Texas Ecological Systems Project: Phase 1 Interpretive Booklet

Prepared for Texas Parks and Wildlife Department and Texas Natural Resources Information System

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Prologue

Texas Parks & Wildlife Department's (TPWD) mission is "*To manage and conserve the natural and cultural resources of Texas and to provide hunting, fishing and outdoor recreation opportunities for the use and enjoyment of present and future generations".* TPWD developed a comprehensive strategy as part of the Texas Wildlife Action Plan[1]. The strategy includes eight (8) key elements, 4 of which have plant community quantity and distribution as necessary components, including:

2nd Element*: Descriptions of locations and relative condition of key habitats and community types essential to the conservation of species identified in the 1st element.*

3rd Element*: Descriptions of problems which may adversely affect species identified in the 1st element or their habitats, and priority research and survey efforts needed to identify factors which may assist in restoration and improved conservation of these species and habitats.*

4th Element*: Descriptions of conservation actions determined to be necessary to conserve the identified species and habitats and priorities for implementing such actions.*

5th Element*: Descriptions of the proposed plans for monitoring species identified in the 1st element and their habitats, for monitoring the effectiveness of the conservation actions proposed in the 4th element, and for adapting these conservation actions to respond appropriately to new information or changing conditions.*

This project was designed as a team effort. Overall leadership is provided by the Texas Parks and Wildlife Department, particularly Duane German and Kim Ludeke, together with the Texas Natural Resources Information Service, particularly Jim Scott. Executive Director Carter Smith provided on-going encouragement and support. The Natural Resources Conservation Service provided staff time and access to digital soils data, including ecological site descriptions. The Missouri Resource Assessment Partnership, University of Missouri, provided remote sensing and ecological systems modeling and mapping expertise. We have only completed the first year of a five-year project, and many additional partners will participate.

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[1] Comprehensive Wildlife Conservation Strategy, 2005, Editors: Steve Bender, Stephanie Shelton, Kelly Conrad Bender, Arlene Kalmbach, TPWD

Numerous Texas Parks and Wildlife Department staff have participated in this effort to date. On-going input has been provided by:

Kim Ludeke – TPWD GIS Lab Manager
Duane German – Landscape Characterization Team Leader
Amie Treuer-Kuehn – Plant Ecologist
Wendy Connally – State Wildlife Grants Coordinator
Jackie Poole - Botanist
Jason Singhurst – Botanist

Overview

The Ecological Systems Classification of Texas project grew out of a recognized need to provide better land cover classification and mapping for the state in order to facilitate improved planning and management. The original satellite-based land cover map produced by the Texas Parks and Wildlife Department (McMahan et al. 1984) represented a ground-breaking effort. That map was updated by more recent products, including the newest National Landcover Dataset (NLCD) (http://landcover.usgs.gov/uslandcover.php), the USGS GAP Analysis dataset (http://gapanalysis.nbii.gov/portal/server.pt), and the national LandFire map (http://www.landfire.gov). All of the recent maps resulted in 30 meter resolution datasets, appropriate for planning at regional and statewide scales of resolution. The national 'gold standard' is NLCD (developed using circa 2001 satellite data), which recognized fewer than 20 land cover types statewide. None of these efforts have produced maps that are generally useful at a county level or below.

Our goal is to produce a map that has spatial resolution useful at about 1:24,000 scale (a USGS 7.5' quadrangle), and has a sufficient number of land cover classes (thematic resolution) to provide improved insights for planning and management at a sub-county, or large ownership, scale of resolution.

Several aspects of this effort set it apart from any large scale mapping ever done elsewhere in the United States. First, we provide a 10 meter resolution map; second, we provide roughly 10 times more land cover classes versus previous maps of similar type; finally, we use a modified Ecological Systems Classification that incorporates vegetation dynamics explicitly and therefore facilitates better ecological interpretations. To achieve these results, we incorporated new remote sensing classification techniques, and used a variety of abiotic data to model final map units. This meticulous approach requires a good deal of time and effort, so the project is being conducted in phases across a five-year period (Figure 1).
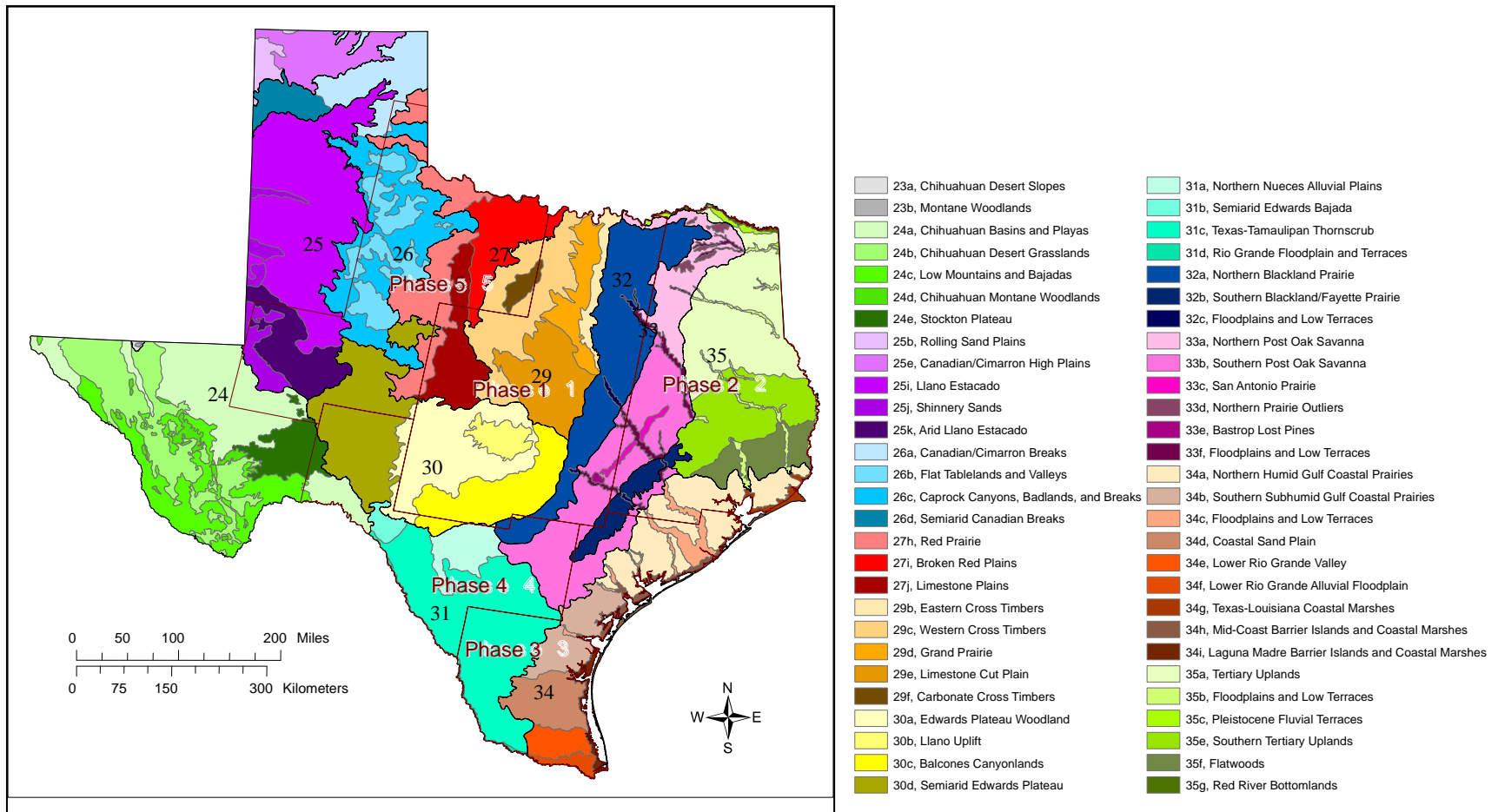
Figure 1. Texas Ecological Systems Mapping project phase map. Outlines of the phases correspond with the footprints of satellite scene data. The project will be completed in the early fall of 2012.

This map was produced by first classifying the land cover, and then using ancillary data (e.g. hydrology, environmental data, highways and cities) to model final mapped vegetation types. The first step resulted in 15 base land cover classes for Phase 1 of this effort, whereas the second step resulted in 109 final mapped vegetation types (see Appendix 1). Following is a summary of techniques, followed by brief summaries of mapped units for Phase 1 of the project.

Ecological Systems and Mapped Vegetation Types

Numerous classifications have been applied to the vegetation of Texas. Prominent among these is the classification used by McMahan, Frye, and Brown (1984) for their Texas Parks and Wildlife Department mapping effort. While extremely useful, the vegetation types they identified were not broadly accepted beyond Texas and were succeeded by other classifications. In 1987, Diamond, Riskind, and Orzell developed the series level of classification. Diamond continued to refine this classification, and it has been widely used in conservation planning, but has not been applied to mapping projects, except at relatively local scales. In the early 90's, The Nature Conservancy developed, and NatureServe currently maintains and refines, the U. S. National Vegetation Classification System (NVCS). The finest levels of the NVCS, the Association and Alliance, have been used for mapping (e. g. a modified Alliance classification was used for GAP Analysis products for Texas) but are generally considered too fine for large-scale mapping.

In developing the legend of vegetation types that we mapped, we chose to use the Terrestrial Ecological Systems classification developed and maintained by NatureServe (NatureServe, 2003). Ecological systems are defined as groupings of plant communities that tend to co-occur on the landscape and share similar ecological processes, substrates, and/or environmental gradients. This classification characterizes units at a scale amenable to the application of remote sensing and abiotic modeling that we used to map vegetation types. In addition, the classification provides a framework that is recognized nationally, has been developed by dozens of ecologists over more than ten years, and will therefore result in products that will be recognized and useful beyond the bounds of the state of Texas. Other projects, such as Landfire (http://www.landfire.gov), Southwest Regional Gap Analysis Project (http://fws-nmcfwru.nmsu.edu/swregap/), and Southeast Gap Analysis Project (http://www.basic.ncsu.edu/segap/), have also used terrestrial ecological systems for mapping vegetation.

We mapped multiple vegetation types that are components of the more broadly defined ecological systems. We called these mapping subsystems "**Mapped Vegetation Types**", and they typically represent the various land covers (e.g. broadleaf evergreen

forest, deciduous forest, evergreen shrubland, grassland) that constitute the full range of variation within an ecological system, depending on land use history or successional state (Appendix 1).

Terrestrial ecological systems do not fit hierarchically within the NVCS. However, they do represent groupings of vegetation communities that are represented by Associations and Alliances within the NVCS. Therefore, while these finer units of vegetation classification do not nest uniquely within a given ecological system, they can be associated with one or more ecological systems and can be useful in the identification and characterization of systems. Alternatively, mapped ecological systems will be useful in identifying areas that may harbor a given suite of Associations.

Remote Sensing Land Cover Classification Methods

We used three dates of LandSat Thematic Mapper satellite data, combined with other information, to classify the land cover. For Phase 1, this involved acquisition of five LandSat path-row scenes (Table 1). After data acquisition, the next step in the classification process was to create a seamless mosaic of LandSat scenes for all dates (Figure 2).

We used a decision tree classification approach to classify the initial 15 land cover classes for Phase 1 (Table 2). This approach allows for the combination of remotely sensed data with ancillary data in a flexible way. We tried multiple different combinations of satellite reflectance data and ancillary data before settling on a final combination that provided the best result. Important ancillary data used for classification (in addition to all 6 LandSat reflectance bands for three dates), included; slope, aspect, landscape position, solar insolation, percent canopy cover from the National Landcover Dataset (NLCD), percent impervious surface from the NLCD, and agricultural areas as defined by the NRCS Common Land Unit (CLU).

Table 1. Dates of satellite imagery used for Phase 1.

Path/Row	Summer/Fall Leaf-on Date	Leaf Off Date	Spring Leaf-on
27/37	September 13, 2006	February 4, 2007	April 3, 2005
27/38	September 13, 2006	February 4, 2007	April 3, 2005
27/39	September 26, 2005	February 14, 2005	April 4, 2007
28/38	September 20, 2006	February 8, 2006	March 31, 2007
28/39	September 20, 2006	February 8, 2006	March 31, 2007

Table 2. Land cover classes derived directly from decision tree classification using three dates of satellite imagery data, digital elevation model-derived environmental data, and common land use (crop or non-crop) information.

Landcover Class	Description	Examples from Phase 1 Area	Sample Species
Open Water	open water with little or no emergent vegetation		
High Intensity Urban	urban development, generally >70% impervious cover	city centers, highways	
Low Intensity Urban	urban development, generally <70% impervious cover	residential areas	Residential areas
Barren / Sparsely Vegetated	little or no vegetation year-round	river beds, quarries, areas cleared for development, rural roads	Salt flats, sand dunes, rock outcrops, river sand bars
Cold Deciduous Forest and Woodland	>25% total tree canopy (>4 m tall), where >75% of the relative cover is cold deciduous trees	Texas oak, cedar elm, sugar hackberry, post oak	*Quercus buckleyi, Ulmus crassifolia, Celtis laevigata, Quercus stellata*
Broadleaf Evergreen Forest and Woodland	>25% total tree canopy (>4 m tall), where >75% of the relative cover is broadleaf evergreen trees	plateau live oak	*Quercus fusiformis*
Coniferous Evergreen Forest and Woodland	>25% total tree canopy (>4 m tall), where >75% of the relative cover is coniferous evergreen	loblolly pine, Ashe juniper, eastern redcedar	*Pinus taeda, Juniperus ashei, Juniperus virginiana*
Mixed CD / Evergreen Forest and Woodland	>25% total tree canopy (>4 m tall), where >75% of the relative cover is neither only cold deciduous trees or only evergreen trees	Texas oak, cedar elm, post oak with Ashe juniper, eastern redcedar, plateau live oak	*Quercus buckleyi, Ulmus crassifolia, Quercus stellata, Juniperus ashei, Juniperus virginiana, Quercus fusiformis*

Landcover Class	Description	Examples from Phase 1 Area	Sample Species
Cold Deciduous Shrubland	>25% total canopy of trees and shrubs (<4 m tall), where the majority of the canopy is shrubs, and the majority of the woody plants are cold deciduous	mesquite, white shin oak, whitebrush	*Prosopis glandulosa, Quercus sinuata* var. *breviloba, Aloysia gratissima*
Evergreen Shrubland	>25% total canopy of trees and shrubs (<4 m tall), where the majority of the canopy is shrubs, and the majority of the woody species are evergreen	Ashe juniper, eastern redcedar, plateau live oak	*Juniperus ashei, J. virginiana, Quercus fusiformis, Juniperus ashei*
Grassland	dominated by herbaceous vegetation, usually graminoid, with less than 25% woody cover. Includes both planted pasture and native prairie.	little bluestem, Texas wintergrass, King Ranch bluestem, Bermuda grass	*Schizachyrium scoparium, Nassella leucotricha, Bothriochloa ischaemum* var. *songarica, Cynodon dactylon*
Irrigated Sod Grass Farm	dominated by irrigated grass sod farming. May also include urban grassland areas such as parks and golf courses.	Bermuda grass, Johnsongrass	*Cynodon dactylon, Sorghum halepense*
Row Crops	Row crop agricultural lands	sorghum, corn	
Herbaceous Marsh	seasonally or semi-permanently flooded, or saturated soil wetlands dominated by herbaceous vegetation	rushes, sedges, grasses	*Juncus spp, Cyperus spp, Carex spp.*
Swamp	semi-permanently flooded woody wetlands dominated by woody vegetation > 4 meters tall	baldcypress	*Taxodium distichum*

Figure 2. Spring, summer, and fall mosaics for five LandSat images used in Phase 1 land cover classification.
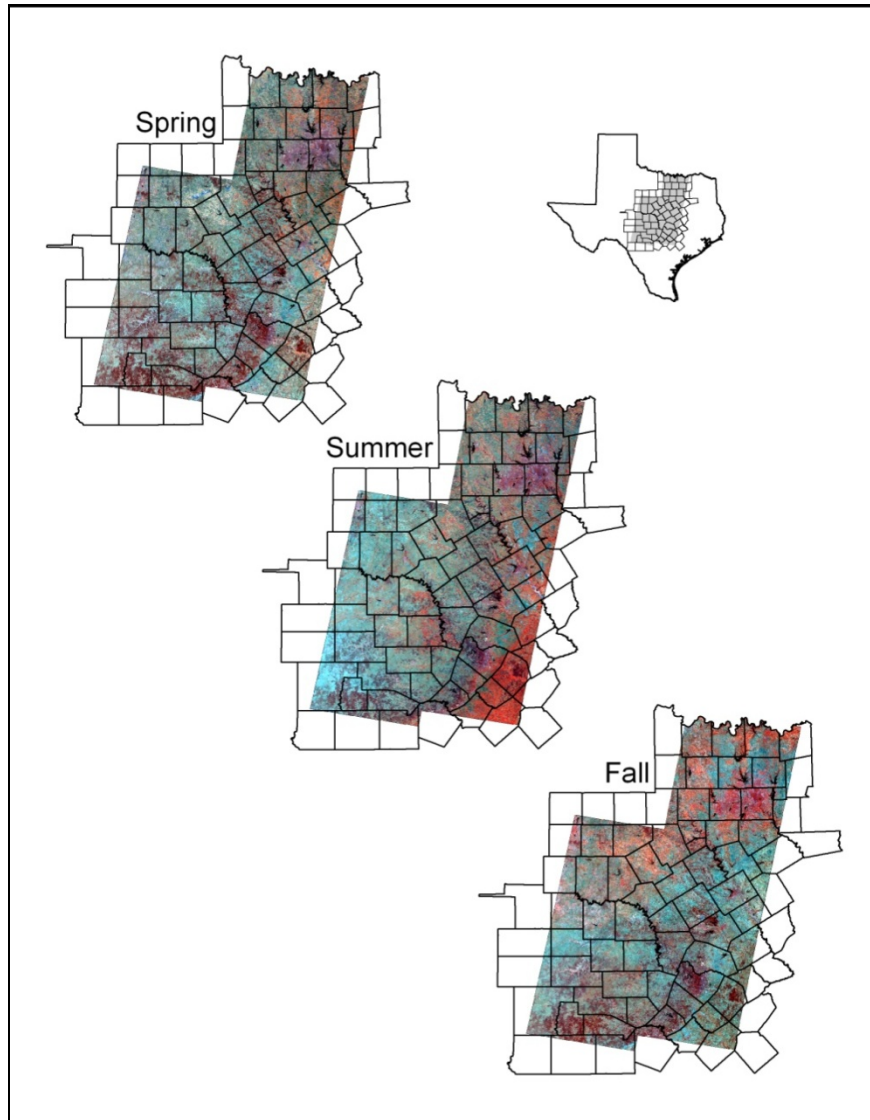
The decision tree classification approach requires a training data set for each land cover class mapped. We generated this dataset via air photo interpretation (5951 points) and ground-collected data (2209 points). Air photo interpretation required the use of both leaf-on and leaf-off photos. Leaf-on photos were interpreted from National Agriculture Imagery Program (NAIP) photography collected in 2004 and 2005, whereas leaf-off photos were Orthorectified Color infrared collected in 1996. Most photo-interpreted training points were generated via (1) generating a random grid of sample sites across the Phase 1 area, (2) zooming to those locations at 1:6,000 resolution, and (3) circumscribing visually homogeneous vegetation and assigning those polygons a land cover type using 2004, 2005, and 2006 leaf-on NAIP photographs and 1995-1996 StratMap leaf-off photography. A grid of 150 meter spacing was laid down across the

Phase 1 region, and grid points that fell within the delineated polygons were assigned the land cover type from the associated polygon. These point data were then double-checked by a second worker using both leaf-on and leaf-off photography to ensure that the correct landcover type had been assigned to each point. Training data were also collected from a second set of polygons using digital vegetation maps from Texas Parks and Wildlife lands, including Mason Mountain Wildlife Management Area and Lost Maples State Natural Area. We checked the maps using leaf-on and leaf-off images and used the same 150 meter grid to collect points within the vegetation polygons. A final set of 2209 training points came from on-the-ground data collection (see methods, below). We checked all ground-collected data using air photos and eliminated about 529 data points. In all cases, at least three different interpreters viewed all photo data to confirm interpretations and eliminate questionable data.

