

Forest Management Guidelines for Participation in the Lost Pines Habitat Conservation Plan

1.0 Introduction

These forest management guidelines were prepared for private landowners and forest managers to help avoid or minimize long-term impacts to the Houston toad (*Bufo houstonensis*) from timber harvesting and other forestry practices within the Lost Pines Habitat Conservation (LPHCP) **Plan Area**.¹ Landowners and forest managers following these guidelines are eligible to receive authorization through the LPHCP for incidental take of the Houston toad resulting from forest management activities. These forest management guidelines were developed with the guidance of the Texas Forest Service (TFS), Texas Parks and Wildlife Department (TPWD), U. S. Fish and Wildlife Service (Service), forest industry professionals, private consultants, and others. They are designed to help landowners plan and implement a management program for forested areas that will provide long-term benefits for the Houston toad and help serve local forest management -needs.

While responsible forest management contributes greatly to the health of forested habitats, some practices associated with forest management have the potential to cause incidental take of the Houston toad and could result in short-term negative impacts to the species. As such, the LPHCP offers coverage for incidental take resulting from forest management practices that are part of a responsible long-term forest management program. Private forest landowners or managers wishing to receive incidental take coverage for forest management practices through the LPHCP must follow these guidelines and comply with the Texas Forestry **Best Management Practices** (BMPs) developed by the TFS and the Texas Forestry Association (TFA) (TFS and TFA 2000 et seq.). Further, any forest management program covered by the LPHCP must also have a written forest management plan approved by the TFS that incorporates these guidelines and the Texas Forestry BMPs. A primary commitment of covered programs is the maintenance of forested habitat both during and after harvest operations. Forestry operations that do not follow these guidelines are not eligible for incidental take coverage under the LPHCP and landowners must contact the Service directly to obtain coverage for incidental take.

¹ Technical terms are identified in bold type at the first use of the term and are defined in Section 8.0 (Definitions).

The Texas Forestry BMPs address practices related to management planning, road construction and maintenance, timber harvesting, **site preparation**, planting, **prescribed burning**, chemical applications, and the use of **streamside management zones**. The LPHCP Forest Management Guidelines tailor the Texas Forestry BMPs for use in Houston toad habitat to avoid and minimize long-term impacts to the species (e.g. inclusion of **water management zones**). For questions regarding these guidelines or how to receive coverage for incidental take coverage for forest management activities, contact the LPHCP Administrator with the County of Bastrop.

1.1 Long Term Benefits To The Houston Toad

The Houston toad depends on healthy and mature forest ecosystems with mixed species composition, significant canopy cover, an open understory layer with a herbaceous component, and breeding pools with shaded edges. Unmanaged forests and forests that sustain other types of land uses, such as residential, recreational, or agricultural activities, can become less suitable as Houston toad habitat over time. Without active management, forests can become too dense and shaded, accumulate dangerous levels of burnable duff and debris, and be negatively impacted by cattle, pollutants, and vehicles. These and other changes may reduce the ability of forest ecosystems to provide quality Houston toad habitat by altering the toad's food base and competitive environment, increasing the risk of catastrophic fires that could destroy large blocks of habitat, and reducing Houston toad reproductive success. Active management of existing forests and reducing negative impacts from various types of land uses within and adjacent to forested areas is essential to the long-term sustainability of Houston toad habitat in the Plan Area.

The active management of forested habitat and the return of pasture or croplands to forested habitat suitable for eventual timber harvest is a significant mechanism for creating long term stability and even net benefit to the Houston toad. As with any adaptive land management approach, identifying goals, modifying practices based on new information, and seeking to enhance results based on current outcomes are critical aspects of Houston toad habitat management. To derive exemplar forest habitat goals, a series of measurements were made within currently occupied Houston toad habitat on the Griffith League Ranch in Bastrop County, Texas. Those measurements included documenting canopy cover, diameter at breast height (DBH), and stand age for a series of ponds within occupied Houston toad habitat, but included ponds which support Houston toad reproduction and others that either do not support, or support very low numbers of toads (ie. 5-10 individuals). The results of that investigation indicate a predictable relationship between canopy cover and Houston toads. Houston toads have been documented as occasional fauna across a range of canopy cover (60-90 percent), but the greatest number of Houston toads occurs at canopy coverage greater than 80 percent (Forstner and Swannack 2004, Forstner et al. unpublished data).

