adapted to life in moist soil conditions will not persist under the frequent flooding conditions that are a necessary aspect of the vital flood control mission of Lewisville and Grapevine Lakes. Through practical experience the Corps has learned that some species fare better than others and should be the focus of ecosystem-based vegetation management in these low lying areas. In the Moist Soil Zone, tree species to be emphasized include green ash, cedar elm, black willow, sycamore, and baldcypress. Although the accompanying table lists bur oak and a few other trees as being adapted to moist soil conditions, experience has shown that these trees will not persist under frequent flooding. Shrub species are generally limited to those listed for Wet Soil conditions. The grasses known to persist in the moist soil zone have already been mentioned in the discussion on Grasslands.

- **Wet Soil Zone**

The Lewisville Aquatic Ecosystem Research Facility (LAERF), located on Lake Lewisville and operated as a satellite research facility of the Corps of Engineers Engineering Research and Development Center (ERDC) in Vicksburg, Mississippi, recommends a number of plants for shoreline management: Water hyssop, Buttonbush, Tall Burhead, Creeping Burhead, Flatstem spikerush, Squarestem spikerush, Water stargrass, American waterwillow, Spatterdock, White waterlily, Smartweed, Pickerelweed, Illinois pondweed, American pondweed, Bulltongue, Arrowhead, American bulrush, Soft-stem bulrush, and Wild celery.

Dr. Michael Smart, Director of LAERF offers this advice.....“I think the best approach (from a pragmatic perspective) would be to concentrate on a very limited number of species that could tolerate the changing soil moisture conditions (from flooded to saturated to bone dry). In an urban/suburban setting I think that means slender spikerush. It could handle the widest range of conditions, and even an occasional mowing, and keep coming back. It would also be the easiest/cheapest to propagate. In more natural settings you could include additional species such as buttonbush.” (Smart, 2004).

NARROW SHORELINE VARIANCE AREAS (NSVA)

Adjacent landowners, after obtaining written permission from the Corps, will be allowed to mow to the water's edge on a regular basis in these areas. Maps of each NSVA will be provided in the final Environmental Assessment. The guidelines applicable to the MUZ also apply to the NSVA. In the NSVA, permittees will be required to mitigate for the loss of natural resources where the mowing and/or underbrushing extends beyond the standard 25-foot and 50-foot MUZ. The dollar

value of this required mitigation can be derived from the attached Mitigation Cost Analysis table. In brief terms, the amount of mitigation required will depend on the amount of area being mowed within the NSVA, the type and quality of habitat where the mowing is occurring, and the elevation of the area being mowed, all of which will be determined by the USACE. Permittees will have the option of making a cash payment or performing volunteer services of equivalent cash value. Funds collected from permittees will be utilized by the Corps to implement habitat restoration or improvements in areas where the greatest return on investment can be achieved and where the restoration or improvement can be provided long-term protection.

OTHER MANAGEMENT ISSUES WITHIN THE HMZ

- **Driftwood and Litter**

Large accumulations of logs, driftwood, and man-made litter sometimes occur on shorelines during flood events. The Corps will work with adjoining landowners and others who may have an interest in removing some or all of this material. Some of this material may also be removed by the general public during major events such as National Public Lands Day.

SUMMARY OF MANAGEMENT PROCEDURES FOR THE HMZ

Management Procedures and Schedule for Woodlands

1. Locate and remove non-native species that have invaded the woodland areas once a year in September and October.
2. Leave dead trees standing. Leave fallen ones where they fall. Exceptions to this are when a dead tree is a hazard to an access path or the MUZ. In which case, the dead tree may be “topped” to a height such that it no longer poses a hazard to the area of concern. Fallen logs may be moved should they be causing flooding or excessive erosion within a stream channel. Should a log require moving, it must be placed on the forest floor within the woodland zone.
3. Native understory is to be left intact with the exception of controlling thicket forming species and overly aggressive vines in tree canopies. It is not to be cleared, mowed, trimmed.
4. Interplanting of desirable native tree and shrub species should be undertaken where these species are absent.

Signs of Mismanagement of Woodlands

1. Non-native species such as Japanese Honeysuckle, Chinese Privet, Nandina, Chinaberry, Crepe Myrtle, Chinese Tallow, etc. are present and appear older than 1 year.
2. There are no dead trees standing and no downed logs, etc. on the forest floor.
3. The understory layer has been cleared or removed.

Management Procedures and Schedule for Grasslands

1. Prairie areas are to be burned in February on a 3-5 year frequency. Should this be deemed impossible, the prairies are to be mowed at most once a year in February. Should there be a need in the beginning, the prairies may require frequent mowing no lower than 8 inches the first 2-3 growing seasons to keep Giant Ragweed and Johnsongrass from becoming a problem until the native stock can become established.
2. There is to be an annual survey for exotic species during the summer. Exotic species such as Johnsongrass, K.R. Bluestem, Fescue, etc. are to be aggressively removed as soon as they are discovered.
3. During the first 3 years, the site is to be monitored for replacement and/or enhancement seeding of the native species found in the local prairies. A no-till seeding method is to be used during the seeding process. Seeds chosen for planting will consist of those species that were planted previously but failed as well as additional species to enhance the biodiversity of the site. After 3 years this seeding may be discontinued.

Signs of Mismanagement for Grasslands

1. Non-native species such as Johnsongrass, K.R. Bluestem, Fescue, etc. are present and a plan for control is not being implemented or is deemed insufficient.
2. There are woody species found within the unit that appear older than 1 year.
3. The unit is being mowed more than once a year. (Note: this only applies after the three year establishment period, during which mowing more frequently may be required to reduce weedy competition).

Management Procedures and Schedule for Shoreline/Aquatic Vegetation

1. The area is to be kept natural.
2. There are to be no invasive non-native species introduced into the system. These species include, but are not limited to, Water Hyacinth, Parrot's Feather, Giant Salvinia, Purple Loosestrife, Hydrilla and Eurasian Watermilfoil.
3. Aggressive native species (such as Cattails or American Lotus) are to be kept to isolated pockets if they are allowed to persist at all. They are not to be allowed to dominate the shoreline.

4. There are to be no domestic or resident ducks allowed in the area. These are usually white muscovy ducks or tame mallards that are resident year-round. Native, seasonal duck usage is to be encouraged.
5. To accomplish these things, a yearly survey during the summer is to be done and appropriate, aggressive action is to be taken to eliminate any problem species noted before a serious problem exists.

Signs of Mismanagement for Shoreline/Aquatic Vegetation

1. Non-native species such as those mentioned above are present and a plan for control is not being implemented or is deemed insufficient.
2. There is little vegetation around the shoreline.
3. The shoreline vegetation is dominated by one or two aggressive native or exotic plant species.
4. There is bank erosion occurring.
5. There are domestic (tame) ducks found on the shoreline.

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