The decision tree classification process assigns pixels to land cover classes using the statistical relationship between the training data and the satellite imagery and ancillary data of a given area. All decision tree classifications were run using a 30m spatial resolution, which is the native spatial resolution for the LandSat Thematic Mapper imagery. The classification procedure was implemented multiple times, using different combinations of data, in an effort to maximize classification accuracy. We generated more than 20 different classification results. The most accurate classification used satellite reflectance data from all three dates together with slope, aspect divided into 9 equal classes, landscape position, solar insolation, percent canopy cover from the NLCD, percent impervious cover from the NLCD, and Common Land Unit designation (cropland or not cropland).

Achieving Higher Spatial Resolution. A one hectare minimum mapping unit (MMU) was specified for this project. To ensure that the MMU was achieved, a post hoc process was implemented using image objects generated with the eCognition Developer software. Image objects were generated from the first principle component of a NAIP image county mosaic that had been re-sampled to a 10m spatial resolution. This procedure was run for each county mosaic within the study area. Some counties needed to be divided into multiple pieces because they were too large to be processed individually. This resulted in 92 separate sets of image objects being developed for the entire study area. The image objects were then used to summarize the classification resulting from the decision tree classification procedure. The statistic of interest during the summarization process was the mode. ArcGIS was used to determine the mode for each of the nearly 10 million image objects that were generated. The 92 separate sets of image objects were then imported to a file geodatabase. The geodatabase was then gridded off at a spatial resolution of 10m, assuring that the new grid lined up with the

digital elevation models that were to be used in the modeling process discussed later (Figure 3).

30 Meter Land Cover   10 Meter Land Cover
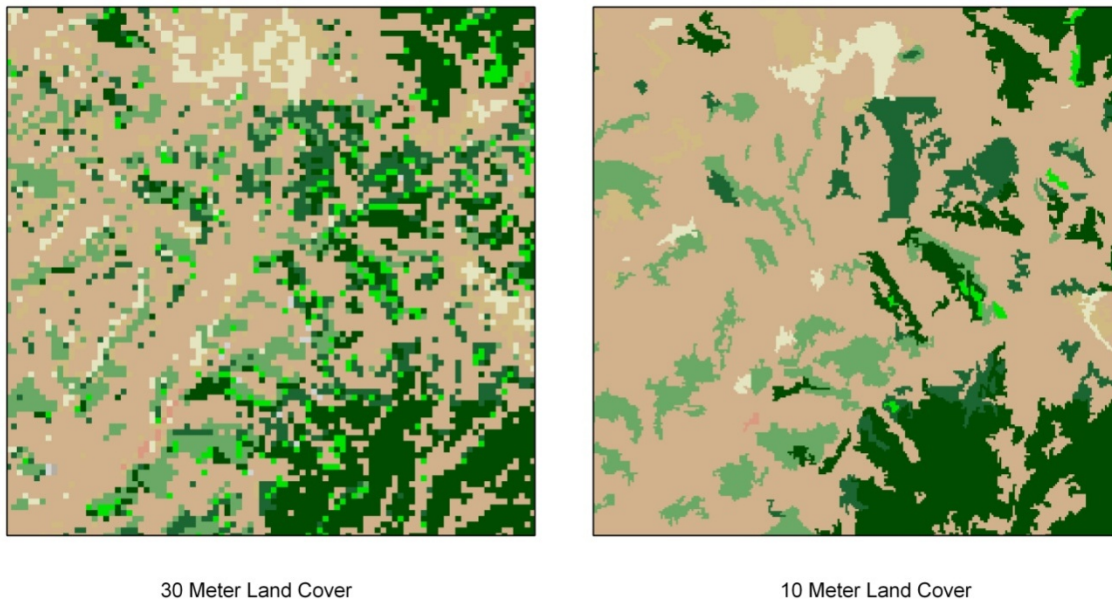
Figure 3. Illustration of the increase in spatial resolution from 30 meter pixels to 10 meter pixels. Image objects were generated from the first principle component of a NAIP image county mosaic that had been re-sampled to 10 meters.

Modeling: Achieving the Final Mapped Vegetation Types

We used EPA ecoregion boundaries (see http://www.epa.gov/wed/pages/ecoregions/level_iv.htm) together with environmental data to generate the final map. Basic modeling data included:

(1) County digital soils map polygons from the Natural Resource Conservation Service (NRCS) Soil Geographic Database (SSURGO) grouped together by ecological site type (ecoclassid in the SSURGO data tables; see http://soils.usda.gov/survey/geography/ssurgo/).
(2) Floodplain soils modified from the SSURGO data. We initially included all soils with a flood frequency other than 'none' plus ecological site types "Bottomland" and "Draw," and then corrected apparent inconsistencies across county lines by hand selecting individual soil map units.

(3) Stream center lines taken from the 1:24,000 National Hydrologic Dataset (see http://nhd.usgs.gov/data.html), which were assigned as 30 meter wide (3, 10 meter pixels) 'riparian' corridors in the classification.

(4) Slope generated from 10 meter digital elevation models (DEMs; see USGS National Elevation Dataset, http://ned.usgs.gov/). All land cover on slopes greater than 20% were assigned to slope Ecological Mapping Subsystems, different from flatter areas, and all slopes greater than 100% were designated as cliffs/bluffs.

(5) Transportation center lines from US Census TIGER data and Texas Railroad Commission railway data were 'burned in' to the classification as urban land cover.

The land cover classification results were overlain with the data layers listed above which allowed the assignment of the original land cover types to different mapped vegetation types (Figure 4, Table 3). In other words, different combinations of land cover with different soils, slope, hydrology, or ecoregions were assigned to different final mapped vegetation types. For example, the cold deciduous forest land cover type on a floodplain was assigned to a floodplain hardwood mapping subsystem, whereas cold deciduous forest on a slope >20% was assigned to a slope forest, and so on. Grasslands were assigned to different types mainly based on soils and on the ecoregion in which they occurred, and Bastrop Lost Pines types were only assigned within that ecoregion and a narrow strip just south of the Colorado River.

Table 3. Data sources used for modeling the mapped vegetation types.

Data Layer	Comments
SSURGO Soils	From NRCS digital county soil surveys. Basic data layer for modeling which allows for some ecological interpretations, such as identification of invasive shrubland on former prairie soils.
Slope >20%	Generated from 10 meter digital elevation models. Used to identify all 'slope' mapped vegetation types.
Slope >100%	Generated from 10 meter digital elevation models. Used to identify all cliffs and bluffs
Floodplains	Generated from NRCS digital county soils surveys and modified on-screen to match across county lines. Used to identify all floodplain mapped vegetation types.
Riparian Zones	Defined as a 30 meter buffer on the streams identified in the National Hydrology Dataset at 1:24,000 scale. Used to identify all riparian mapped vegetation types.

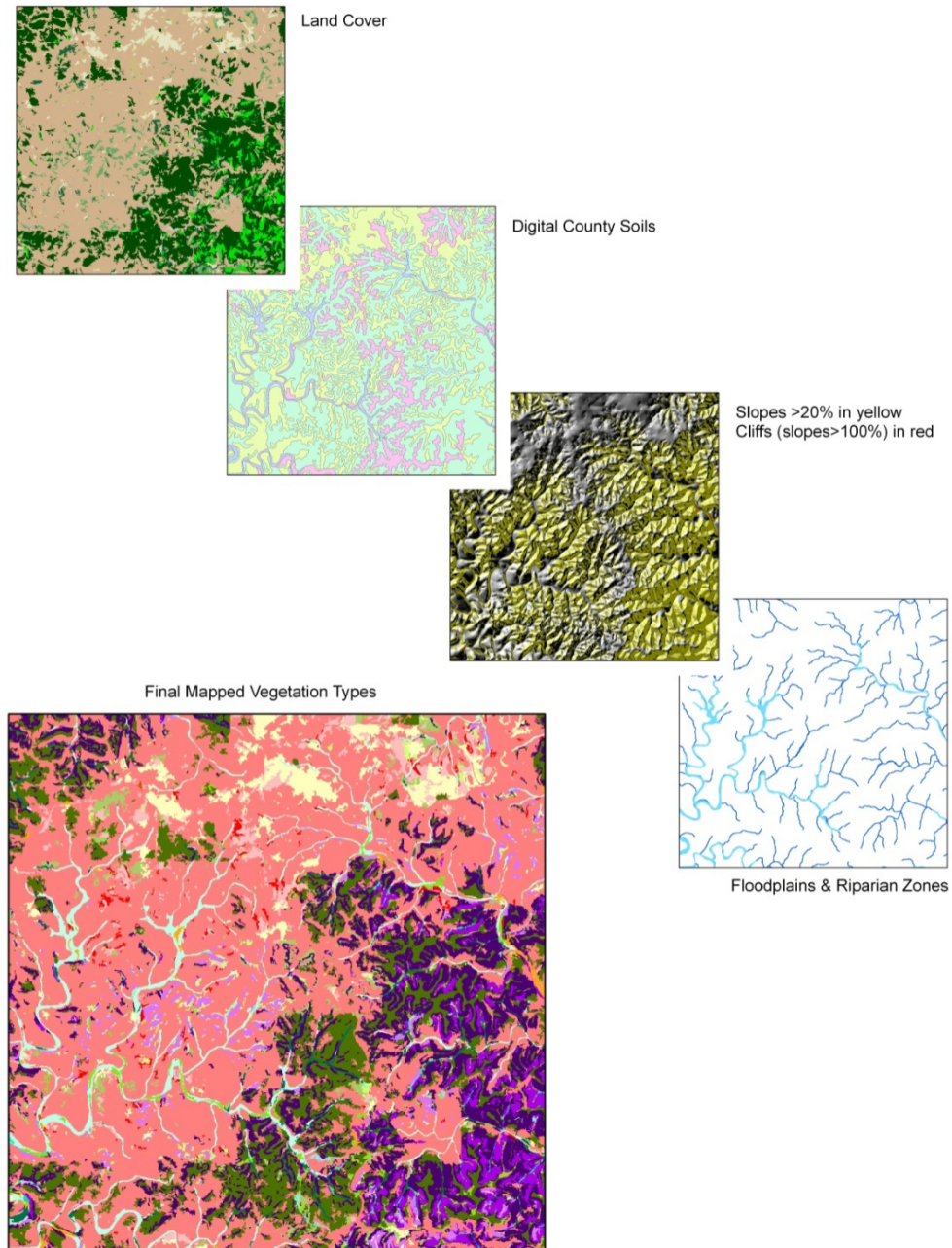| Data Layer	Comments
Ecoregions	Based on EPA Level 4 ecoregions. Used to correct some apparently mis-mapped SSURGO soils, modified to define the area where Bastrop Lost Pines subsystems are mapped, and to define where Grand Prairie grasslands are mapped.

Figure 4. Data layers used to model mapped vegetation types. This process resulted in an increase from 15 land cover types (relatively standard for satellite image classifications) to 109 mapped vegetation types.

Ground Data Collection

TPWD and partner personnel collected ground data on land cover, composition, ecological system, and mapped vegetation type using a legend developed via expert committee. The starting point for the legend was NatureServe's Ecological Systems classification, but this was supplemented with an eye toward mapping all land cover types (see Table 2) within each Ecological System (see Appendix 1) if those cover types existed. In addition, agricultural and other human-related types were included in the legend.

The general data collection procedure included:

1. Sample plots were located either near a road or on accessible public lands. Locations were precise, based on use of a GPS (usually Trimble 232 with +/- 3 meter accuracy) linked to ESRI GIS software on a computer in the field vehicle. Samples were spread across the entire Phase 1 region.
2. Samples along roads were collected at one-mile intervals, often on both sides of the same road, starting from a random location. In addition, samples were collected at most stream/road crossings. Samples on public lands were more accessible and were examined directly on the ground.
3. For data collected along roads, we were limited to views from the right-of-way, air photography, and other environmental data layers loaded on the laptop, including county SSURGO soils and the Geological Atlas of Texas. Where trees obscured the view away from the road, we relied primarily on photos and road-side observation to select a sample plot of relatively homogeneous vegetation. All sample plots were located at least 30 meters from the road within a square with sides of at least 50 meters, to reduce possible edge effects on the 30 meter square satellite data.
4. We collected a standardized suite of data using a computerized feature data form with drop-down windows to reduce mistakes, and we took a picture at most site locations (Table 4, 5).

Table 4. Example of information within the feature database used for field data collection.

Field Name	Data Type	Example Value(s)	Description
SampleDate	Date	9/21/2007	Date sample taken.
TeamLeader	Text	Duane German	Name of data collection team leader.
SiteID	Integer	291	Unique identifier for sample site.
PictureID	Integer	421	Unique identifier for each sample site photo.
EcoSysName	Text	Edwards Plateau Floodplain Terrace	Name of Ecological System from the map legend (see Appendix 1).
EcoSysConf	Text	High	A categorical value expressing team leader's confidence in correctness of Ecological System identification. Values: High, Good, Medium, Low.
CoverClass	Text	Grassland	Name of the landcover class (see Table 2)
TotWood_PC	Text	0-5	Total percent cover of all woody vegetation - categorical data 0-5, 6-25, 26-50, 51-75, 76-100
BLEG_PC	Text	26-50	Total percent cover of all Broad-leafed Evergreen trees - categorical data 0-5, 6-25, 26-50, 51-75, 76-100 -- must be less than or equal to TotWood_PC
NLEG_PC	Text	76-100	Total percent cover of all Needle-leafed Evergreen trees - categorical data 0-5, 6-25, 26-50, 51-75, 76-100 -- must be less than or equal to TotWood_PC
Tree_PC	Text	26-50	Total percent cover of all trees - categorical data 0-5, 6-25, 26-50, 51-75, 76-100 -- must be less than or equal to TotWood_PC
Shrub_PC	Text	6-25	Total percent cover of all shrubs - categorical data 0-5, 6-25, 26-50, 51-75, 76-100 -- must be less than or equal to TotWood_PC
Herb_PC	Text	0-5	Total percent cover of all herbaceous plants - categorical data 0-5, 6-25, 26-50, 51-75, 76-100
Tree1	Text	*Ulmus crassifolia*	Scientific name of **most** visually dominant over-story tree species in plot area. This is a single-trunked perennial woody plant of greater than 5 meters in height. NA if none present.
Tree2	Text	*Carya illinoinensis*	Scientific name of **second most** visually dominant over-story tree species in plot area. This is a single-trunked perennial woody plant of greater than 5 meters in height. NA if none present.
Tree3	Text	*Quercus fusiformis*	Scientific name of **third most** visually dominant over-story tree species in plot area. This is a single-trunked perennial woody plant of greater than 5 meters in height. NA if none present.

Shrub1	Text	*Juniperus ashei*	Scientific name of **most** visually dominant shrub in plot area. Shrub is defined as woody perennial plant, usually multi-trunk, between .5 meters and 5 meters in height. Will contain NA value if no shrubs present in plot.
Shrub2	Text	*Prosopis glandulosa*	Scientific name of **second most** visually dominant shrub in plot area. Shrub is defined as woody perennial plant, usually multi-trunk, between .5 meters and 5 meters in height. Will contain NA value if no shrubs present in plot.
Shrub3	Text	*Sapindus saponaria*	Scientific name of **third most** visually dominant shrub in plot area. Shrub is defined as woody perennial plant, usually multi-trunk, between .5 meters and 5 meters in height. Will contain NA value if no shrubs present in plot.
Herb1	Text	*Cynodon dactylon*	Scientific name of **most** visually dominant herbaceous plant in plot area (1/4 acre). Include woody vines. Will contain bare ground is no herbaceous plants are present.
Herb2	Text	*Bothriochloa laguroides*	Scientific name of **second most** visually dominant herbaceous plant in plot area (1/4 acre). Include woody vines. Will contain NA if bare or only one species present.
Herb3	Text	*Panicum virgatum*	Scientific name of **third most** visually dominant herbaceous plant in plot area (1/4 acre). Include woody vines. Will contain NA if bare or only one species present.

Figure 5. Screen-capture of ground verification data collection database schema, overlay of data collection plots on satellite image, and photograph take at one data plot.
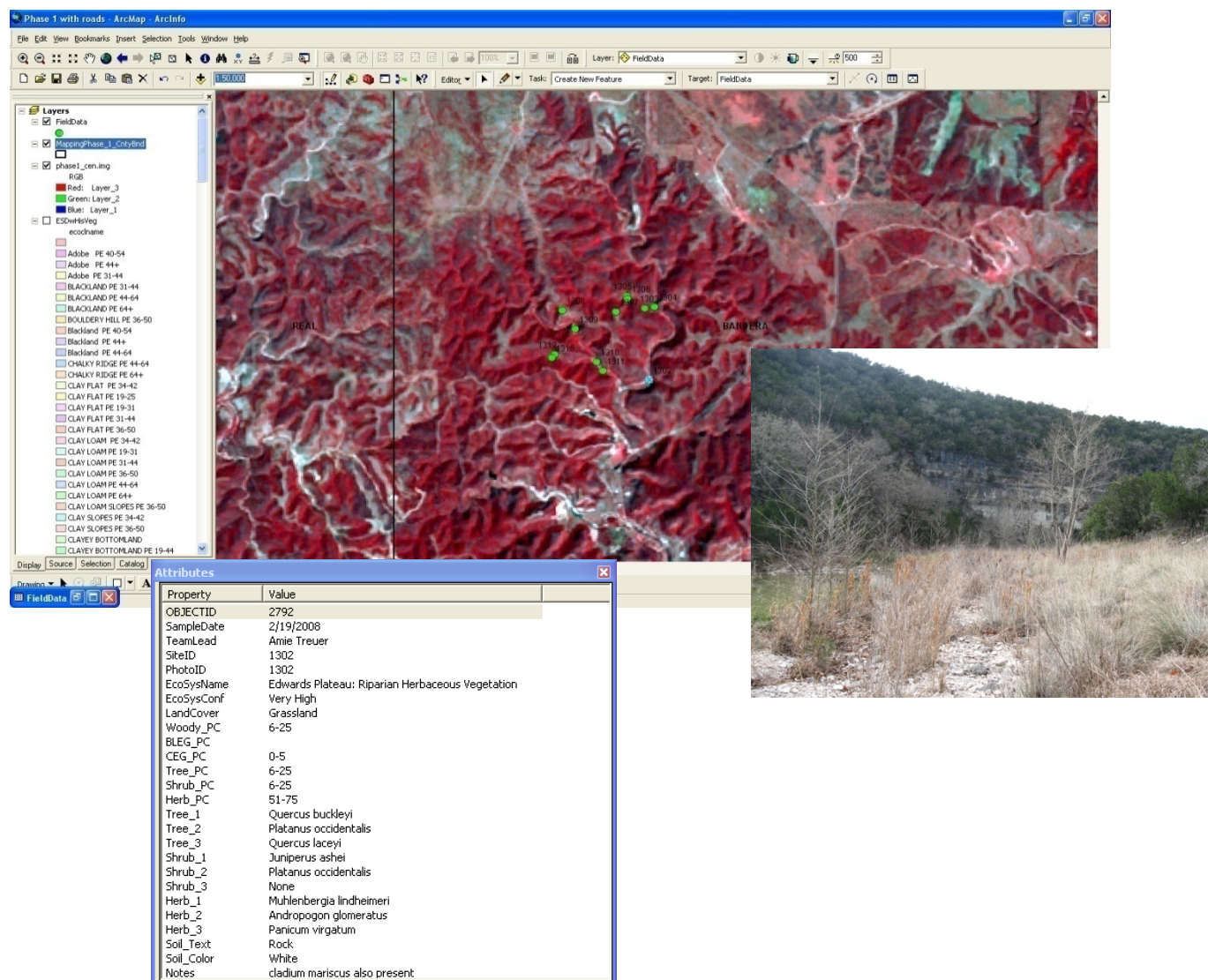
Limitations of the Approach

Several interacting variables impact the accuracy of final mapping results. These include (1) limitations to satellite remote sensing techniques, (2) inconsistencies in soils mapping, (3) variation among observers in terms of interpretation of vegetation cover types on the ground, and (4) merging of 10 meter map objects with 30 meter satellite data.