However, canopy cover is not a conclusive measure of habitat quality for the toad because very dense, but young forests may also provide high canopy coverage, but do not support Houston toads. Thus, the age of the stand and DBH form a relationship critical for achieving suitable habitat that supports toads. For example, areas where canopy coverage is 85 percent would seem indicative of good habitat, but the mean DBH of that stand is 15cm and thus toads are seldom found there. Such habitat supports very few, if any, Houston toads, and does not support successful annual reproduction. Likewise, at a different pond the canopy is at 95 percent, but the mean DBH is 7cm and again in this extreme case virtually no toads occur in those forest conditions. Indeed, each of these forests is a dense thicket of small trees, but with a consequently high percentage canopy measures. These two locations do not support Houston toads at acceptable levels. In contrast, at 89 percent canopy and DBH of 26cm, a very different character of forest is defined and a large number of Houston toads is documented to occur and reproduce each year under the canopy of larger trees. From the data thus far collected, a forest of fewer, but larger trees with near complete canopy coverage is an arguably sufficient goal to maintain Houston toad populations. See Section 3.4 of the LPHCP.

Thus, in defining a habitat goal we must account for both canopy and the actual character of the forest by taking into account the need for canopy and the need for larger, more mature trees with adequate spacing. From the evidence assembled by Forstner and Swannack (2004) Houston toads are best supported in forest of 80 percent or greater canopy, composed of larger (26cm or greater DBH on average) trees. Currently, Forstner et. al.'s (2005 unpublished data) evaluation of stand age indicate that Houston toads have been more prevalent in mixed pine forest in excess of 30 years of age, than in stands younger than that for the six years of study (Forstner and Swannack 2004). Hence, the goals of these forestry management guidelines are to establish and maintain mature healthy forests of pine and mixed hardwoods that meet those criteria, until additional work clarifies more explicitly the optimal Houston toad habitat.

Unfortunately, forests meeting those criteria are not common even on the Griffith League Ranch itself. As with current habitat conditions within much of the forested Plan Area, much of the habitat examined in preparation of these guidelines more accurately represents the consequences of decades of fire suppression. The negative consequences of fire suppression are well studied in many forests including southern pine forests (Means et. al. 2004). Furthermore, in the absence of forestry guidelines approved for use in the Houston toad habitat area, the forests regenerating within old agricultural fields are most often unmanaged or managed without explicit forest stewardship goals. These conditions have net negative short and long-term consequences for the Houston toad. In order to provide a long-term net benefit, economically viable forestry management has the greatest potential to

positively impact the Houston toad by creating and maintaining significant tracts of healthy forest habitat.

While, in principle, the goals of forestry management are economic gain (gauged by value in board feet), the forest also provides value as habitat for the toad and other wildlife. Without viable methods to manage the current forested habitat, there are no incentives to maintain that habitat, much less to generate additional standing timber. The existing habitat is constrained to poor management without the LPHCP, thus actually increasing the potential of catastrophic fire and consequent total loss of suitable habitat in the burned areas for decades. Houston toads require forested habitat to survive, yet such forests cannot exist without active management, either by natural or human intervention. Thus the direction offered by the LPHCP Forest Management Guidelines in the Plan Area may be an effective conservation measure available to the Houston toad.

The LPHCP identifies the characteristics of suitable Houston toad habitat and provides the guidance, the mechanism, and the incentive for individual property owners to develop and sustain healthy and mature forests on their property. However, many common land management activities have the potential to negatively impact Houston toads in the short-term, such as using equipment to remove brush or thin forest stands, implementing prescribed burns to manipulate forest vegetation and prevent large forest fires, and using chemicals to help control non-native or invasive wildlife or plants. The guidelines presented in the LPHCP provide specific guidance for avoiding and minimizing short-term negative impacts to Houston toads resulting from common management practices in and adjacent to forest habitat.

The guidelines prepared under the LPHCP are the primary focus of the LPHCP conservation program. The guidelines are voluntary and designed to be compatible with local attitudes and views towards land management and property ownership, regardless of whether a landowner is seeking authorization for incidental take. This approach seeks to remove as many barriers as possible to long-term planning and management with regard to forest habitat. The development, distribution, and promotion of these guidelines throughout the community is the County's maximum practicable effort to avoid and minimize negative impacts to the Houston toad from management activities, while still being able to realize the long-term benefits of managing for healthy and mature forests. Thus, without the implementation of the LPHCP, existing toad habitat would be insufficiently managed, which could lead to potential catastrophic fires and the consequent loss of suitable habitat for the Houston toad.

1.2 Incidental Take coverage

Parties seeking incidental take authorization for forestry land management activities that do not cause permanent habitat loss must submit or file a Notice of Intent to implement forestry land management (NOI) with the LPHCP Administrator on an annual basis. Incidental take coverage will be extended upon the LPHCP Administrator issuing a Notice of Receipt (NOR) of the party's properly completed NOI.

2.0 Management Planning

Management practices covered for incidental take by the LPHCP must be performed under a forest management plan approved by the TFS. The management plan must be approved prior to the implementation of activities intended for coverage under the LPHCP. The management plan must identify and map potential Houston toad breeding sites on the property, including ponds, stock tanks, creeks, streams, wetlands, seeps, or springs.

Water Management Zones (WMZ) must be designated around all identified water features, including, ponds, stock tanks, creeks, streams (with three feet or more scoured width), wetlands, seeps, and springs that are within or immediately adjacent to a forested area. However, minor depressions and mud holes that hold water only for a short period after a rain are not included and will not require a WMZ. WMZs must extend at least 150 feet from the edges (high water mark) of each water feature within or adjacent (1000 ft) to a forested area or evolving forested areas (more than 40 percent canopy cover). The buffering provided by a WMZ will lessen the disturbance of all forestry practices on these important habitat sites that might be used by Houston toads for breeding or dispersal.

3.0 Road Construction and Maintenance

Forest management practices, including timber harvesting, typically involves creating temporary access roads in the forest stand and creating landings for loading logs onto trucks. The traffic associated with these sites during the timber operation disturbs the existing vegetation and can create soil compaction, soil erosion, and opportunities for oil, gas, chemical, or other pollutant spills in Houston toad habitat. The following guidelines address these potential impacts and eliminate or minimize their impact on Houston toads.

1. Road construction and maintenance is prohibited during the breeding season and emergence period of the Houston toad (January 1 through June 30) to avoid the period when the species is most active above ground;
2. All roads will follow the general contour of the land to the maximum extent practicable;

3. The area allotted for construction of haul roads cannot exceed two percent of the total acreage of the managed forest stand; and
4. Log landings are limited to no more than one 0.5-acre landing per 25 acres of forest.

4.0 Reforestation Site Preparation and Planting

Reforestation after a timber harvest or establishing a new forest or timber stand in an area that was previously unforested involves a number of practices that could result in incidental take of the Houston toad. Site preparation and tree planting practices may include clearing, herbicide applications (see Section 5.0 for information of common herbicides used in forest management), fertilization, burning, disking, bedding, windrowing, or raking. These activities can disturb the soil and create the potential for widespread soil erosion and sedimentation within potential Houston toad breeding areas. Other potential adverse impacts include contamination from chemical use, establishment of invasive species (e.g., red imported fire ants and bermudagrass), changes in competitor and predator populations. The guidelines below represent opportunities for avoiding or minimizing the long-term impacts of these activities on the Houston toad.

1. Site preparation for planting must be conducted outside of the Houston toad breeding season (January 1 through June 30);
2. Site preparation may be conducted by either: a) broadcast herbicide application followed by a prescribed burn (“brown and burn”); b) prescribed burning and piling of **slash** and debris with minimal soil disturbance; c) mechanical disking (allowed for site preparation for the conversion of pastureland, but not allowed as a site preparation method in cutover stands) to establish pine forest. (Landowners are encouraged to maintain brush piles, where practicable, to supply cover for wildlife.);
3. Site preparation practices using heavy mechanical equipment (e.g., tractors, large trucks, bulldozers) are prohibited within WMZs. Hand cutting (e.g., chainsaws) and manually stacking slash and brush is allowed within WMZs;
4. The application of chemicals for site preparation is prohibited within WMZs and from areas where the potential for run off into the WMZs exists.
5. Herbicides may be used according to labeling instructions, as necessary, on areas outside of WMZs and outside of the toad activity season, but application is limited to broadcast, chemical **banding**, and spot/stem treatments;