The satellite sensors only detect differences in plant biomass on the ground, and even though a variety of abiotic data was included in the land cover mapping process, the

results still mainly detect differences in plant green biomass, which correlate to differences in current land cover. Data are collected at a 30 meter pixel resolution, and the boundaries of pixels might fall partially within forest, for example, and partially within grassland, resulting in an inherent mistake in classification for a portion of the pixel. The sensors collect information on plant biomass, not on structure or plant type. A heavily grazed shrubland might have similar biomass to less heavily grazed grassland; a sparse woodland might have similar biomass to a shrubland; a dense shrubland might have similar biomass to a forest; cropland seeded for grazing in the off-season may have similar biomass throughout the growing season as a grassland. Therefore, mistakes in classification can result. This classification achieved 75% accuracy on 15 original land cover classes. Based on ground data information where the observer ranked confidence in identification of the type as 'high' or 'very high', the overall accuracy for ecological systems was 74%, and for mapped vegetation types 67%.

Soils were mapped by NRCS workers on a county by county basis and this dataset, together with an interpretation of the historic vegetation from ecological site descriptions (see http://esis.sc.egov.usda.gov/Welcome/pgReportLocation.aspx?type=ESD), was the primary source for modeling mapped vegetation types, which are described below. Even though the idea that different vegetation will develop on different mapped soils is simple and direct, the use of soil maps to model vegetation if fraught with difficulty. Different observers interpreted soils in different ways, and soils are often not mapped consistently across county boundaries within regions. Ecological site types coded to a given NRCS major land resource area are often mapped, apparently in error, far outside of that region. Finally, the assignment of ecological site types to soil map units is not always consistent and uniform. Due to inconsistencies in soil mapping and the application of ecological site types to soil map unit polygons, we often pooled together several ecological site types in the modeling process in order to avoid harsh boundaries at county lines. Even after this pooling process, we sometimes imposed mapping rules based on EPA Level IV ecoregion boundaries when one ecological site type was mapped across vast regions, or was mapped in two or more distinct ecoregions. We were not able to correct all apparent mistakes. On balance, use of the SSURGO soils dataset allowed for better mapping and interpretation of the final mapped vegetation types, but also resulted in various types of mapping inconsistencies.

Different observers often view the same vegetation in different lights: one person's grassland may be shrubland to another; one person's mixed forest may be called deciduous forest by another. These sources of confusion are more confounding than is often assumed. For Phase 1, differences among forest types (mainly plateau live oak, mixed, mainly deciduous) and between sparse forest and shrubland (sparse live oak forest with shrubs versus shrubland with sparse plateau live oak over-story) are often

not clear. Likewise, the difference between a grassland with shrubs versus a shrubland with grass is not straight-forward, especially where mesquite is the primary shrub component.

Intersection of map objects with land cover classification was inexact. The 10 meter resolution map objects themselves had no information regarding classification, but were simply assigned a land cover class based on the mode of the landcover classification under each of the image objects. The image objects were generated from a single band of information, and the software did not always 'see' differences among some types, especially shrubland versus grassland, and cold deciduous mixed forest versus other forest types. Thus, map objects that appear spatially right might be labeled incorrectly in terms of their mapped vegetation type. Based on ground data collection, mixed forests appear under-represented (pooled with needle leaf or broadleaf evergreen forest types) whereas grassland appears over-represented, often at the expense of shrubland. In addition, limitations in computing ability led to a limitation in the minimum size of map objects. This may have reduced map accuracy where small patches of one type (generally <1 hectare) were not mapped within a larger, matrix patch of a different type.

In Phase 1, mesquite is a common component of many communities, but is difficult to detect. This species has a small leaf area index, meaning that even a fairly dense stand will not add much biomass to a given mapping pixel, and therefore might not be 'visible' in terms of satellite reflectance. Different timing and intensity of grazing might result in substantial differences in plant biomass among stands, overwhelming any impacts of differences in overall biomass added by more or less dense mesquite.

Mapped Vegetation Types Descriptions and Ecological Interpretations

We developed a naming convention for mapped vegetation types that incorporates regional relationships of the types, as well as descriptive information about the composition or structure of the vegetation. Generally, types that show some (though not necessarily perfect) fidelity to a particular region have names that begin with the region's name followed by a colon. This reference is then followed by a descriptive phase that includes reference to the dominant species where possible (e.g. Post Oak), and includes reference to the structural character of the type (e.g. Woodland). If more than one dominant species or group of species is identified, then these are separated by a forward slash, "/". This suffix portion of the name may also include a descriptor of the landform that the type occupies (e.g. Slope), or a unique edaphic feature characterizing the type (e.g. Sandyland). While these names simplify reference, they retain explicit relationships to the Ecological System Classification (Appendix 1) and can be easily referenced relative to those concepts. Types resulting from human-related activities and not attributable to particular ecological systems lack the geographic region

as a prefix, but may be prefixed by the term "Native Invasive:", in the case of woodlands or shrublands dominated by native invasive species.

We mapped some human-associated types such as urban and row crops directly from the decision tree classification. In addition, we assigned historic vegetation to soils, which sometimes allowed for interpretation of current land cover. The mapped "Native Invasive:" types do not nest within ecological systems and are labeled mainly using information from ecological site descriptions (ecoclasses) provided by the Natural Resources Conservation Service. For example, evergreen shrubland on former prairie soils is labeled "Native Invasive: Juniper shrubland;" deciduous shrubland on former prairie soils is labeled "Native Invasive: Mesquite Shrubland," and so on. Additional ecological interpretations for some mapped types are found in the following section.

Each mapped vegetation type is briefly described. Where possible, we include a representative photograph collected at a sample site within Phase 1, a range map for Phase 1, and where to view that vegetation type on public lands in Phase 1. The descriptions outline representative species and variation for that mapped type, sometimes including perceptions of possible mistakes in the mapping based on ground data.

We are confident that the mapped vegetation types represent a given land cover on a given soil type, but the descriptions are quite tentative, and will need to be revised over time in an iterative way. The mapped types almost always include a good deal of variation in terms of plant associations and community condition. Descriptions mention plant species that may be common within the mapped type somewhere within the range based on ground samples and professional judgment, and thus often include species that do not commonly occur together within the same plant association (e.g. late succession species and early succession species; species from the northern versus southern part of the range of a type; species from a wetter and a drier expression of a given type). Some of the less common or peripheral types were not sampled on the ground at all, or only at a few locations, even though almost 3000 ground samples were collected. More complete conceptual descriptions for all mapped vegetation types, including geology, landform, and soils, are found in Appendix 1. Finally, two representative vegetation profiles are included for Phase 1.
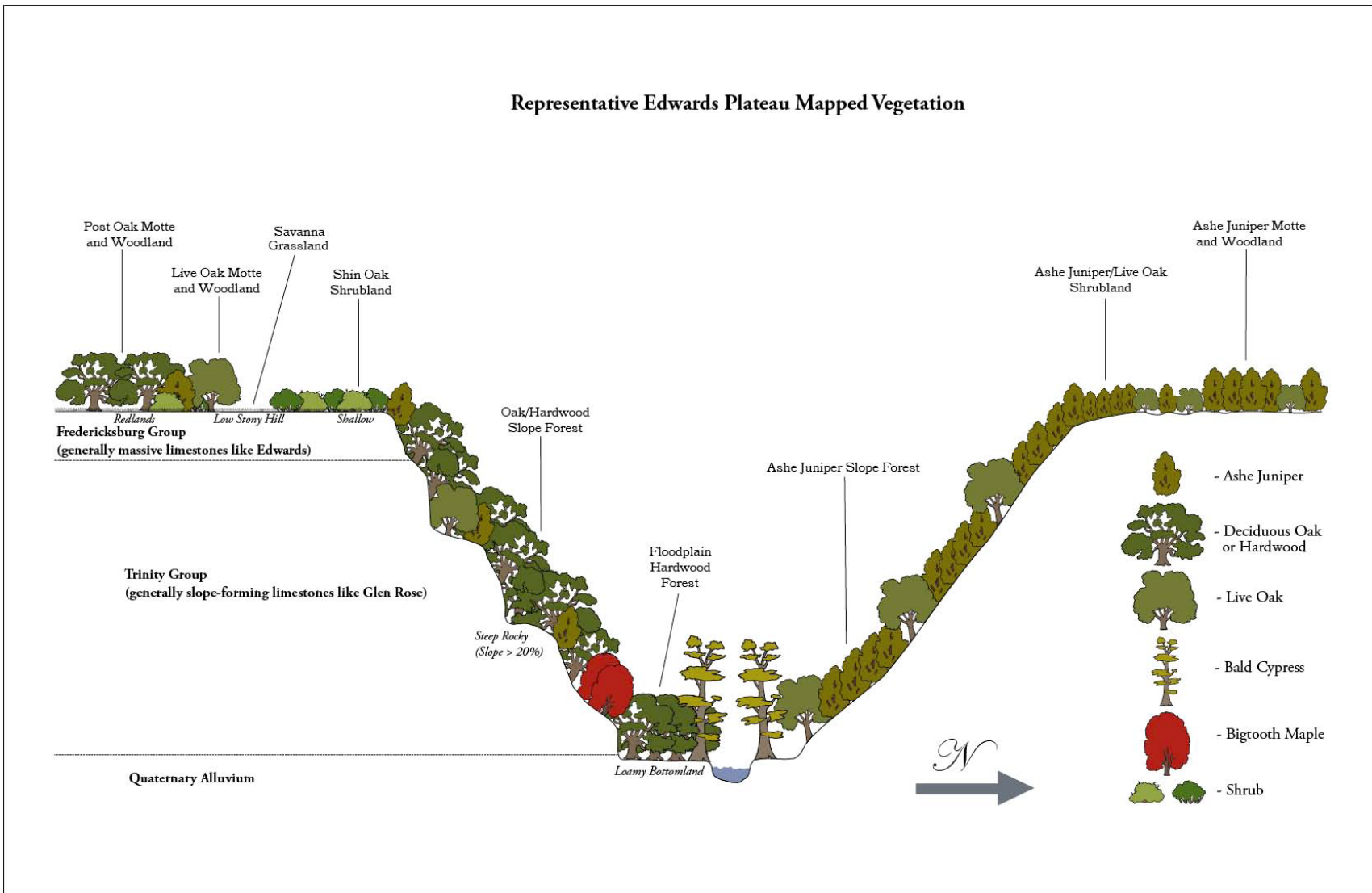
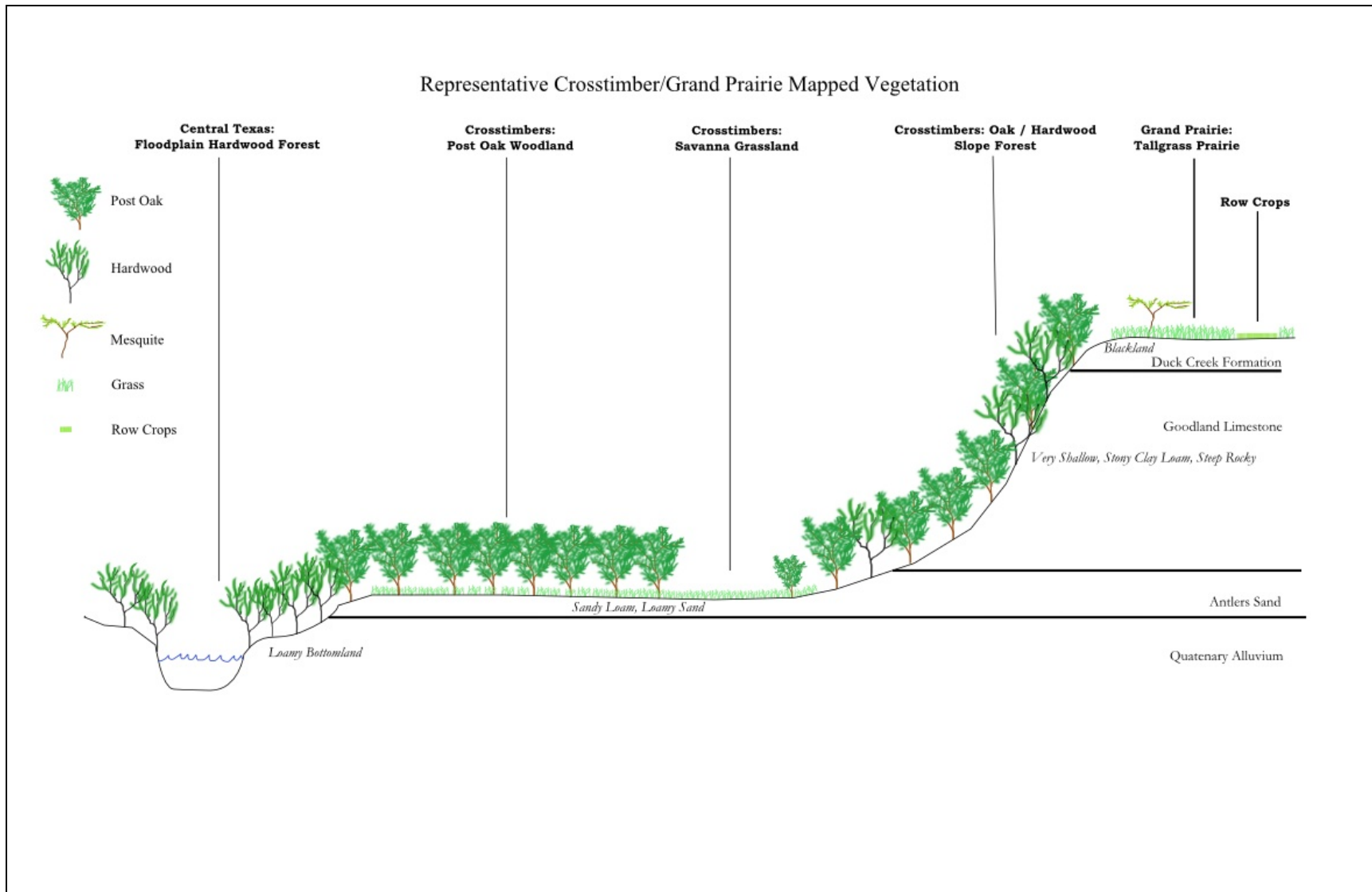Figure 6. Profile of representative mapped vegetation on the Edwards Plateau.

Figure 7. Profile depicting the representative mapped vegetation of the Crosstimber and Grand Prairie.

Barren

Area in Phase 1: 136,240 acres (55,135 ha)

Description of Mapped Type: This type includes areas where little or no vegetation cover existed at the time of image data collection. Large areas cleared for development are included, as well as rural roads and buildings and associated clearings in primarily rural areas. Stream beds with exposed gravel or bedrock, rock outcrops, quarries, and year-round fallow fields are also included.

Where to Visit:

None
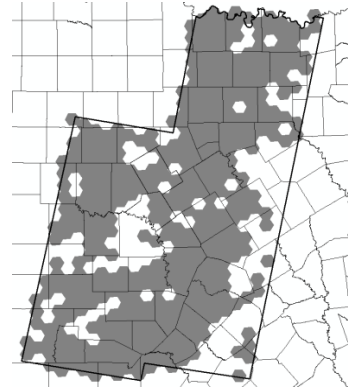
Bastrop Lost Pines: Hardwood Slope Forest

Area in Phase 1: 44 acres (18 ha)

Description of Mapped Type: Post oak, sugar hackberry, American elm, and cedar elm may be components of the overstory of this deciduous forest.

Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department
South Shores Park: Lower Colorado River Authority
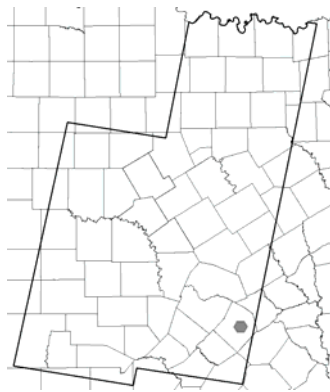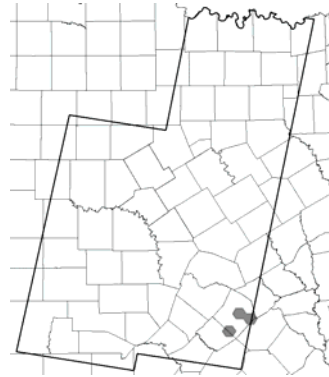
Bastrop Lost Pines: Loblolly Pine / Oak Forest

Area in Phase 1: 16,060 acres (6,500 ha)

Description of Mapped Type: Loblolly pine, post oak, blackjack oak, cedar elm, and sugar hackberry are common canopy trees, and eastern redcedar may be among the dominants in some areas. Farkleberry is often in the understory.

Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department

Buescher State Park: Texas Parks and Wildlife Department

South Shores Park: Lower Colorado River Authority
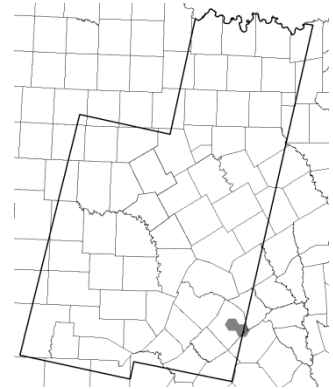
Bastrop Lost Pines: Loblolly Pine / Oak Slope Forest

Area in Phase 1: 610 acres (250 ha)

Description of Mapped Type: Loblolly pine and post oak are often important in the canopy, and blackjack oak, black hickory, cedar elm, and sugar hackberry may be important. Eastern redcedar is an important component in some areas.

Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department

Buescher State Park: Texas Parks and Wildlife Department

Bastrop Lost Pines: Loblolly Pine Forest

Area in Phase 1: 23,040 acres (9,325 ha)

Description of Mapped Type: Loblolly pine is the primary overstory dominant, and post oak and blackjack oak may be components of the canopy. Farkleberry is often in the understory. Some areas may be dominated by eastern redcedar.

Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department

Buescher State Park: Texas Parks and Wildlife Department

South Shores Park: Lower Colorado River Authority
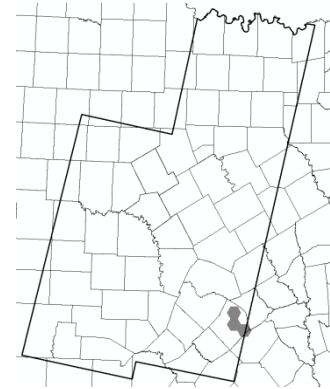
Bastrop Lost Pines: Loblolly Pine Slope Forest

Area in Phase 1: 725 acres (295 ha)

Description of Mapped Type: Loblolly pine is the primary overstory dominant, and post oak, cedar elm, blackjack oak, and sugar hackberry may be overstory components. Some areas may be dominated by eastern redcedar.

Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department

Buescher State Park: Texas Parks and Wildlife Department

South Shores Park: Lower Colorado River Authority
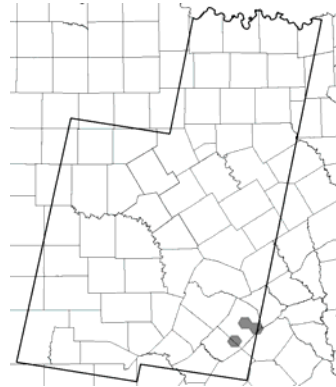
Blackland Prairie: Disturbance or Tame Grassland

Area in Phase 1: 2,230,435 acres (902,625 ha)

Description of Mapped Type: This type includes grasslands in many conditions, and introduced Bermuda grass or King Ranch bluestem are the most frequent dominant grasses. Mesquite is often present and may be fairly dense. Important native grasses may include little bluestem, silver bluestem, Indiangrass, Texas wintergrass, hairy grama, and three-awn species. This type is mapped on disturbed soils such as pits and dams throughout Phase 1.

Where to Visit:

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Hagerman National Wildlife Refuge: US Fish and Wildlife Service
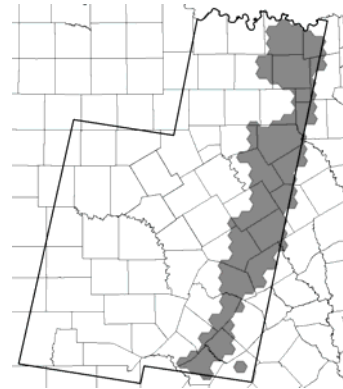
Central Texas: Barren or Grassy Cliff/Bluff

Area in Phase 1: 5 acres (2 ha)

Description of Mapped Type: This type is only mapped in areas with slopes over 100% and grassy or barren vegetation cover, especially along the bluffs of the Brazos River upstream from Waco.