6. Machine planting within a WMZ is not allowed at any time. Machine planting is only allowed in areas that were previously unforested, such as old pastures or crop fields. Machine planting in cutover areas is only allowed if approved by the Service;
7. Hand planting of pine or hardwood seedlings is an acceptable practice at any time of the year, including within WMZs;

5.0 Chemical Applications

Chemical applications in forestry are typically used to control competing vegetation within regenerating timber stands. Fertilizers are sometimes used during site preparation and planting. Common herbicides used in forest management operations include (TFS 2003 and Information Ventures, Inc. 1995):

- Imazapyr – A general use herbicide that controls annual and perennial grasses, broadleaved weeds, brush, vines, and many deciduous trees. The chemical disrupts plant growth by blocking protein and DNA synthesis and inhibiting cell growth. Imazapyr is sold under the trade names Arsenal®, Chopper®, or Contain®;
- Glyphosate – A general use herbicide that controls grasses, herbaceous plants, brush, and some broadleaf and coniferous trees and shrubs. The chemical is absorbed by leaves and prevents the synthesis of an essential amino acid, which inhibits plant growth. Glyphosate used for forestry purposes is sold under the trade names Accord® and Accord® Site Prep, and is also the active ingredient in Roundup®;
- Triclopyr – A general use herbicide that controls woody plants and broadleaf weeds. The chemical is applied to leaves or stems to inhibit plant growth by accumulating in the meristems (e.g., the actively growing portion of the plants). Triclopyr for forestry management is sold under the trade names of Garlon® 3a or Garlon® 4; and
- Sulfometuron-methyl – A general use herbicide that controls grasses and broadleaf weeds. The chemical is absorbed by leaves and roots and disrupts cell division. This product is commonly sold under the trade name of Oust®.

The guidelines for applying chemical herbicides or fertilizers within the Plan Area are listed below:

1. Herbicide applications used in conjunction with establishing new pine stands (e.g., stands up to, but not exceeding, three years old) are limited to banding (spraying a strip of herbicide approximately four feet wide down each planted row) and broadcast applications of herbicide;
2. Within existing forested stands (up to 15 years old), herbicides may be used to control competing woody vegetation by stem application only, and in compliance with the product label.
3. Herbicides (other than for fire ant control) and fertilizers must not be applied within WMZs, nor allowed to run off into the WMZs.

6.0 Timber Harvesting

Timber harvesting involves the removal of merchantable trees from a forested area. In order to receive incidental take authorization under the LPHCP for timber harvesting, the landowner or applicant must submit a copy of a timber harvesting plan that meets all applicable state and federal timber harvesting requirements, along with a signed statement of intent to comply with the Forestry Guidelines of the LPHCP. The LPHCP Administrator does not approve timber harvesting plans. The landowner or applicant has the burden of complying with these timber harvesting guidelines and with all applicable state and federal regulations. Upon the issuance of a NOR by the LPHCP Administrator, the proposed timber harvesting plan will have incidental take coverage under the LPHCP, so long as the person or entity harvesting complies with these Forestry Guidelines and all applicable state and federal requirements. The landowner will submit to the LPHCP an annual report of activities taken pursuant to the forest management plan, including harvesting activities.

A variety of harvesting strategies are available to forest managers and range from selective, single-tree cuts to limited **total harvest**. In fact, a variety of methods of harvest are recommended as one mechanism to maintain diversity within the remaining forest fragments in the Plan Area (Sullivan and Sullivan 2001). Houston toads rely on forested habitat in all life stages, therefore all following guidelines use “biological” basal area, not harvestable basal area. Biological basal area is the total vegetation contributing to canopy cover, not simply the contribution from merchantable trees. The guidelines listed below address the needs of the Houston toad, while still allowing forest management activities to take place.

1. During the breeding season and emergence period of the Houston toad (January 1 through June 30) timber harvesting is prohibited within 300 hundred feet of any feature having a WMZ to protect the species during the period when it is most active above ground; this provides the opportunity for harvests to occur outside of those WMZs during this period.

2. **Single-tree selection** is an allowed method of thinning/harvest in occupied Houston toad habitat. The residual stand (trees remaining following the timber operation) must contain no less than 80 square feet per acre average total biological **basal area** which simultaneously maintains toad habitat;
3. **Group selection** is allowable within occupied Houston toad habitat if implemented using the following criteria:
 - a) Group selection is not allowed within WMZs;
 - b) Maximum group size is not to exceed five acres regardless of tract size but cannot exceed 20% of the tract Maximum width of any group is not to exceed 100 feet;
 - c) Maximum width of any group is not to exceed 100 feet;
 - d) Harvest cycles for group cuts are set at intervals of 7 years or more;
 - e) Consecutive (by harvest cycle), adjacent group harvests are not allowed. Harvests should cycle in a mosaic pattern on each parcel;
4. **Total harvest** is allowed for areas not exceeding 20 acres to enable the success of artificial regeneration (planting for forest regeneration). This mechanism is explicitly required to allow pine forest regeneration which need larger forest openings to succeed. No more than 20 percent of the managed acreage can be harvested in this regime in any 14-year period (two harvest cycles).
5. The **seed-tree** method of natural regeneration is also allowed in occupied Houston toad habitat so long as a suitable level of pine forest regeneration is assured (see 5 below for guidance). Total area harvested and prepared for seed-tree regeneration method shall not exceed 20 percent of the managed acreage or 20 acres in size in any 14-year period (two harvest cycles).
6. The total area for all harvested groups is determined by stand age to allow for a thinning regime that will produce quality wood products while maintaining suitable habitat for the Houston toad. Some aspects of the harvest regime are determined by the regeneration method to be applied:
 - a) Natural Regeneration
 - i. For dominant stand ages from 0 to 30 years, - thinning is allowed every 7 years which may remove up to, but not exceed, 30 percent of the forest stand while maintaining an

average basal area of at least 70 square feet per acre DURING EACH CYCLE OF THINNING;

- ii. For dominant stand ages from 31 to 45 years, thinning operations may remove up to, but not exceed, 20 percent of the forest stand every 7 years while maintaining an average basal area of at least 60 square feet per acre;
- iii. For dominant stand ages 45 years and above, regeneration cuts become necessary to maintain forest health and Houston toad habitat. For these mature stands seed-tree cuts may not exceed 20 percent of the total managed forest area while maintaining an average basal area of at least 30 square feet per acre in seed-tree regeneration areas (natural regeneration). Managed forest stands not yet included in regeneration cuts will be maintained at a minimum average basal area of 60 square feet per acre. Seed-tree cuts for natural regeneration should take place no more frequently than on a 14-year interval following the last regeneration harvest.
- iv. Single-tree harvesting or thinning in conjunction with group selection is acceptable under the criteria stated above.

b). Artificial Regeneration

- v. For dominant stand ages from 0 to 30 years, thinning is allowed every 7 years which may remove up to, but not exceed, 30 percent of the forest stand while maintaining an average basal area of at least 70 square feet per acre;
- vi. For dominant stand ages from 31 to 45 years, thinning operations may remove up to, but not exceed, 20 percent of the forest stand every 7 years while maintaining an average basal area of at least 60 square feet per acre;
- vii. For dominant stand ages 45 years and above, regeneration cuts become necessary to maintain forest health and Houston toad habitat. When the regeneration is to be artificial via planting of seedlings, the areas to be harvested for regeneration may not exceed 20 percent of the total managed forest area. The basal area per acre will be zero in these regeneration areas. Managed forest stands not yet included in regeneration harvests will need to be maintained at a minimum average basal area of at least 60 square feet per acre. This maintains Houston toad habitat while preparing the stand for the regeneration cut, which will be Total Harvest under the guidelines above in 6.4.
- viii. Single-tree harvesting or thinning in conjunction with group selection is acceptable under the criteria stated above.

7. Total harvest and **seed-tree cuts** aside from these guidelines are allowed only if approved in writing by the Service;
8. Harvesting and thinning within WMZs must leave a minimum of 80 square feet of basal area per acre;
9. Commercial or safety salvage of dead or damaged trees must not exceed five acres in a single forest unit. Harvesting plans for timber salvage operations that include group sizes larger than one acre, or exceeding five acres in a single forest unit, must be approved by the Service prior to commencing any such harvest.