Where to Visit:

None
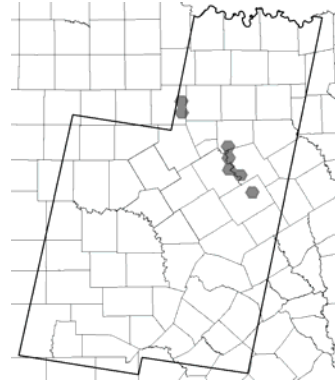
Central Texas: Floodplain Deciduous Shrubland

Area in Phase 1: 68,680 acres (27,795 ha)

Description of Mapped Type: Shrublands dominated by deciduous species such as possumhaw, mesquite, black willow, roughleaf dogwood, or common buttonbush.

Where to Visit:

Navarro Mills Lake Recreation Area: US Army Corps of Engineers

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Benbrook Lake Recreation Area: US Army Corps of Engineers

Aquilla Wildlife Management Area: Texas Parks and Wildlife Department

Palmetto State Park: Texas Parks and Wildlife Department

Lake Lewisville Recreation Area: US Army Corps of Engineers

Lake Whitney Recreation Area: US Army Corps of Engineers

Dinosaur Valley State Park: Texas Parks and Wildlife Department
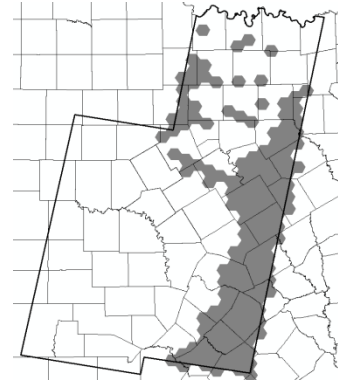
Central Texas: Floodplain Evergreen Shrubland

Area in Phase 1: 3,640 acres (1,475 ha)

Description of Mapped Type: Eastern redcedar or Ashe juniper usually dominate this shrubland, but yaupon may also dominate. Mesquite, sugar hackberry, and cedar elm may be components.

Where to Visit:

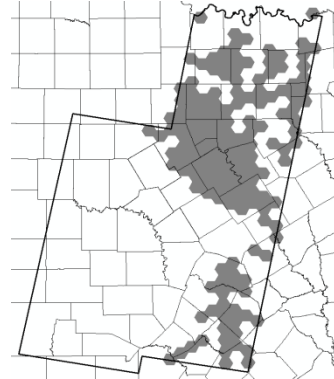Granger Wildlife Management Area: Texas Parks and Wildlife Department

Lake Whitney Recreation Area: US Army Corps of Engineers

Dinosaur Valley State Park: Texas Parks and Wildlife Department

Meridian State Park: Texas Parks and Wildlife Department

Caddo National Grassland – Lake Fannin: US Forest Service

Springfield Park: City of Rowlett

Central Texas: Floodplain Hardwood / Evergreen Forest

Area in Phase 1: 40,640 acres (16,445 ha)

Description of Mapped Type: Deciduous trees such as pecan, cedar elm, sugar hackberry, and American elm commonly share dominance with evergreens such as plateau or coastal live oak or eastern red cedar in this mixed forest type.

Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department

Caddo National Grassland – Lake Fannin: US Forest Service

Palmetto State Park: Texas Parks and Wildlife Department

Ham Creek Park: City of Blum

Rochester Park: City of Dallas

Mountain Creek Lake Park: City of Duncanville

Lavon Lake Recreation Area: US Army Corps of Engineers

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Hagerman NWR: US Fish and Wildlife Service
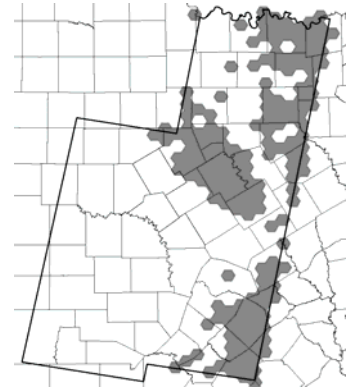
Central Texas: Floodplain Hardwood Forest

Area in Phase 1: 729,225 acres (295,110 ha)

Description of Mapped Type: Deciduous trees such as pecan, white ash, cedar elm, American elm, sugar hackberry, willows, and eastern cottonwood are commonly encountered in this deciduous floodplain forest.

Where to Visit:

Lake Lewisville Recreation Area: US Army Corps of Engineers

Lavon Lake Recreation Area: US Army Corps of Engineers

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Navarro Mills Lake Recreation Area: US Army Corps of Engineers

Hagerman NWR: US Fish and Wildlife Service

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Aquilla Wildlife Management Area: Texas Parks and Wildlife Department

Mountain Creek Lake Park: City of Duncanville

Rochester Park: City of Dallas

Fort Worth Nature Center: Tarrant County

Lake Whitney Recreation Area: US Army Corps of Engineers
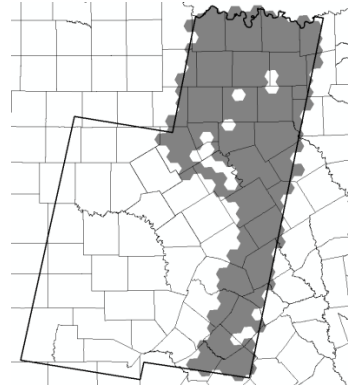
Central Texas: Floodplain Herbaceous Vegetation

Area in Phase 1: 636,140 acres (257,440 ha)

Description of Mapped Type: Floodplains of the region that lack a significant overstory or shrub canopy, but retain cover in the herbaceous layer. Non-native grass species such as Bermuda grass and Johnsongrass may frequently dominate this vegetation type, and scattered shrubs such as mesquite and juniper are common. Eastern gamagrass or switchgrass may dominate some lowland sites.

Where to Visit:

Lake Lewisville Recreation Area: US Army Corps of Engineers

Navarro Mills Lake Recreation Area: US Army Corps of Engineers

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Lavon Lake Recreation Area: US Army Corps of Engineers

Lake Whitney Recreation Area: US Army Corps of Engineers

Aquilla Wildlife Management Area: Texas Parks and Wildlife Department

Dinosaur Valley State Park: Texas Parks and Wildlife Department

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Hagerman NWR: US Fish and Wildlife Service

Ham Creek Park: City of Blum

Springfield Park: City of Rowlett
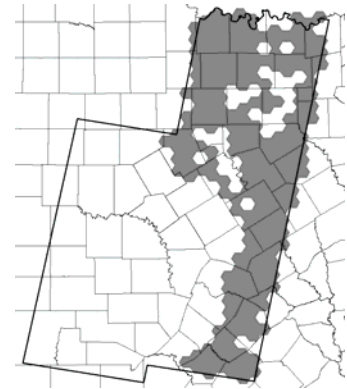
Central Texas: Floodplain Evergreen Forest

Area in Phase 1: 2,590 acres (1,050 ha)

Description of Mapped, Type: The canopy of this mainly evergreen forest is dominated by junipers, usually eastern redcedar but Ashe juniper and redberry juniper may also be present. Plateau live oak or coastal live oak may be present, along with deciduous trees such as cedar elm, sugar hackberry, pecan, and American elm. Some areas near the Bastrop Lost Pines are dominated by loblolly pine.

Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department

South Shores Park: Lower Colorado River Authority

Lake Whitney Recreation Area: US Army Corps of Engineers
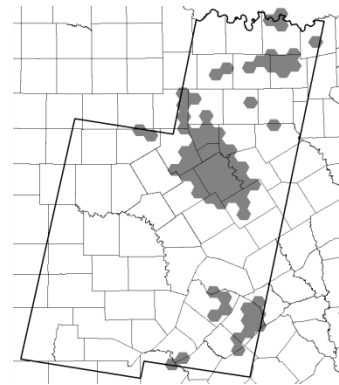
Central Texas: Floodplain Live Oak Forest

Area in Phase 1: 4,040 acres (1,635 ha)

Description of Mapped Type: This forest contains plateau live oak or coastal live oak in the canopy. Deciduous species such as cedar elm, sugar elm, pecan, and American elm may be present. Eastern redcedar may also be present in some areas.

Where to Visit:

Lavon Lake Recreation Area: US Army Corps of Engineers

Lake Lewisville Recreation Area: US Army Corps of Engineers

Ham Creek Park: City of Blum

Hagerman NWR: US Fish and Wildlife Service
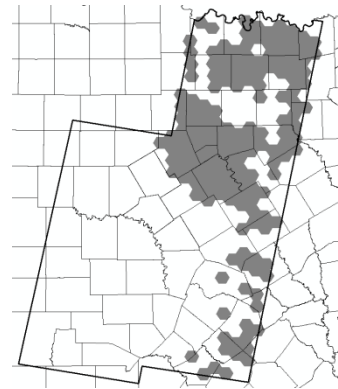
Central Texas: Riparian Deciduous Shrubland

Area in Phase 1: 19,305 acres (7,810 ha)

Description of Mapped Type: Shrublands in riparian sites dominated by deciduous shrubs such as possumhaw, mesquite, black willow, roughleaf dogwood, or common buttonbush.

Where to Visit:

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Lake Whitney Recreation Area: US Army Corps of Engineers

Navarro Mills Lake Recreation Area: US Army Corps of Engineers
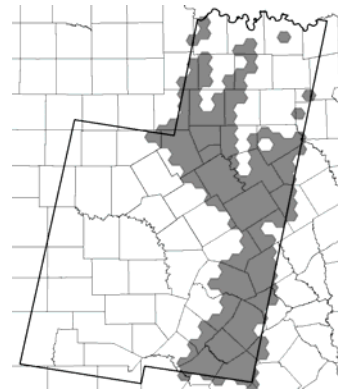
Central Texas: Riparian Evergreen Shrubland

Area in Phase 1: 4,320 acres (1,750 ha)

Description of Mapped Type: Shrublands in riparian sites that are dominated by junipers or, sometimes broadleaf evergreen shrubs such as yaupon. The juniper is usually eastern redcedar, but may be Ashe juniper or redberry juniper in some areas.

Where to Visit:

Lake Whitney Recreation Area: US Army Corps of Engineers

Ham Creek Park: City of Blum

Lake Waco Recreation Area: US Army Corps of Engineers

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department
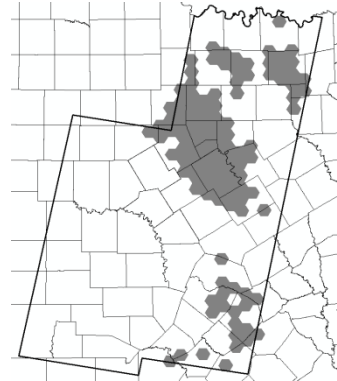
Central Texas: Riparian Hardwood / Evergreen Forest

Area in Phase 1: 33,360 acres (13,500 ha)

Description of Mapped Type: This type often contains a mix of evergreen species, including junipers, or plateau live oak or coastal live oak, and deciduous species such as cedar elm, sugar hackberry, American sycamore, and eastern cottonwood in the canopy.

Where to Visit:

Lake Whitney Recreation Area: US Army Corps of Engineers

Bastrop State Park: Texas Parks and Wildlife Department

McKinney Roughs: Lower Colorado River Authority

Dinosaur Valley State Park: Texas Parks and Wildlife Department

Caddo National Grassland – Lake Fannin: US Forest Service

Ham Creek Park: City of Blum

Buescher State Park: Texas Parks and Wildlife Department

Cedar Hill State Park: Texas Parks and Wildlife Department
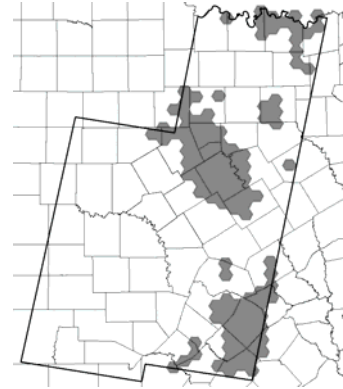
Central Texas: Riparian Hardwood Forest

Area in Phase 1: 173,920 acres (70,385 ha)

Description of Mapped Type: These forests are dominated by deciduous trees such as sugar hackberry, cedar elm, American sycamore, eastern cottonwood, western soapberry, black willow, and ashes in the overstory. Plateau live oak or coastal live oak may also be a component.

Where to Visit:

Lake Lewisville Recreation Area: US Army Corps of Engineers

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Lavon Lake Recreation Area: US Army Corps of Engineers

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Lake Whitney Recreation Area: US Army Corps of Engineers

Hagerman NWR: US Fish and Wildlife Service

Lake Mineral Wells State Park: Texas Parks and Wildlife Department

Cedar Hill State Park: Texas Parks and Wildlife Department

Aquilla Wildlife Management Area: Texas Parks and Wildlife Department
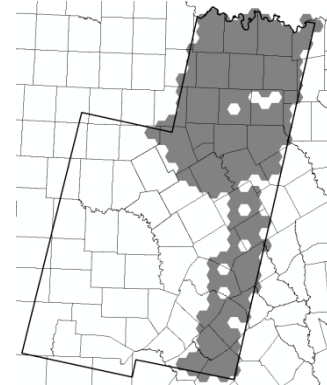
Central Texas: Riparian Herbaceous Vegetation

Area in Phase 1: 163,845 acres (66,305 ha)

Description of Mapped Type: These riparian areas lack significant overstory or shrub canopy but retain herbaceous cover. Sites may be dominated by Bermuda grass, little bluestem, Texas wintergrass, Virginia wildrye, or other grass species. Eastern gamagrass or switchgrass may dominate some lowland areas.

Where to Visit:

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Lake Lewisville Recreation Area: U. S. Corps of Engineers

Lake Whitney Recreation Area: U. S. Corps of Engineers

Lake Waco Recreation Area: U. S. Corps of Engineers

Clymer Meadow Preserve: The Nature Conservancy

Hagerman National Wildlife Refuge: U. S. Fish and Wildlife Service
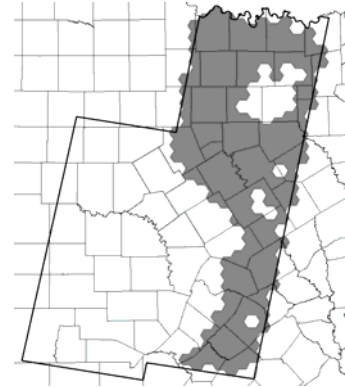
Central Texas: Riparian Evergreen Forest

Area in Phase 1: 5,415 acres (2,190 ha)

Description of Mapped Type: Riparian forest with the canopy dominated by either eastern redcedar or Ashe juniper, or rarely redberry juniper in areas to the west and south (just north of the Edwards Plateau) within Phase 1.
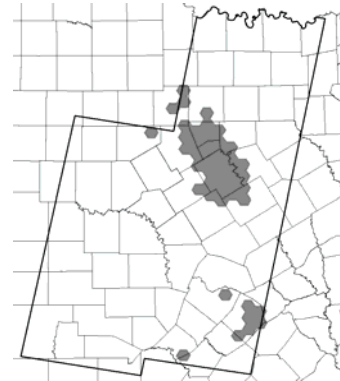
Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department

Lake Whitney Recreation Area: U. S. Corps of Engineers

Buescher State Park: Texas Parks and Wildlife Department

Cleburne State Park: Texas Parks and Wildlife Department

Ham Creek Park: City of Blum

Central Texas: Riparian Live Oak Forest

Area in Phase 1: 2,020 acres (820 ha)

Description of Mapped Type: Plateau live oak or coastal live oak are major components of the canopy. Deciduous species such as cedar elm, sugar hackberry, American sycamore, and western soapberry may also be present, as well as either eastern redcedar or Ashe juniper.

Where to Visit:

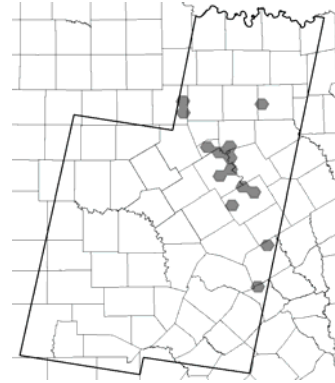Lake Whitney Recreation Area: U. S. Corps of Engineers
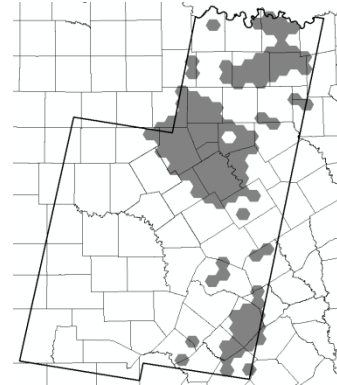
Central Texas: Wooded Cliff/Bluff

Area in Phase 1: 22 acres (9 ha)

Description of Mapped Type: This type is only mapped in a few areas with slopes over 100% that support shrubs or trees, especially along the Brazos River upstream from Waco.

Where to Visit:

Lake Whitney Recreation Area: U. S. Corps of Engineers
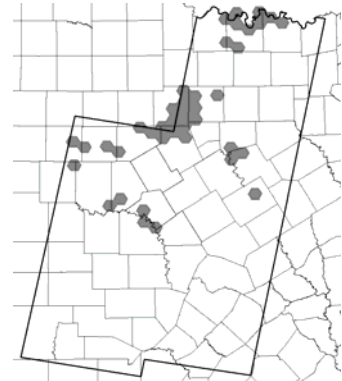
Crosstimbers: Hardwood / Juniper Slope Forest

Area in Phase 1: 8,900 acres (3,600 ha)

Description of Mapped Type: Deciduous species such as Texas oak, chinkapin oak, cedar elm, and post oak may share dominance with Ashe juniper or eastern redcedar (to the north) in this mixed forest. Plateau live oak may also be a component. Understory species may include Texas persimmon, elbowbush, and Texas redbud. This type usually occurs on limestone within the generally sandier Crosstimbers ecoregion.

Where to Visit:

Lake Whitney Recreation Area: U. S. Corps of Engineers

Lake Mineral Wells State Park: Texas Parks and Wildlife Department

Crosstimbers: Juniper Slope Forest

Area in Phase 1: 4,650 acres (1,880 ha)

Description of Mapped Type: Ashe juniper dominates this evergreen forest, and plateau live oak, Texas oak, cedar elm, and sugar hackberry may be in the overstory. Understory species may include Texas persimmon, Texas redbud, and elbowbush. This type occurs on limestone within the generally sandy Crosstimbers ecoregions.

Where to Visit:

Lake Mineral Wells State Park: Texas Parks and Wildlife Department

Lake Whitney Recreation Area: U. S. Corps of Engineers
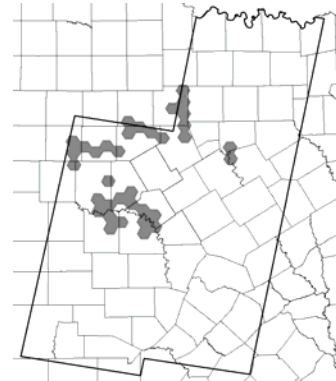
Crosstimbers: Live Oak Forest and Woodland

Area in Phase 1: 540 acres (220 ha)

Description of Mapped Type: Description of Mapped Type: Plateau live oak together with post oak, eastern redcedar, and cedar elm may be in the overstory. Mesquite may be a component of the understory.

Where to Visit:

None
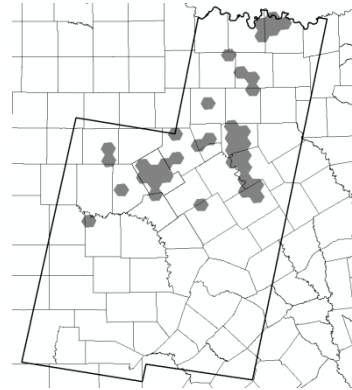
Crosstimbers: Oak / Hardwood Slope Forest

Area in Phase 1: 73,580 acres (29,775 ha)

Description of Mapped Type: Post oak, Texas oak, chinkapin oak, bur oak, and blackjack oak, along with other deciduous trees such as cedar elm and sugar hackberry, may share dominance in this mainly deciduous forest. Plateau live oak may be a component, and Ashe juniper or eastern redcedar may appear in the canopy or understory.

Where to Visit:

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Lake Mineral Wells State Park: Texas Parks and Wildlife Department

Lake Lewisville Recreation Area: U. S. Corps of Engineers

Grapevine Lake Recreation Area: U. S. Corps of Engineers

Fort Worth Nature Center: Tarrant County

LBJ National Grassland, Cross Timbers Research Natural Area: U. S. Forest Service

Lake Brownwood State Park: Texas Parks and Wildlife Department
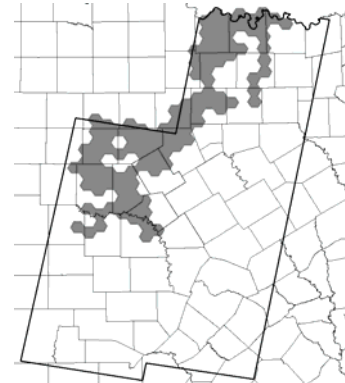
Crosstimbers: Post Oak / Juniper Woodland

Area in Phase 1: 88,345 acres (35,751 ha)

Description of Mapped Type: This type may be dominated by post oak and eastern redcedar if over sandy substrates or in the north, or by Texas oak, plateau live oak, and Ashe juniper if over limestone substrate in the central, western, and southern Crosstimbers. Cedar elm and sugar hackberry may be canopy trees in either situation.
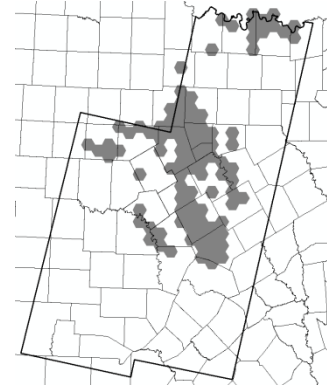
Where to Visit:

Lake Whitney Recreation Area: U. S. Corps of Engineers

Hagerman National Wildlife Refuge: U. S. Fish and Wildlife Service

Caddo National Grasslands – Lake Fannin: U. S. Forest Service

Ham Creek Park: City of Blum

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Crosstimbers: Post Oak Woodland

Area in Phase 1: 1,087,475 acres (440,085 ha)

Description of Mapped Type: Post oak, blackjack oak, black hickory, cedar elm, sugar hackberry, and plateau live oak are common overstory dominants of this mainly deciduous woodland. Eastern redcedar may be a component, and relatively dense mesquite cover may occur. A few areas over limestone may appear more like the Edwards Plateau: Oak / Hardwood Motte and Woodland type.

Where to Visit:

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Lake Lewisville Recreation Area: U. S. Corps of Engineers

Grapevine Lake Recreation Area: U. S. Corps of Engineers

Hagerman National Wildlife Refuge: U. S. Fish and Wildlife Service

Lake Whitney Recreation Area: U. S. Corps of Engineers

Aquilla Wildlife Management Area: Texas Parks and Wildlife Department

Lake Mineral Wells State Park: Texas Parks and Wildlife Department

Fort Worth Nature Center: Tarrant County

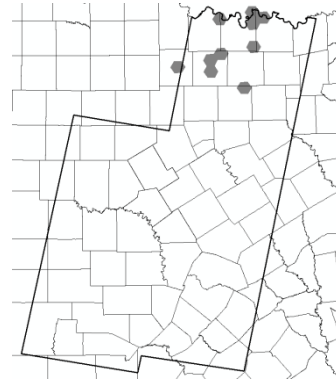LBJ National Grassland, Cross Timbers Research Natural Area: U. S. Forest Service
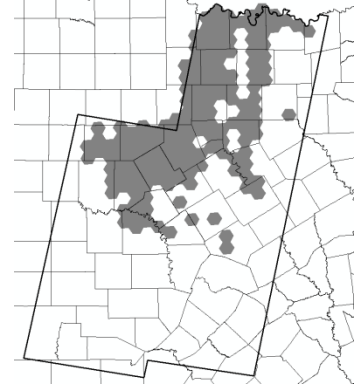
Crosstimbers: Redcedar Forest and Woodland

Area in Phase 1: 545 acres (220 ha)

Description of Mapped Type: This type is dominated by eastern redcedar and is particularly well-represented in the vicinity of the Red River. Post oak and cedar elm may also be present in the canopy.

Where to Visit:

None

Crosstimbers: Sandyland Oak Woodland

Area in Phase 1: 66,030 acres (26,720 ha)

Description of Mapped Type: Post oak and blackjack oak are common dominants of this mainly deciduous woodland, and black hickory, cedar elm, sugar hackberry, and Texas oak may be important in the overstory. Ashe juniper and mesquite are common shrub species.

Where to Visit:

Fort Worth Nature Center: Tarrant County

Lake Whitney State Park: Texas Parks and Wildlife Department

LBJ National Grassland, Cross Timbers Research Natural Area: U. S. Forest Service
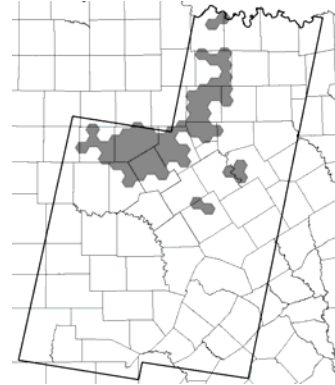
Crosstimbers: Savanna Grassland

Area in Phase 1: 1,997,480 acres (808,350 ha)

Description of Mapped Type: This type includes grassland in many different conditions, including areas dominated by non-native Bermuda grass and King Ranch bluestem with grazing-tolerant forbs such as broomweed and western ragweed, as well as areas with native species such as little bluestem, Texas wintergrass, Indiangrass, silver bluestem, and sideoats grama. Mesquite is a common shrub, and this mapped type may include some areas with fairly dense mesquite cover.

Where to Visit:

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Lake Lewisville Recreation Area: U. S. Corps of Engineers

Aquilla Wildlife Management Area: Texas Parks and Wildlife Department

Hagerman National Wildlife Refuge: U. S. Fish and Wildlife Service

Fort Worth Nature Center: Tarrant County
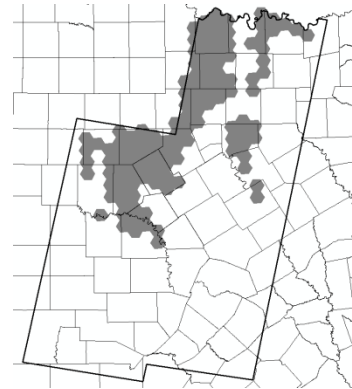
Edwards Plateau: Ashe Juniper / Live Oak Shrubland

Area in Phase 1: 2,159,135 acres (873,770 ha)

Description of Mapped Type: Ashe juniper and plateau live oak are the most frequent dominants of this evergreen shrubland. Plateau live oak trees may form a sparse canopy and Vasey oak (west), white shin oak, Mohr's shin oak (west), Texas mountain-laurel, and evergreen sumac may be present. This type is usually mapped on moderate slopes, and is similar to the Native Invasive: Juniper Shrubland where the two occur together, but the latter is mapped on 'better' (deeper, more moist) soils.

Where to Visit:

Devil's Sinkhole State Natural Area: Texas Parks and Wildlife Department

Walter Buck Wildlife Management Area: Texas Parks and Wildlife Department

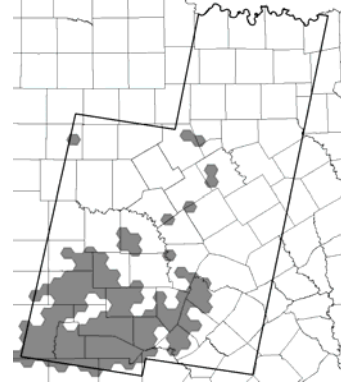Hill Country State Natural Area: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Barton Creek habitat Preserve: The Nature Conservancy
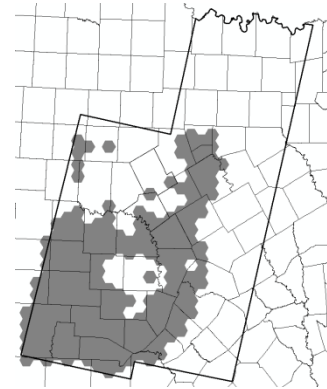
Edwards Plateau: Ashe Juniper / Live Oak Slope Shrubland

Area in Phase 1: 237,930 acres (96,290 ha)

Description of Mapped Type: This type is similar to the Edwards Plateau: Ashe Juniper / Live Oak Shrubland but is mapped on slopes >20%. Species such as evergreen sumac and Lindheimer's silk-tassel are more frequent on this type versus the former.

Where to Visit:

Hill Country State Natural Area: Texas Parks and Wildlife Department

Walter Buck Wildlife Management Area: Texas Parks and Wildlife Department

Devil's Sinkhole State Natural Area: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Garner State Park: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Edwards Plateau: Ashe Juniper Motte and Woodland

Area in Phase 1: 1,050,490 acres (425,120 ha)

Description of Mapped Type: Ashe juniper and plateau live oak are the most frequent dominants of this evergreen woodland. Some areas are characterized by nearly pure stands of Ashe juniper, while others have taller plateau live oaks with an understory of smaller Ashe juniper. Lacey oak and papershell pinyon may be important to the west, and white shin oak in the central and eastern part of the range. Persimmon and agarito are common shrubs.

Where to Visit:

Pedernales Falls State Park: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Barton Creek Habitat Preserve: The Nature Conservancy

Government Canyon State Natural Area: Texas Parks and Wildlife Department

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Hill Country State Natural Area: Texas Parks and Wildlife Department
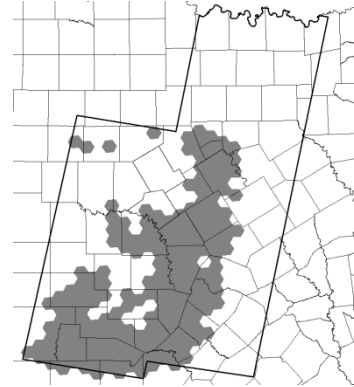
Edwards Plateau: Ashe Juniper Slope Forest

Area in Phase 1: 353,415 acres (143,020 ha)

Description of Mapped Type: Ashe juniper and plateau live oak are often the most dominant species of this mainly evergreen woodland or forest, and other oaks such as Texas oak, Lacey oak (west), and white shin oak may be important. Ashe juniper is often the most important understory species, along with species such as Texas persimmon, Texas mountain-laurel, and fragrant mimosa.

Where to Visit:

Hill Country State Natural Area: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Colorado Bend State Park: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Government Canyon State Natural Area: Texas Parks and Wildlife Department

Lost Maples State Natural Area: Texas Parks and Wildlife Department

Emma Long Metropolitan Park: City of Austin
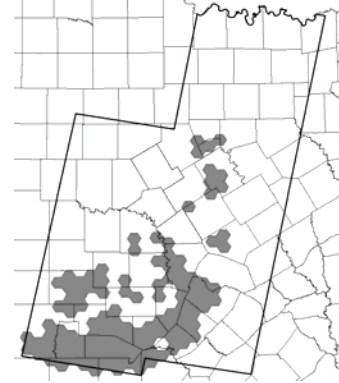
Edwards Plateau: Barren or Grassy Cliff/Bluff

Area in Phase 1: 85 acres (34 ha)

Description of Mapped Type: This type is mapped on slopes >100%, primarily on cliffs or bluffs associated with stream valleys. It is either steep enough to be barren or may support sparse grasses such as old-field three-awn, hairy grama, and Texas grama.

Where to Visit:

None
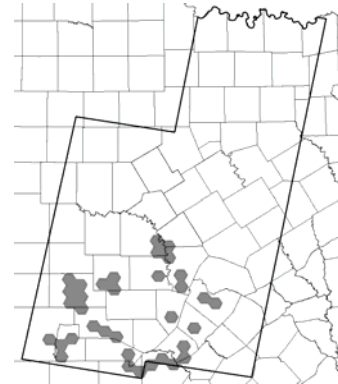
Edwards Plateau: Deciduous Oak / Evergreen Motte and Woodland

Area in Phase 1: 680,115 acres (275,230 ha)

Description of Mapped Type: This mixed woodland type contains significant variation, but deciduous oaks such as Texas oak, white shin oak, or lacey oak (west) are often important in the overstory, together with Ashe juniper, plateau live oak, cedar elm, or sugar hackberry. The understory often contains Ashe juniper and plateau live oak, and Texas persimmon, agarito, and Texas mountain-laurel are common.

Where to Visit:

Balcones Canyonland National Wildlife Refuge: U. S. Fish and Wildlife Service

Government Canyon State Natural Area: Texas Parks and Wildlife Department

Dinosaur Valley State Park: Texas Parks and Wildlife Department

Barton Creek Habitat Preserve: The Nature Conservancy

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Guadalupe River State Park: Texas Parks and Wildlife Department

Barton Creek Greenbelt: City of Austin

Meridian State Park: Texas Parks and Wildlife Department
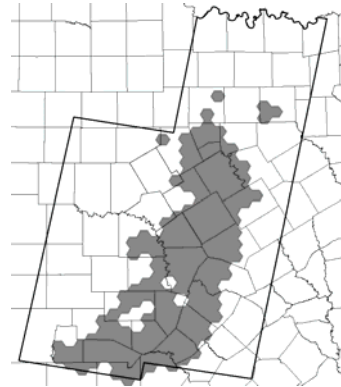
Edwards Plateau: Floodplain Ashe Juniper Forest

<u>Area in Phase 1:</u> 11,390 acres (4,610 ha)

<u>Description of Mapped Type:</u> Ashe juniper and plateau live oak are frequent canopy dominants of this primarily disturbance type woodland or forest.

<u>Where to Visit:</u>

Garner State Park: Texas Parks and Wildlife Department
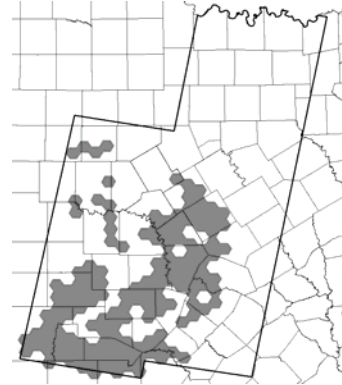
Barton Creek Greenbelt: City of Austin

Hill Country State Natural Area: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Guadalupe River State Park: Texas Parks and Wildlife Department

Edwards Plateau: Floodplain Ashe Juniper Shrubland

Area in Phase 1: 50,890 acres (20,595 ha)

Description of Mapped Type: Ashe juniper, plateau live oak, and mesquite are frequent components of this mainly disturbance evergreen shrubland.

Where to Visit:

Hill Country State Natural Area: Texas Parks and Wildlife Department
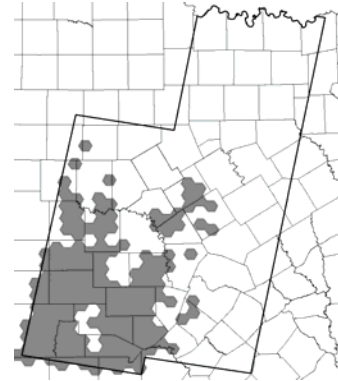
Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Pedernales Falls State Park: Texas Parks and Wildlife Department

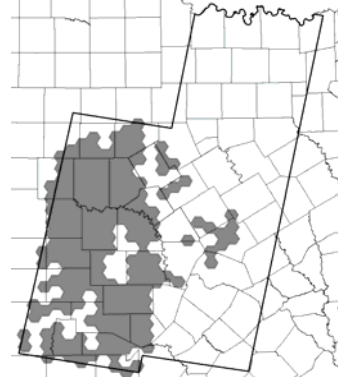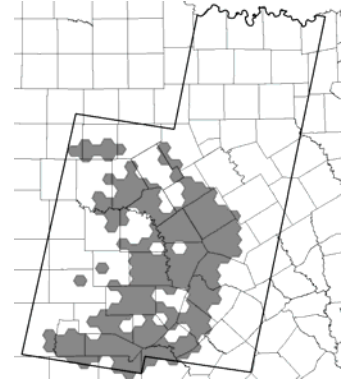South Llano River State Park: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

Lost Maples State Natural Area: Texas Parks and Wildlife Department

Edwards Plateau: Floodplain Deciduous Shrubland

Area in Phase 1: 113,990 acres (46,130 ha)

Description of Mapped Type: This type contains various shrublands, and mesquite, cedar elm, and plateau live oak (scattered trees or shrubs) are common components. Huisache, western soapberry, little walnut, sugar hackberry, Ashe juniper, and common buttonbush may be components.

Where to Visit:

Stillhouse Hollow Lake Recreation Area: U. S. Corps of Engineers

Belton Lake Recreation Area: U. S. Corps of Engineers

South Llano River State Park: Texas Parks and Wildlife Department

Hill Country State Natural Area: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

Lost Maples State Natural Area: Texas Parks and Wildlife Department

Enchanted Rock State Park: Texas Parks and Wildlife Department

Pedernales River State Park: Texas Parks and Wildlife Department

Edwards Plateau: Floodplain Hardwood / Ashe Juniper Forest

Area in Phase 1: 26,060 acres (10,550 ha)

Description of Mapped Type: Ashe juniper trees or shrubs are a primary component of this mixed forest type. Cedar elm, plateau live oak, pecan, American elm, sugar hackberry, pecan, bur oak, and sycamore may be present.

Where to Visit:

Belton Lake Recreation Area: U. S. Corps of Engineers

Barton Creek Greenbelt: City of Austin

Hill Country State Natural Area: Texas Parks and Wildlife Department

Stillhouse Hollow Lake Recreation Area: U. S. Corps of Engineers

Guadalupe River State Park: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Barton Creek Habitat Preserve: The Nature Conservancy

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Edwards Plateau: Floodplain Hardwood Forest

Area in Phase 1: 207,150 acres (83,830 ha)

Description of Mapped Type: Cedar elm, American elm, pecan, plateau live oak, bur oak, western soapberry, Arizona walnut, green ash, and plateau live oak are common components of this broadly-circumscribed mainly deciduous forest. Understory species may include gum bumelia, roughleaf dogwood, red mulberry, Texas persimmon, and possumhaw.

Where to Visit:

Belton Lake Recreation Area: U. S. Corps of Engineers

Stillhouse Hollow Lake Recreation Area: U. S. Corps of Engineers

South Llano River State Park: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Mother Neff State Park: Texas Parks and Wildlife Department

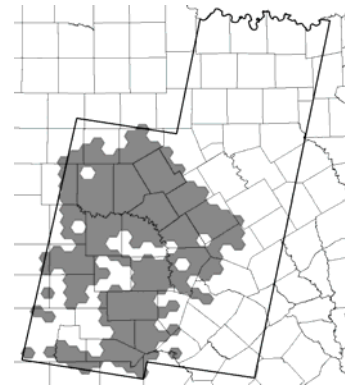Pedernales Falls State Park: Texas Parks and Wildlife Department

Guadalupe River State Park: Texas Parks and Wildlife Department

Enchanted Rock State Park: Texas Parks and Wildlife Department
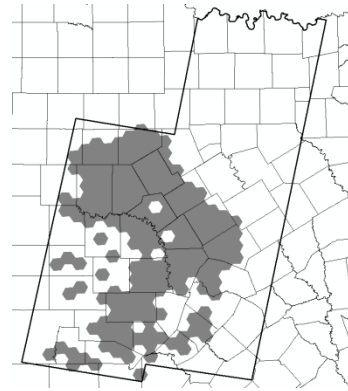
Edwards Plateau: Floodplain Herbaceous Vegetation

Area in Phase 1: 306,015 acres (123,840 ha)

Description of Mapped Type: This mapped type circumscribes various grasslands, including areas dominated by Bermuda grass or King Ranch bluestem. Native species that may be present, common, or dominant include switchgrass, bushy bluestem, Virgina wildrye, Texas wintergrass, little barley, eastern gamagrass, and Lindheimer muhly. Plateau live oak trees and mesquite trees or shrubs are often components of these grasslands.