7.0 Prescribed Burning

Prescribed burning is a **silvicultural** practice that controls understory vegetation and can improve wildlife habitat. Therefore, prescribed burning may be used as a tool to achieve increased timber production, as well as other management goals. The following guidelines have been prepared to direct landowners and managers who plan to perform prescribed burning on property located within the Plan Area:

1. Prescribed burning and making preparations for a prescribed burn is not allowed during the breeding season and emergence period of the Houston toad (January 1 through June 30);
2. A prescribed burning plan must comply with Chapter 153.047 of the Texas Natural Resources Code, effective September 1, 1999, as amended. It is recommended that this plan be prepared and implemented by a certified burn manager;
3. Prescribed burning managers must be certified by the Prescribed Burning Board of the Texas Department of Agriculture;
4. Prescribed burns must not exceed 300 acres. Prescribed burns must also be limited to no more than 50 percent of the contiguous stand, unless the entire property is less than 50 acres;
5. Prescribed burning within the same stand must not be conducted more frequently than once every three years;
6. **Firebreaks** and firelines will be maintained in non-burning years by mowing and hand clearing. Any method of firebreak or fireline maintenance in a non-burning year that mechanically disturbs the soil, such as plowing or disking, is prohibited;

7. Construction of firebreaks and firelines is permissible as necessary for wildfire suppression activities and in preparation for a controlled burn.

8.0 FIRE ANT CONTROL

Although the full impact of red imported fire ants (fire ants) on the Houston toad is not known, fire ants are believed to be a serious and increasingly important threat (Campbell 1995). Controlling heavy fire ant infestations in Houston toad habitat may help minimize their impact. The guidelines below represent means for avoiding or minimizing any negative long-term impacts of fire ant control on the Houston toad.

1. Landowners can help to control fire ant infestations by limiting soil disturbance, inspecting imported soil and nursery products thoroughly for fire ants, and properly disposing of trash; and
2. Individual mound treatment - Individual fire ant mounds can be treated with commercial fire ant bait or environmentally sensitive means (e.g., boiling water, diatomaceous earth, etc.). Baits containing the active ingredients hydramethylnon or fenoxycarb, such as Amdro, Award, or Logic, are recommended for areas other than pastures or cropland. Baits must be used in strict accordance with the product label and must only be placed near fire ant mounds and not near the mounds of native ant species. To avoid adverse effects on non-target species, the bait should only be applied when ants are actively foraging to prevent accumulations of excess bait.
3. Treatment in larger areas – Individual mound treatment may not be practical in larger areas. Where fire ant control is needed in pastures or other large areas, use a product that is labeled for pasture use (e.g., Extinguish or Justice), and follow the label directions.

9.0 Definitions

Banding – A method of applying chemicals, usually herbicides, in a strip approximately four feet wide and centered on each planted row of seedlings.

Basal Area – The total cross-sectional area (in square feet) of tree stems at breast height (approximately 4.5 feet from ground level), inclusive of the bark. Basal area is a measure of the degree of crowding or density of trees in a stand. Basal area may refer to merchantable trees only or it may include all tree stems regardless of merchantability.

Best Management Practice – A practice or combination of practices determined to be an effective and practicable means of preventing or reducing the amount of negative

impact on natural or environmental resources, including water quality and endangered species habitat.

Biological basal area – The total cross-sectional area (in square feet) measured at breast height (4.5 feet from the ground), inclusive of bark, for all woody vegetation (marketable or not) with a height of 25 feet or more. Biological basal area is a measure of the degree of crowding or density of trees that primarily compose the mid to upper canopy of the forest stand.

Firebreak – A naturally occurring or man-made barrier that helps reduce or eliminate the spread of fire. Firebreaks can include mechanically or hand cleared fire lines.

Forest stand – a contiguous group of trees sufficiently uniform in species composition, arrangement of age classes, and condition such as to be considered as a distinguishable unit.

Forest unit – a term to include all forested areas to be managed for production of timber to provide the periodic sustained yield of forest products.

Group Selection – A timber harvest system in which one or more "groups" are cut. All the trees in the designated area or group are harvested; likened to a small-scale clear-cut. The maximum harvest width for a group is sometimes set at approximately twice the height of mature trees.

Merchantable basal area – The total cross-sectional area (in square feet) of marketable tree stems at breast height (4.5 feet from the ground), inclusive of bark. Merchantable basal area is a measure of the degree of crowding or density of trees that have reached a merchantable size within a stand.