Where to Visit:

Stillhouse Hollow Lake Recreation Area: U. S. Corps of Engineers

Hill Country State Natural Area: Texas Parks and Wildlife Department

Belton Lake Recreation Area: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

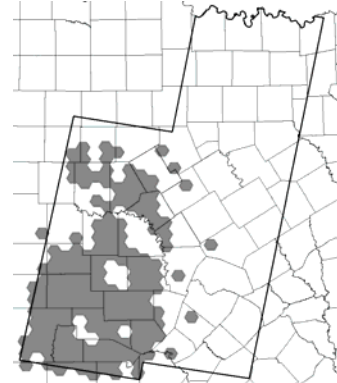South Llano River State Park: Texas Parks and Wildlife Department

Guadalupe River State Park: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Emma Long Metropolitan Park: City of Austin

Edwards Plateau: Floodplain Live Oak Forest

Area in Phase 1: 50,295 acres (20,355 ha)

Description of Mapped Type: Plateau live oak is a dominant canopy tree, together with deciduous trees such as cedar elm, sugar hackberry, pecan, and Texas ash. Ashe juniper may be present as a tree or understory shrub.

Where to Visit:

Hill Country State Natural Area: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

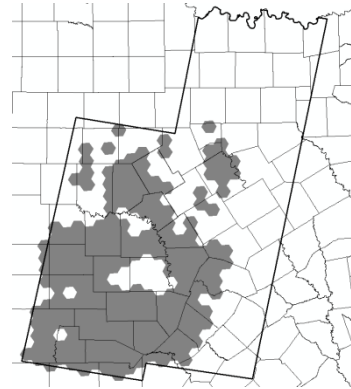Lost Maples State Natural Area: Texas Parks and Wildlife Department

Enchanted Rock State Park: Texas Parks and Wildlife Department

South Llano River State Park: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Guadalupe River State Park: Texas Parks and Wildlife Department

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Edwards Plateau: Live Oak Motte and Woodland

Area in Phase 1: 1,568,390 acres (634,705 ha)

Description of Mapped Type: Plateau live oak dominates this evergreen woodland, and Ashe juniper is the most frequent understory species. Ashe juniper may also appear in the overstory, along with Texas oak, white shin oak, Lacey oak (west), and post oak. Frequent shrubs include Texas persimmon and agarito.

Where to Visit:

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Hill Country State Natural Area: Texas Parks and Wildlife Department

Guadalupe River State Park: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Devil's Sinkhole State Natural Area: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Edwards Plateau: Live Oak Slope Forest

Area in Phase 1: 41,020 acres (16,600 ha)

Description of Mapped Type: Plateau live oak is the most important tree of this mainly evergreen slope woodland or forest, but Ashe juniper and deciduous trees such as Texas oak, Lacey oak (west), white shin oak, cedar elm, and sugar (or netleaf) hackberry may be important in the overstory. The understory may contain Ashe juniper along with species such as Texas persimmon and Texas mountain-laurel.

Where to Visit:

Hill Country State Natural Area: Texas Parks and Wildlife Department

Lost Maples State Natural Area: Texas Parks and Wildlife Department

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Walter Buck Wildlife Management Area: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Old Tunnel Wildlife Management Area: Texas Parks and Wildlife Department
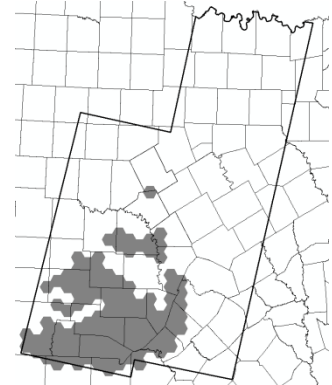
Edwards Plateau: Oak / Ashe Juniper Slope Forest

Area in Phase 1: 258,895 acres (104,770 ha)

Description of Mapped Type: Deciduous oaks such as Texas oak, Lacey oak (west), white shin oak, and chinkapin oak share dominance with Ashe juniper in this mixed woodland or forest. Other deciduous trees such as cedar elm, netleaf hackberry, escarpment black cherry, and Arizona walnut may be in the canopy. Understory species may include red buckeye, Texas redbud, and roughleaf dogwood, along with Ashe juniper.

Where to Visit:

Lost Maples State Natural Area: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Belton Lake Recreation Area: U. S. Corps of Engineers

Stillhouse Hollow Lake Recreation Area: U. S. Corps of Engineers

Hill Country State Natural Area: Texas Parks and Wildlife Department

Barton Creek Greenbelt: City of Austin

Government Canyon State Natural Area: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department
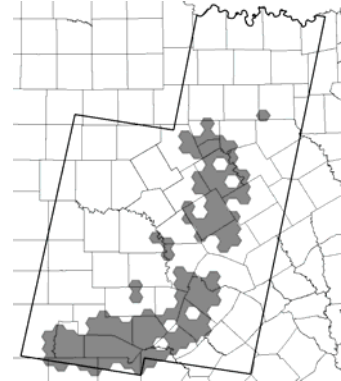
Edwards Plateau: Oak / Hardwood Motte and Woodland

Area in Phase 1: 894,305 acres (361,915 ha)

Description of Mapped Type: This deciduous woodland or forest may contain a diversity of species in the overstory, including cedar elm, Texas oak, sugar hackberry, post oak, white shin oak, or pecan. Plateau live oak is often an important component, and Ashe juniper may be in the overstory as well as the understory. Some areas of dense white shin oak shrubland and highly productive (especially tame) grassland are mapped as this type.

Where to Visit:

Belton Lake Recreation Area: U. S. Corps of Engineers

Stillhouse Hollow Lake Recreation Area: U. S. Corps of Engineers

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Kerr Wildlife Management Area: Texas Parks and Wildlife Department
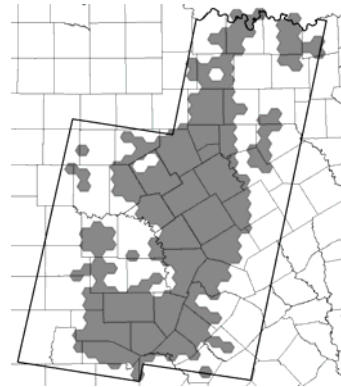
Edwards Plateau: Oak / Hardwood Slope Forest

Area in Phase 1: 153,375 acres (62,070 ha)

Description of Mapped Type: A fairly wide diversity of deciduous trees such as Texas oak, Lacey oak (west) white shin oak, chinkapin oak, bigtooth maple (local), Texas ash, escarpment black cherry, Arizona walnut, cedar elm, and sugar hackberry may be in the overstory of this mainly deciduous woodland or forest. Plateau live oak is often important in the canopy. The understory may also contain a diversity of woody plants such as elbowbush, roughleaf dogwood, Texas redbud, red buckeye, Mexican buckeye, Jersey tea, Carolina buckthorn, and rusty blackhaw. Dense deciduous shrublands, such as white shin oak shrubland, may sometimes be mapped as this type.

Where to Visit:

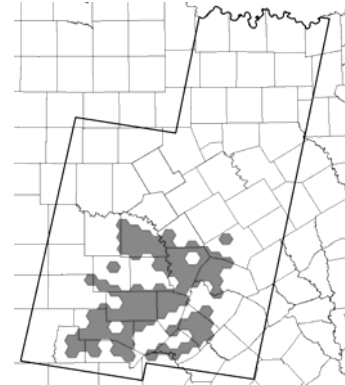Belton Lake Recreation Area: U. S. Corps of Engineers

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Lost Maples State Natural Area: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Cedar Hill State Park: Texas Parks and Wildlife Department
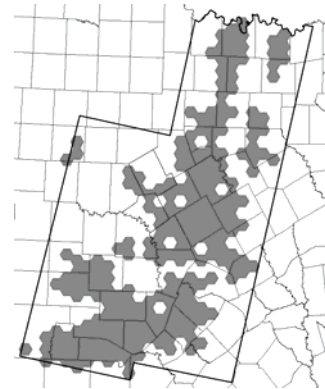
Edwards Plateau: Playa

<u>Area in Phase 1:</u> 155 acres (63 ha)

<u>Description of Mapped Type:</u> Buffalograss, white tridens, tobosa, yellow stonecrop, and cane bluestem are common components of this type, which is mapped on upland depressions and shallow lakebeds.

<u>Where to Visit:</u>

None
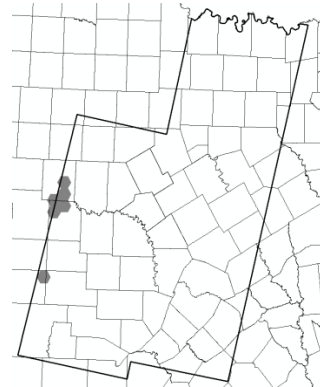
Edwards Plateau: Post Oak Motte and Woodland

Area in Phase 1: 93,910 acres (38,000 ha)

Description of Mapped Type: Post oak and plateau live oak are often the most important overstory dominants of this mainly deciduous woodland, and cedar elm, blackjack oak, Texas oak, and sugar hackberry are often present. Ashe juniper may be in the overstory and understory.

Where to Visit:

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

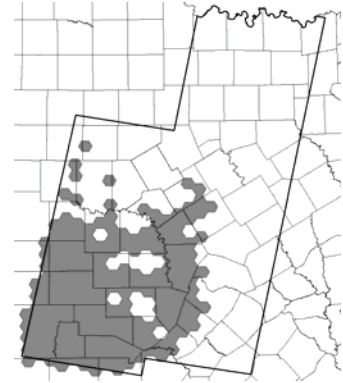Colorado Bend State Park: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Edwards Plateau: Riparian Ashe Juniper Forest

Area in Phase 1: 55,485 acres (22,455 ha)

Description of Mapped Type: Ashe juniper, plateau live oak, and sugar hackberry trees are common dominants of this narrow evergreen woodland along mainly first-order streams.

Where to Visit:

Pedernales Falls State Park: Texas Parks and Wildlife Department

Barton Creek Habitat Preserve: The Nature Conservancy

Colorado Bend State Park: Texas Parks and Wildlife Department

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Government Canyon State Natural Area: Texas Parks and Wildlife Department

Hill Country State Natural Area: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department
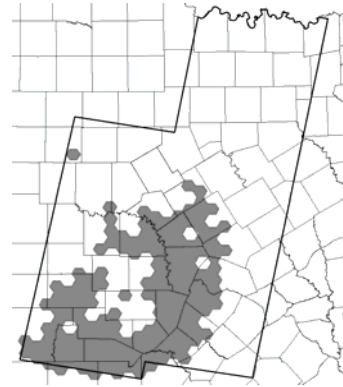
Edwards Plateau: Riparian Ashe Juniper Shrubland

Area in Phase 1: 103,840 acres (42,025 ha)

Description of Mapped Type: Ashe juniper and Texas persimmon are common dominants of this narrow evergreen shrubland along mainly first-order streams. Plateau live oak, cedar elm, sugar hackberry, or Texas oak trees may form a sparse canopy.

Where to Visit:

Devil's Sinkhole State Natural Area: Texas Parks and Wildlife Department

Hill Country State Natural Area: Texas Parks and Wildlife Department

Walter Buck Wildlife Management Area: Texas Parks and Wildlife Department

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Inks Lake State Park: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Edwards Plateau: Riparian Deciduous Shrubland

Area in Phase 1: 88,700 acres (35,900 ha)

Description of Mapped Type: A variety of small trees or shrubs such as black willow, sugar hackberry, mesquite, desert willow, Baccharis, Texas persimmon, little walnut, or whitebrush may dominate this broadly circumscribed type.

Where to Visit:

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Enchanted Rock State Park: Texas Parks and Wildlife Department

Hill Country State Natural Area: Texas Parks and Wildlife Department

South Llano River State Park: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Lost Maples State Natural Area: Texas Parks and Wildlife Department
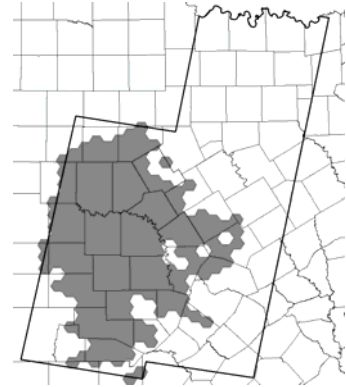
Edwards Plateau: Riparian Hardwood / Ashe Juniper Forest

Area in Phase 1: 50,940 acres (20,615 ha)

Description of Mapped Type: Ashe juniper and plateau live oak are the frequent dominant trees of this mixed forest, and cedar elm, American sycamore, green ash, and sugar hackberry are common trees.

Where to Visit:

Belton Lake Recreation Area: U. S. Corps of Engineers

Stillhouse Hollow Lake Recreation Area: U. S. Corps of Engineers

Barton Creek Habitat Preserve: The Nature Conservancy

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Government Canyon State Natural Area: Texas Parks and Wildlife Department

Lost Maples State Natural Area: Texas Parks and Wildlife Department
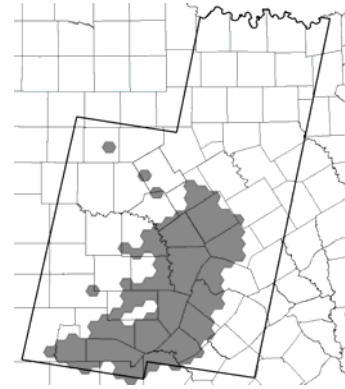
Edwards Plateau: Riparian Hardwood Forest

<u>Area in Phase 1:</u> 99,510 acres (40,270 ha)

<u>Description of Mapped Type:</u> This narrow, deciduous forest may contain cedar elm, plateau live oak, Texas oak, sugar hackberry, American sycamore, green ash, pecan, or boxelder as important overstory trees. Ashe juniper, elbowbush, Texas persimmon, whitebrush, false-willow, little walnut, or buttonbush may be present in the shrub layer.

<u>Where to Visit:</u>

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Belton Lake Recreation Area: U. S. Corps of Engineers

Stillhouse Hollow Lake Recreation Area: U. S. Corps of Engineers

Enchanted Rock State Park: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Guadalupe River State Park: Texas Parks and Wildlife Department
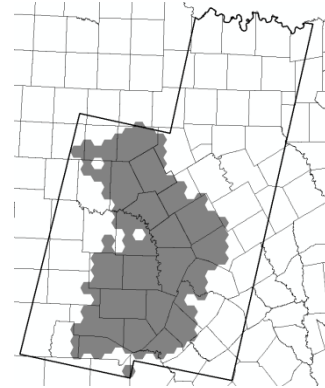
Edwards Plateau: Riparian Herbaceous Vegetation

Area in Phase 1: 173,860 acres (70,360 ha)

Description of Mapped Type: This is a broadly-defined grassland that is often dominated by King Ranch bluestem or Bermuda grass in the modern landscape, and Johnsongrass is a common component. Plateau live oak and Ashe juniper trees or shrubs often form a sparse canopy. Important native grasses may include bushy bluestem, switchgrass, southwestern bristelgrass, Texas wintergrass, Lindheimer muhly, sideoats grama, curlymesquite, and eastern gamagrass.

Where to Visit:

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Stillhouse Hollow Lake Recreation Area: U. S. Corps of Engineers

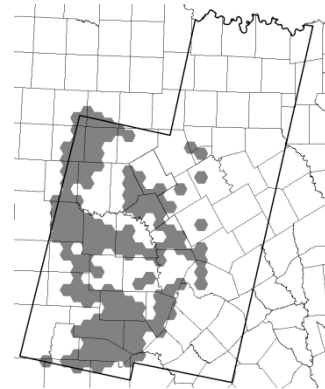Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Enchanted Rock State Park: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Hill Country State Natural Area: Texas Parks and Wildlife Department
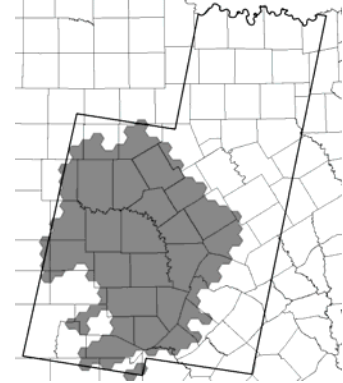
Edwards Plateau: Riparian Live Oak Forest

<u>Area in Phase 1:</u> 82,970 acres (33,575 ha)

<u>Description of Mapped Type:</u> Plateau live oak and Ashe juniper are the common canopy dominants of this mainly evergreen forest. Other important species may include sugar hackberry, pecan, Texas oak, cedar elm, and little walnut.

<u>Where to Visit:</u>

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Hill Country State Natural Area: Texas Parks and Wildlife Department

Guadalupe River State Park: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Colorado Bend State Park: Texas Parks and Wildlife Department

Walter Buck Wildlife Management Area: Texas Parks and Wildlife Department
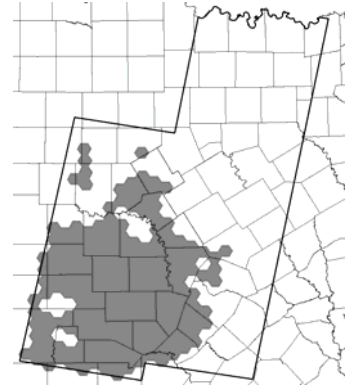
Edwards Plateau: Savanna Grassland

Area in Phase 1: 2,244,455 acres (908,300 ha)

Description of Mapped Type: Grassland condition varies for this mapped type, but many areas contain non-native King Ranch bluestem as an important species, and Bermuda grass is also frequent. Common native grasses include little bluestem, sideoats grama, silver bluestem, Texas wintergrass, purple three-awn, and common curlymesquite. Trees and shrubs are usually present, and may include plateau live oak, Ashe juniper, mesquite, agarito or cedar elm. Shrub cover may be dense enough to qualify as shrubland rather than grassland in some areas.

Where to Visit:

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

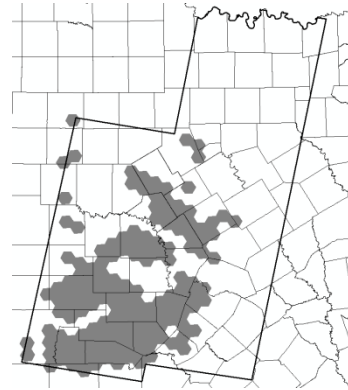Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Hill Country State Natural Area: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

Honey Creek State Natural Area: Texas Parks and Wildlife Department

Guadalupe River State Park: Texas Parks and Wildlife Department
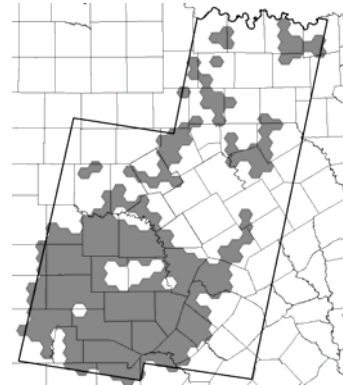
Edwards Plateau: Shin Oak Shrubland

Area in Phase 1: 258,870 acres (104,760 ha)

Description of Mapped Type: White shin oak is the most common dominant of these shrublands, and plateau live oak and Ashe juniper are components. Plateau live oak or Texas oak may forma sparse tree canopy, and mesquite is a common component along with species such as Texas persimmon, elbowbush, netleaf Forestiera, Texas redbud, and skunkbush sumac. This type is similar to the Edwards Plateau: Shin Oak Slope Shrubland, but is mapped on gently rather than steep slopes.

Where to Visit:

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Hill Country State Natural Area: Texas Parks and Wildlife Department

South Llano River State Park: Texas Parks and Wildlife Department

Devil's Sinkhole State Natural Area: Texas Parks and Wildlife Department

Edwards Plateau: Shin Oak Slope Shrubland

Area in Phase 1: 20,850 acres (8,440 ha)

Description of Mapped Type: This type is similar to the Edwards Plateau: Shin Oak Shrubland but is mapped on slopes >20%. Species such as evergreen sumac and Lindheimer's silk-tassel may be more common on this type.

Where to Visit:

Balcones Canyonlands National Wildlife Refuge: U. S. Fish and Wildlife Service

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Walter Buck Wildlife Management Area: Texas Parks and Wildlife Department

Pedernales Falls State Park: Texas Parks and Wildlife Department

Lost Maples State Natural Area: Texas Parks and Wildlife Department

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Garner State Park: Texas Parks and Wildlife Department

Edwards Plateau: Wooded Cliff/Bluff

Area in Phase 1: 611 acres (247 ha)

Description of Mapped Type: Generally limestone cliffs with woody canopy cover, mostly resulting from canopy cover of surrounding slopes. Other woody species such as Lindheimer's silktassel, mock-orange, and butterflybush may also be encountered.

Where to Visit:

Lost Maples State Natural Area: Texas Parks and Wildlife Department

Emma Long Metropolitan Park: City of Austin

Garner State Park: Texas Parks and Wildlife Department

Barton Creek Greenbelt: City of Austin
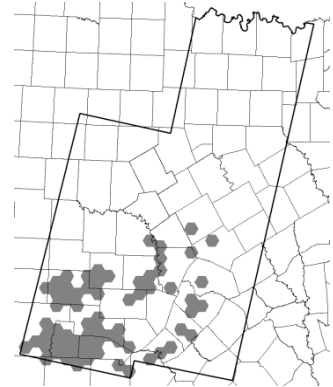
Grand Prairie: Tallgrass Prairie

Area in Phase 1: 2,799,360 acres (1,132,860 ha)

Description of Mapped Type: Little bluestem and King Ranch bluestem are common dominants in the modern landscape, depending on grazing pressure. Other important species may include silver bluestem, sideoats grams, big bluestem, Indiangrass, and tall dropseed. Mesquite, sugar hackberry, and Ashe juniper may form shrub or small tree canopy cover.

Where to Visit:

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Lake Whitney State Park: Texas Parks and Wildlife Department

Ham Creek Park: City of Blum

Dinosaur Valley State Park: Texas Parks and Wildlife Department
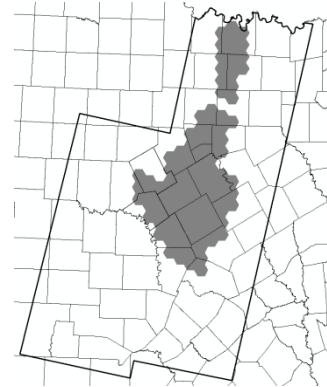
Grass Farm

Area in Phase 1: 5,425 acres (2,195 ha)

Description of Mapped Type: Most areas mapped as this type in Phase 1 are dominated by Bermuda grass and consist of golf course fairways and greens that are fertilized and irrigated. This type also includes a few areas of highly productive grassland on or near floodplains.

Where to Visit:

None
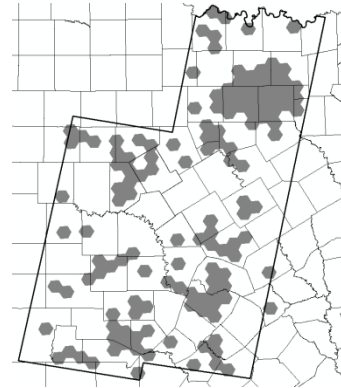
High Plains: Floodplain Deciduous Shrubland

Area in Phase 1: 22,270 acres (9,015 ha)

Description of Mapped Type: Shrublands dominated by shrubs or small trees such as mesquite, black willow, western soapberry, lotebush or sugar hackberry. Saltcedar may also be present or dominant.

Where to Visit:

None
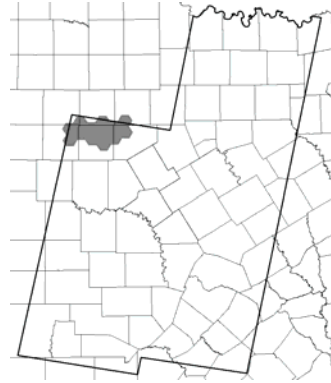
High Plains: Floodplain Hardwood / Juniper Forest

Area in Phase 1: 1,240 acres (500 ha)

Description of Mapped Type: Important overstory trees may include plateau live oak, Ashe juniper, or redberry juniper, together with deciduous trees such as western soapberry, American elm, eastern cottonwood, and sugar hackberry.

Where to Visit:

None
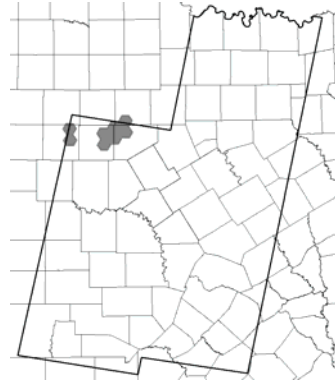
High Plains: Floodplain Hardwood Forest

Area in Phase 1: 14,220 acres (5,755 ha)

Description of Mapped Type: This deciduous forest may include trees such as eastern cottonwood, western soapberry, American elm, cedar elm, sugar hackberry, and black willow among the dominants. Plateau live oak may be important, and mesquite is a common component.

Where to Visit:

None
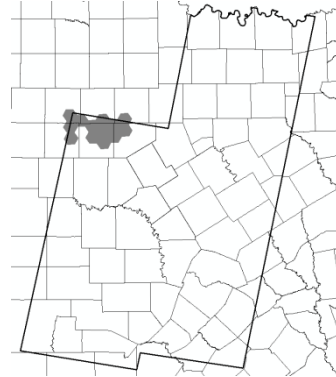
High Plains: Floodplain Herbaceous Vegetation

Area in Phase 1: 13,170 acres (5,330 ha)

Description of Mapped Type: This herbaceous vegetation is often dominated by grasses such as King Ranch bluestem, Bermuda grass, common curlymesquite, three-awn species, buffalograss, and hairy grama in the modern landscape. Patches of tallgrass prairie or marsh may also be included.

Where to Visit:

None
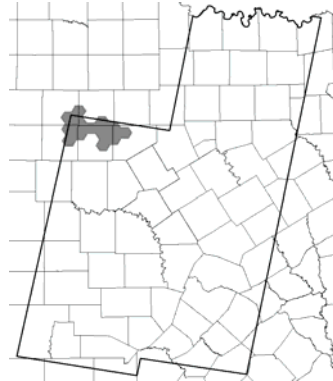
High Plains: Floodplain Juniper Forest

Area in Phase 1: 390 acres (160 ha)

Description of Mapped Type: Ashe juniper or redberry juniper are important dominants of this type, and species such as plateau live oak, western soapberry, American elm, and sugar hackberry may be present. Mesquite may also be a component.
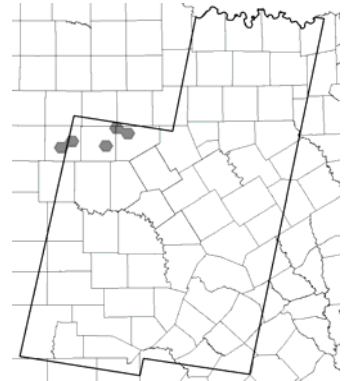
Where to Visit:

None

High Plains: Floodplain Juniper Shrubland

Area in Phase 1: 495 acres (200 ha)

Description of Mapped Type: Ashe juniper or redberry juniper are dominant shrubs, and mesquite is a common component.

Where to Visit:

None
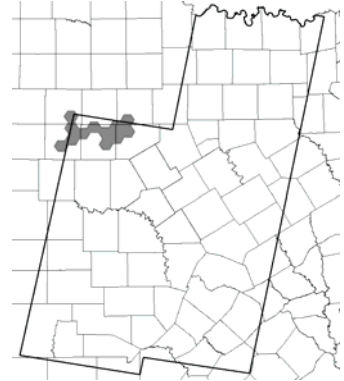
High Plains: Floodplain Live Oak Forest

Area in Phase 1: 690 acres (280 ha)

Description of Mapped Type: Plateau live oak and Ashe or redberry juniper are common overstory trees, together with deciduous species such as eastern cottonwood, western soapberry, black willow, American elm, and sugar hackberry. Mesquite may also be a component.

Where to Visit:

None
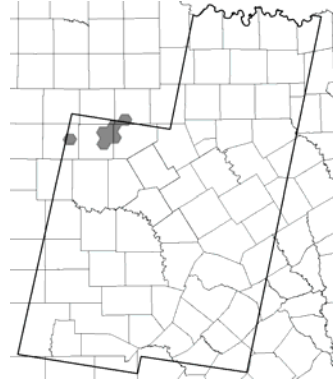
High Plains: Riparian Deciduous Shrubland

Area in Phase 1: 14,190 acres (5,745 ha)

Description of Mapped Type: Mesquite is the primary dominant of these shrublands and lotebush and western soapberry are common components. Grasses such as King Ranch bluestem, buffalograss, Bermada grass, Texas wintergrass, common curlymesquite, three-awns, and hairy grama are common grasses.

Where to Visit:

None
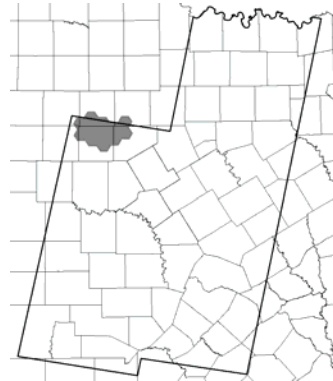
High Plains: Riparian Hardwood / Juniper Forest

Area in Phase 1: 525 acres (215 ha)

Description of Mapped Type: Trees such as sugar hackberry, cedar elm, and western soapberry share dominance with evergreens such as Ashe juniper, redberry juniper, and plateau live oak.

Where to Visit:

None
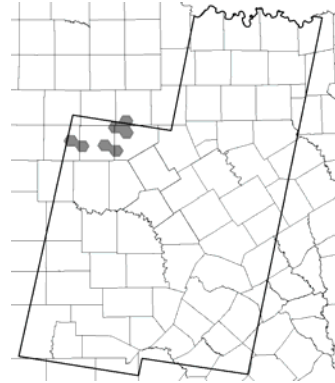
High Plains: Riparian Hardwood Forest

Area in Phase 1: 3,970 acres (1,610 ha)

Description of Mapped Type: Deciduous trees such as sugar hackberry, western soapberry, black willow, and cedar elm are common and mesquite may be important as a shrub or tree. Plateau live oak may also be important.

Where to Visit:

None
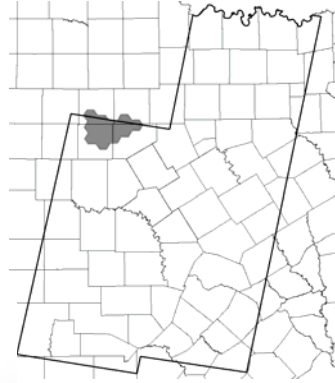
High Plains: Riparian Herbaceous Vegetation

Area in Phase 1: 3,200 acres (1,295 ha)

Description of Mapped Type: Grassland or marsh of riparian situations are broadly circumscribed. Grasses such as Texas wintergrass, King Ranch bluestem, common curlymesquite, three-awns, buffalograss, and hairy grama are common. Some areas may be dominated by tall grasses such as big bluestem or switchgrass, and wetter areas may have bulrushes or cattails.

Where to Visit:

None
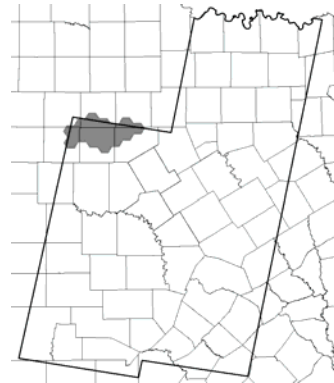
High Plains: Riparian Juniper Forest

Area in Phase 1: 560 acres (225 ha)

Description of Mapped Type: Ashe juniper or redberry juniper are common dominants species, and plateau live oak, western soapberry, sugar hackberry, mesquite, and cedar elm may be components.

Where to Visit:

None
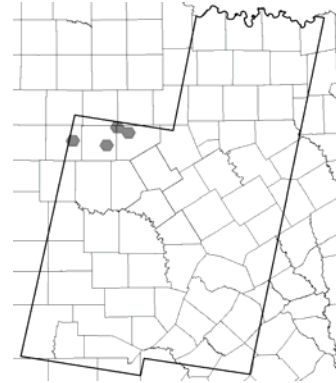
High Plains: Riparian Juniper Shrubland

Area in Phase 1: 750 acres (300 ha)

Description of Mapped Type: Ashe juniper or redberry juniper are common dominants species, and lotebush, mesquite, and plateau live oak may be components.

Where to Visit:

None
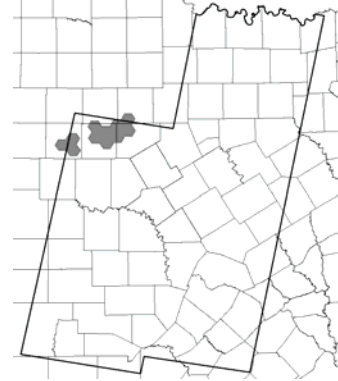
High Plains: Riparian Live Oak Forest

Area in Phase 1: 330 acres (135 ha)

Description of Mapped Type: Plateau live oak is the dominant tree, and species such as Ashe juniper, sugar hackberry, cedar elm, western soapberry, and American elm may be present. Mesquite is a common component.
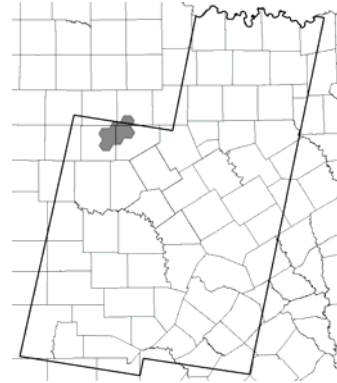
Where to Visit:

None

High Plains: Shinnery Shrublands

Area in Phase 1: 2,500 acres (1,010 ha)

Description of Mapped Type: Havard shin oak and sand sage are common on deep, sandy soils of this type.

Where to Visit:

None
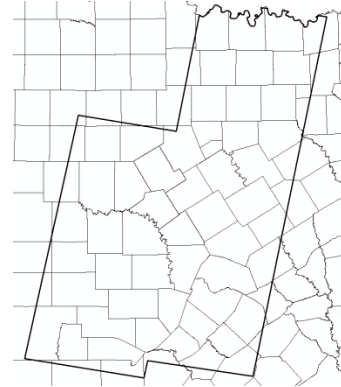
High Plains: Shortgrass Prairie

Area in Phase 1: 41,990 acres (16,990 ha)

Description of Mapped Type: This grassland may be in various conditions and is mapped on shallow soils in the western part of Phase 1. Common grasses include buffalograss, blue grama, purple three-awn, Texas wintergrass, sideoats grama, fluffgrass, and curlymesquite, along with introduced Bermuda grass and blue panicum. Mesquite, agarito, and feather dalea are common shrubs.

Where to Visit:

None
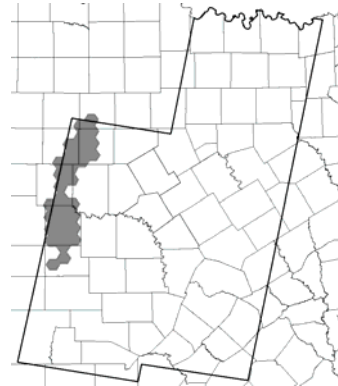
Llano Uplift: Grassland

Area in Phase 1: 33,730 acres (135,055 ha)

Description of Mapped Type: A variety of grassland conditions are represented within this type, but non-natives such as King Ranch bluestem and Bermuda grass are often important. Native species such as purple three-awn, sideoats grama, little bluestem, silver bluestem, Texas wintergrass, and hairy grama may also be important. Trees and shrubs are usually present, and these may include plateau live oak, post oak, cedar elm, mesquite, Texas persimmon, and whitebrush. Mesquite cover may be dense enough to qualify as a shrubland in some areas.
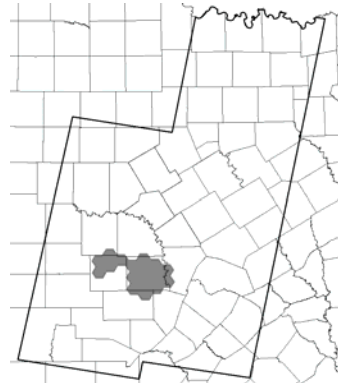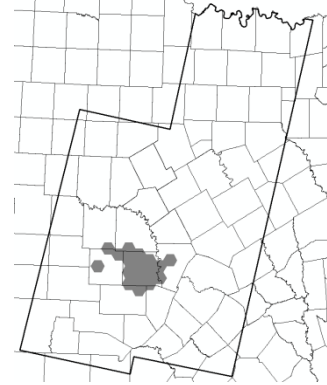
Where to Visit:

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Enchanted Rock State Park: Texas Parks and Wildlife Department

Inks Lake State Park: Texas Parks and Wildlife Department

Canyon of the Eagles Preserve: Lower Colorado River Authority

Llano Uplift: Live Oak Woodland

Area in Phase 1: 30,505 acres (12,345 ha)

Description of Mapped Type: Plateau live oak is the leading dominant of this evergreen woodland, along with deciduous species such as post oak, blackjack oak, cedar elm, and black hickory. Ashe juniper may be present, along with mesquite, whitebrush, Texas persimmon, agarito, and catclaw mimosa.

Where to Visit:

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Enchanted Rock State Park: Texas Parks and Wildlife Department

Canyon of the Eagles Preserve: Lower Colorado River Authority

Inks Lake State Park: Texas Parks and Wildlife Department

Llano Uplift: Mesquite / Whitebrush Shrubland

Area in Phase 1: 99,260 acres (40,170 ha)

Description of Mapped Type: Mesquite, whitebrush, lotebush, Texas persimmon, and Texas colubrina are common components of this shrubland or low woodland. Trees such as post oak, plateau live oak, and cedar elm are often present, and mesquite or plateau live oak may grow tall enough to form a sparse tree canopy.
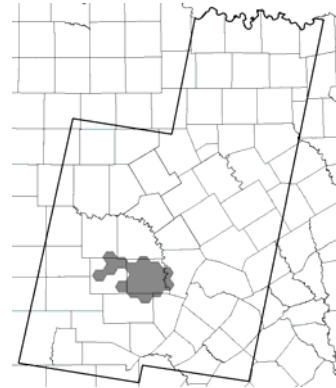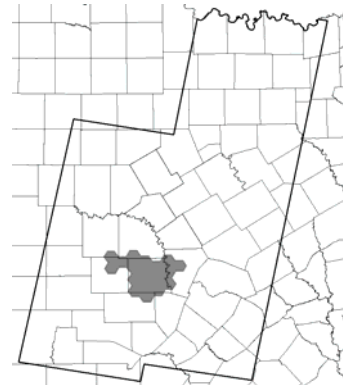
Where to Visit:

Enchanted Rock State Park: Texas Parks and Wildlife Department

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Canyon of the Eagles Preserve: Lower Colorado River Authority

Inks Lake State Park: Texas Parks and Wildlife Department

Llano Uplift: Post Oak Woodland

Area in Phase 1: 150,810 acres (61,030 ha)

Description of Mapped Type: Post oak and other deciduous species such as blackjack oak, black hickory, cedar elm, and sugar hackberry are common dominate trees of this mainly deciduous woodland, and plateau live oak is often a significant component. Mesquite may also reach the canopy or be present as a shrub, along with species such as Texas persimmon and whitebrush. Mesquite may be dense and tall enough to be the dominant tree in some areas.

Where to Visit:

Mason Mountain Wildlife Management Area: Texas Parks and Wildlife Department

Enchanted Rock State Park: Texas Parks and Wildlife Department

Canyon of the Eagles Preserve: Lower Colorado River Authority

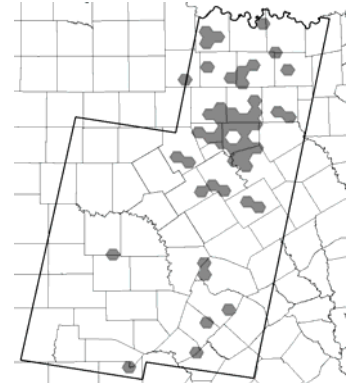Inks Lake State Park: Texas Parks and Wildlife Department

Marsh

Area in Phase 1: 165 acres (67 ha)

Description of Mapped Type: Areas mapped as marsh are small, and consist of wet or alternately wet and dry soils with herbaceous vegetation.

Where to Visit:

None

Native Invasive: Deciduous Woodland

Area in Phase 1: 623,000 acres (252,120 ha)

Description of Mapped Type: This broadly-defined type often has sugar hackberry, cedar elm, or mesquite among the dominants, and post oak or plateau live oak may be important. Eastern redcedar or Ashe juniper may also be present.