Plan Area – The 124,000-acre permit area of the LPHCP representing potential Houston toad habitat in Bastrop County.

Prescribed Burning – The controlled application of fire under certain conditions of weather and fuel moisture which allow the fire to be confined to a predetermined area, while producing the intensity of heat and rate of spread needed to accomplish certain planned objectives, such as stand improvement, wildlife habitat management, grazing, or fire hazard reduction.

Seed-Tree Cut – A timber harvest system in which most mature timber is removed in one cut. A small number of trees are left standing to provide a source of seed for the next timber stand. Trees left for seed sources should be evenly spaced with about 8-10 trees per acre, 14 -20 inches in diameter and capable of producing healthy seedlings.

Shelterwood – A timber harvest system similar to a seed-tree cut whereby the mature timber is harvested, except for a sufficient number of trees to provide a seed source and shade protection for new seedlings. Usually about 30-70 percent of the ground surface remains shaded by the "shelter trees" after the initial harvest. After several years, the residual trees are removed so that they do not retard the growth of the new saplings.

Silviculture – The science and art of cultivating (i.e. growing and tending) forest crops by the manipulation of forest vegetation to accomplish a specified set of objectives, which may include controlling forest establishment, composition, and growth.

Single-Tree Selection – A timber harvest system in which individual trees are removed from a stand. This method is usually reserved for very valuable trees like black walnut or black cherry trees used to make high-value furniture. This method is suited only for management of shade tolerant species.

Site Preparation – A general term for removing unwanted vegetation and other materials, if necessary, and conducting any soil preparations necessary before reforestation. This can include, but is not limited to, sub-soiling, bedding, herbicide application, prescribed burning, drum chopping, windrowing, bulldozing, or other mechanical practices.

Slash – A general term for the debris of trees remaining on a site from felling, wind, or fire.

Thinning – A silvicultural treatment in which stand density is reduced to accelerate diameter growth in the remaining trees.

Total harvest – A timber harvest system in which all merchantable timber is cut from a stand. Often, smaller, unmerchantable trees may remain after the harvest.

Water Management Zone (WMZ) – A buffer area immediately adjacent to stream channels or other water bodies, such as ponds, wetlands, springs, or seeps. The purpose of a WMZ is to protect important breeding and emergence habitat for the Houston toad, in addition to protecting water quality. The minimum width for a WMZ is 150 feet from all edges of the buffered feature.

10.0 References

- Information Ventures, Inc. 1995. Forest Service Pesticide Fact Sheets. Prepared for the U. S. Department of Agriculture, Forest Service. <http://infoventures.com/e-hlth/pesticide/pest-fac.html>, last accessed April 8, 2003.
- Means, D. Bruce *, C. Kenneth Dodd Jr., Steve A. Johnson, And John G. Palis Comments: Amphibians and Fire in Longleaf Pine Ecosystems: Response to Schurbon and Fauth Conservation Biology Volume 18, Issue 4, Page 1149. - August 2004
- Sullivan, Thomas P. and Druscilla S. Sullivan. 2001. Influence of variable retention harvests on forest ecosystems. II. Diversity and population dynamics of small mammals. *Journal of Applied Ecology* 38:6 1234, Volume 38:6, Page 1234
- Texas Forest Service (TFS). 2003. Reforestation Management Practices: Herbicides. Texas A&M University System, Texas Forest Service. http://txforestsERVICE.tamu.edu/forest_management/reforestation/management_practices/index.html, last accessed April 8, 2003.
- Texas Forest Service (TFS) and Texas Forestry Association (TFA). 2000. Texas Forestry Best Management Practices. Combined reprint of “ Texas Best Management Practices for Silviculture” and “ Texas Best Management Practices for Forested Wetlands. http://txforestsERVICE.tamu.edu/forest_management/best_management_practices/support_literature/brochures/handbook/index.html, last accessed April 8, 2003.

Contributors

This document was prepared under the direction of the Bastrop County Stakeholder Workgroup. Special assistance was provided by Daniel Lewis (TFS), Tom Bourland (Tom Bourland and Associates) and Michael Forstner (Texas State University). Edited by Clifton Ladd and Amanda Hunter (Loomis Austin, Inc.).