Where to Visit:

Lavon Lake Recreation Area: U. S. Corps of Engineers

Lake Lewisville Recreation Area: U. S. Corps of Engineers

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

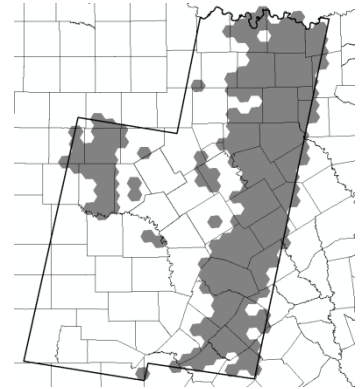Hagerman National Wildlife Refuge: U. S. Fish and Wildlife Service

Cedar Hill State Park: Texas Parks and Wildlife Department

Aquilla Wildlife Management Area: Texas Parks and Wildlife Department

Navarro Mills Lake Recreation Area: U. S. Corps of Engineers

Lake Whitney Recreation Area: U. S. Corps of Engineers

McKinney Roughs: Lower Colorado River Authority

Native Invasive: Juniper Shrubland

Area in Phase 1: 118,130 acres (47,805 ha)

Description of Mapped Type: This type is mapped across Phase 1 where junipers occur on 'better soils,' so eastern redcedar, Ashe juniper, or redberry juniper may be dominant. Associated species include coastal or plateau live oak, cedar elm, sugar hackberry, and mesquite.
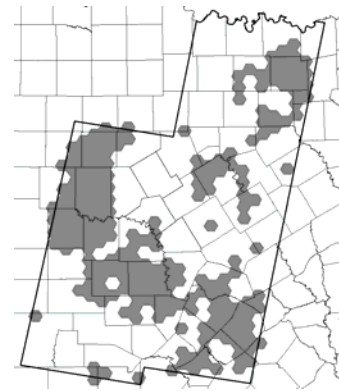
Where to Visit:

Lake Lewisville Recreation Area: U. S. Corps of Engineers

Bastrop State Park

Lake Whitney Recreation Area: U. S. Corps of Engineers

Hagerman National Wildlife Refuge: U. S. Fish and Wildlife Service

Navarro Mills Lake Recreation Area: U. S. Corps of Engineers

Native Invasive: Juniper Woodland

Area in Phase 1: 40,230 acres (16,280 ha)

Description of Mapped Type: This is a diverse type mapped throughout Phase 1 where ever junipers dominate woodlands or forests, except on the Cretaceous limestone soils of the Edwards Plateau and Grand Prairie, which are mapped as Edwards Plateau: Ashe Juniper Motte and Woodland. Eastern redcedar or Ashe juniper may dominate the overstory and also occur in the understory. Common associated species include plateau or coastal live oak, sugar hackberry, cedar elm, and post oak.

Where to Visit:

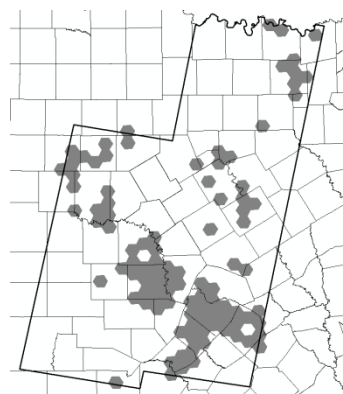Inks Lake State Park: Texas Parks and Wildlife Department

Lavon Lake Recreation Area: U. S. Corps of Engineers

Canyon of the Eagles Preserve: Lower Colorado River Authority

McKinney Falls State Park: Texas Parks and Wildlife Department

Lake Whitney Recreation Area: U. S. Corps of Engineers

Caddo Lake National Grassland – Lake Fannin: U. S. Forest Service

Native Invasive: Mesquite Shrubland

Area in Phase 1: 2,376,700 acres (961,820 ha)

Description of Mapped Type: Mesquite is often the dominant species of this broadly defined type, but may occur in a variety of open woodlands to dense shrublands with a variety of other species such as plateau live oak, Ashe juniper, sugar or netleaf hackberry, cedar elm, lotebush, Texas persimmon, and agarito. Some areas of other deciduous shrubs, such as white shin oak and prairie sumac, may be mapped as this type.

Where to Visit:

Granger Wildlife Management Area: Texas Parks and Wildlife Department

Aquilla Wildlife Management Area: Texas Parks and Wildlife Department

Hords Creek Lake Recreation Area: U. S. Corps of Engineers

Kerr Wildlife Management Area: Texas Parks and Wildlife Department

Belton Lake Recreation Area: U. S. Corps of Engineers

Lake Brownwood State Park: Texas Parks and Wildlife Department

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

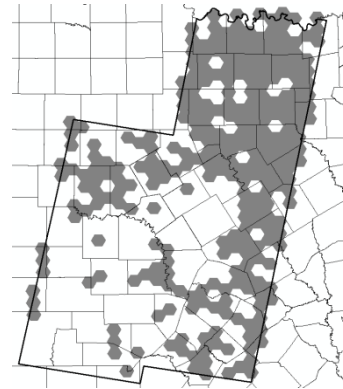Navarro Mills Lake Recreation Area: U. S. Corps of Engineers
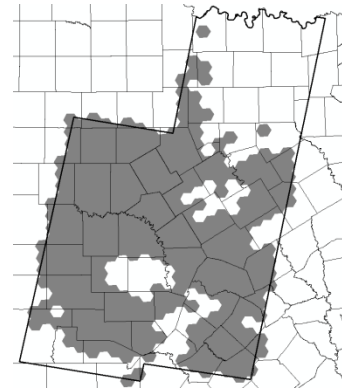
Open Water

Area in Phase 1: 451,860 acres (182,860 ha)

Description of Mapped Type: Most open water in Phase 1 consists of reservoirs or large ponds, although larger rivers, including the Colorado and Brazos, are also mapped as open water.

Where to Visit:

None

Post Oak Savanna: Live Oak Motte and Woodland

Area in Phase 1: 3,450 acres (1,395 ha)

Description of Mapped Type: Coastal live oak dominates this mainly broadleaf evergreen woodland or forest, and post oak, cedar elm, and eastern redcedar are often in the canopy. Near the Bastrop Lost Pines ecoregion, loblolly pine may be important. Yaupon, American beautyberry, and gum bumelia are common in the understory, and greenbriar is a common vine.
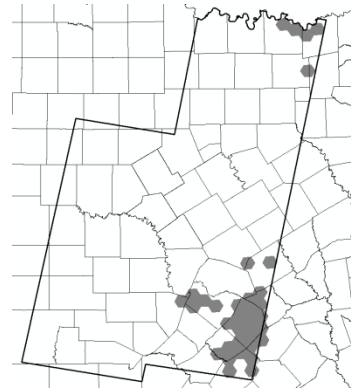
Where to Visit:

Lavon Lake Recreation Area: U. S. Corps of Engineers

McKinney Roughs: Lower Colorado River Authority

Bastrop State Park: Texas Parks and Wildlife Department

Palmetto State Park: Texas Parks and Wildlife Department

Post Oak Savanna: Oak / Hardwood Slope Forest

Area in Phase 1: 4,580 acres (1,855 ha)

Description of Mapped Type: A variety of oaks, including Shumard oak (north), post oak, and chinkapin oak, together with hardwoods such as cedar elm, American ash, and sugar hackberry may dominate this mainly deciduous forest. Common understory species may include possumhaw and American beautyberry.
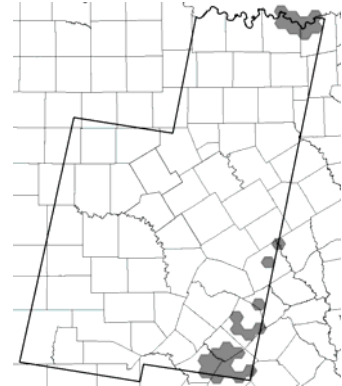
Where to Visit:

Eisenhower State Park: Texas Parks and Wildlife Department

McKinney Roughs: Lower Colorado River Authority

Caddo National Grasslands – Lake Fannin: U. S. Forest Service

Palmetto State Park: Texas Parks and Wildlife Department

Post Oak Savanna: Oak / Redcedar Slope Forest

Area in Phase 1: 1,230 acres (500 ha)

Description of Mapped Type: Post oak and other oaks (blackjack, Shumard, and chinkapin) share the overstory with eastern redcedar in this mixed woodland or forest. Near the Bastrop Lost Pines ecoregion, loblolly pine may be an important overstory species. Common understory species include farkleberry, possumhaw, and American beautyberry.
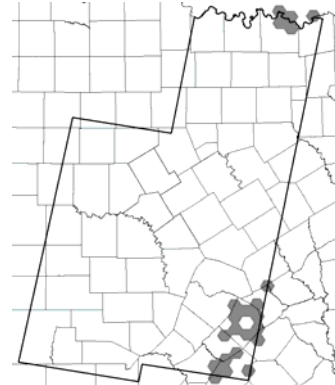
Where to Visit:

McKinney Roughs: Lower Colorado River Authority

Caddo National Grasslands – Lake Fannin: U. S. Forest Service

Eisenhower State Park: Texas Parks and Wildlife Department
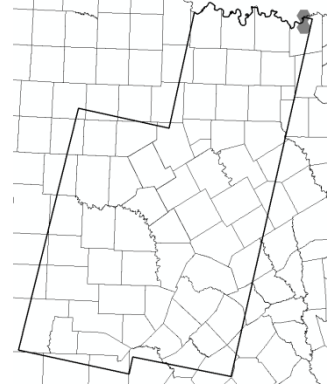
Palmetto State Park: Texas Parks and Wildlife Department

Post Oak Savanna: Post Oak / Redcedar Motte and Woodland

Area in Phase 1: 1,705 acres (690 ha)

Description of Mapped Type: Post oak and eastern redcedar are both in the overstory within this mixed woodland or forest. Blackjack oak, cedar elm, and sugar hackberry are common trees. Eastern redcedar, persimmon, and American beautyberry are common in the understory, and greenbriar is a common vine.

Where to Visit:

Caddo National Grasslands, Lake Fannin: U. S. Forest Service

Post Oak Savanna: Post Oak / Yaupon Motte and Woodland

Area in Phase 1: 185,870 acres (75,220 ha)

Description of Mapped Type: Post oak and eastern redcedar often both occur in the overstory of this mixed woodland or forest, and coastal live oak is often in the overstory in the southern part of the range. Eastern redcedar, yaupon (sometimes dense), mesquite, and American beautyberry are common in the understory. Greenbrair is a common vine. In areas near the Bastrop Lost Pines, loblolly pine may be an important overstory tree.
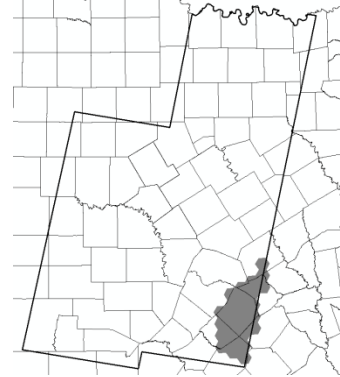
Where to Visit:

McKinney Roughs: Lower Colorado River Authority

Palmetto State Park: Texas Parks and Wildlife Department

South Shores Park: Lower Colorado River Authority

Caddo National Grasslands – Lake Fannin: U. S. Forest Service

M. O. Neasloney Wildlife Management Area: Texas Parks and Wildlife Department

Post Oak Savanna: Post Oak Motte and Woodland

Area in Phase 1: 323,385 acres (130,870 ha)

Description of Mapped Type: Post oak is the most frequent dominant tree species within this deciduous woodland or forest. Cedar elm, blackjack oak, eastern redcedar, sugar hackberry, water oak, and coastal live oak may all be present in the overstory. Mesquite, persimmon, yaupon, possumhaw, gum bumelia, American beautyberry, and eastern redcedar are common shrubs. Greenbrier is a common vine.

Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department

Caddo National Grasslands – Lake Fannin: U. S. Forest Service

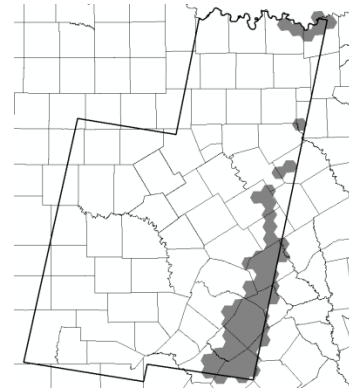Caddo National Grasslands – Bois D'Arc Unit: U. S. Forest Service

McKinney Roughs: Lower Colorado River Authority

Palmetto State Park: Texas Parks and Wildlife Department

Lavon Lake Recreation Area: U. S. Corps of Engineers

M. O. Neasloney Wildlife Management Area: Texas Parks and Wildlife Department

Navarro Mills Lake Recreation Area: U. S. Corps of Engineers

Post Oak Savanna: Redcedar Slope Forest

Area in Phase 1: 75 acres (30 ha)

Description of Mapped Type: Description of Mapped Type: Eastern redcedar and oaks (post, blackjack) are dominant in the overstory of this mainly evergreen forest. Near the Bastrop Lost Pines, loblolly pine may be an important overstory tree. Common understory species include farkleberry, yaupon, and American beautyberry.

Where to Visit:

McKinney Roughs: Lower Colorado River Authority
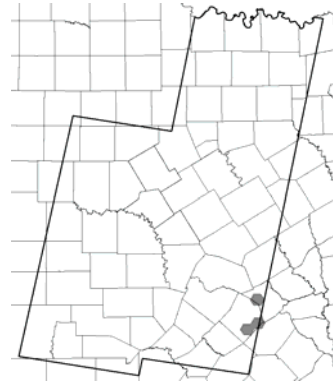
Post Oak Savanna: Sandyland Grassland

Area in Phase 1: 770 acres (310 ha)

Description of Mapped Type: Little bluestem is a common dominant of this type, together with a variety of grasses and forbs common on sands, including curly three-awn, bluntsepal Brazoria, Illinois flatsedge, Florida snakecotton, purple sandgrass, and pinweed. Post oak, blackjack oak, bluejack oak, and sand post oak may be present.

Where to Visit:

None
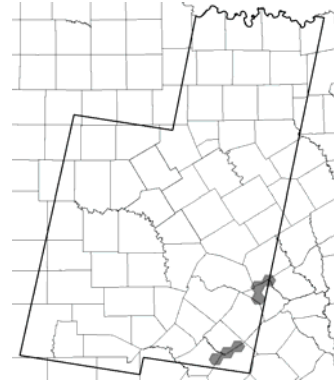
Post Oak Savanna: Sandyland Woodland and Shrubland

Area in Phase 1: 1,235 acres (500 ha)

Description of Mapped Type: Post oak, blackjack oak, bluejack oak, sand post oak, and black hickory are common trees or shrubs, and yaupon may be important. Eastern redcedar may be a component, and a variety of grasses and forbs may be present, including little bluestem, purple sandgrass, and Florida snakecotton.

Where to Visit:

M. O. Neasloney Wildlife Management Area: Texas Parks and Wildlife Department
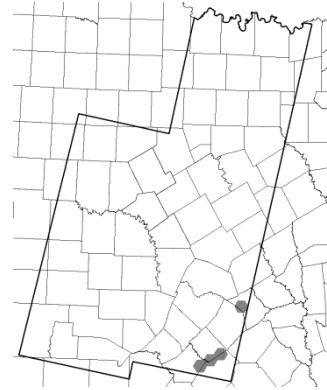
Post Oak Savanna: Savanna Grassland

Area in Phase 1: 645,465 acres (271,210 ha)

Description of Mapped Type: A variety of grasslands are circumscribed within this type, and disturbance or tame grasses such as Bermuda grass and King Ranch bluestem are common dominants. Little bluestem, Indiangrass, silver bluestem, Texas wintergrass, tall dropseed, and brownseed paspalum are native species that may be important. Broomweed and western ragweed are common weedy herbaceous species. Mesquite is a common shrub, and may be dense enough to qualify as shrubland in some areas.

Where to Visit:

Bastrop State Park: Texas Parks and Wildlife Department
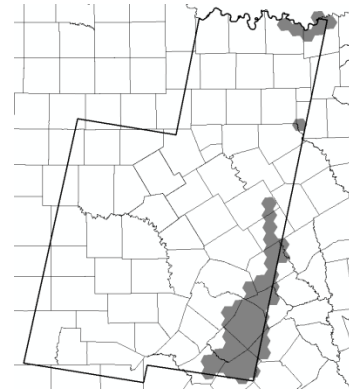
McKinney Roughs: Lower Colorado River Authority

Caddo National Grasslands – Bois D'Arc Unit: U. S. Forest Service

Palmetto State Park: Texas Parks and Wildlife Department

Caddo National Grasslands – Lake Fannin: U. S. Forest Service

Navarro Mills Lake Recreation Area: U. S. Corps of Engineers

M. O. Neasloney Wildlife Management Area: Texas Parks and Wildlife Department

Rolling Plains: Breaks and Canyon Deciduous Shrubland

Area in Phase 1: 76,245 acres (30,855 ha)

Description of Mapped Type: This type is mapped on sloping but not steep topography. Most areas are dominated by mesquite, and lotebush, prickly ash, and skunkbush sumac may be present.
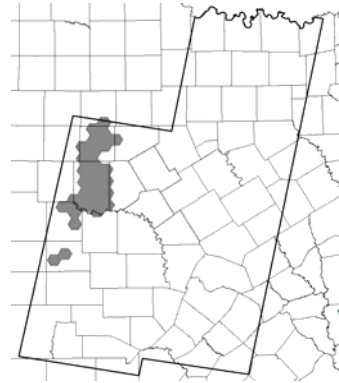
Where to Visit:

None
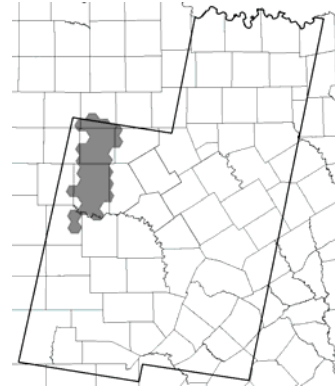
Rolling Plains: Breaks and Canyon Juniper Shrubland

Area in Phase 1: 9,335 acres (3,780 ha)

Description of Mapped Type: This type is mapped on sloping but not steep topography, usually over limestone. Ashe juniper is the most common dominant. Lotebush, prickly ash, skunkbush sumac, and white shin oak may be present.

Where to Visit:

None

**Rolling Plains: Mixedgrass Prairie**

Area in Phase 1: 596,400 acres (241,355 ha)

Description of Mapped Type: Texas wintergrass, little bluestem, silver bluestem, sideoats grama, and hairy grama are common native grasses. Bermuda grass is a common introduced grass of tame pastures. Mesquite trees or shrubs and prickly pear are often present.

Where to Visit:

Colorado Bend State Park: Texas Parks and Wildlife Department

Lake Brownwood State Park: Texas Parks and Wildlife Department
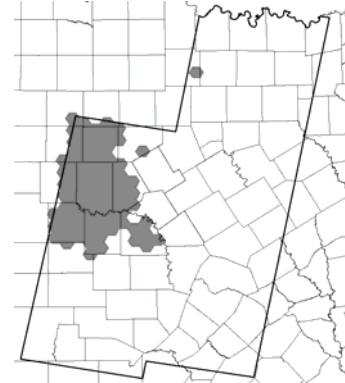
Row Crops

<u>Area in Phase 1:</u> 2,294,870 acres (928,700 ha)

<u>Description of Mapped Type:</u> This type includes all cropland where fields are fallow for some portion of the year. Some fields may rotate into and out of cultivation frequently, and year-round cover crops are generally mapped as grassland.

<u>Where to Visit:</u>

None
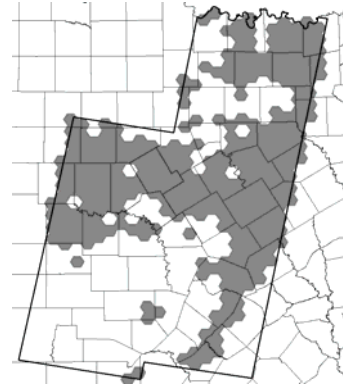
Southwest: Tobosa Grassland

Area in Phase 1: 31,315 acres (12,675 ha)

Description of Mapped Type: This grassland is mapped on clay flats. Tobosa is a common component, especially in the northwestern part of Phase 1, and buffalograss, hairy grama, Texas grama, sideoats grama, curlymesquite, and fluffgrass may be present, along with mesquite and King Ranch bluestem.

Where to Visit:

None
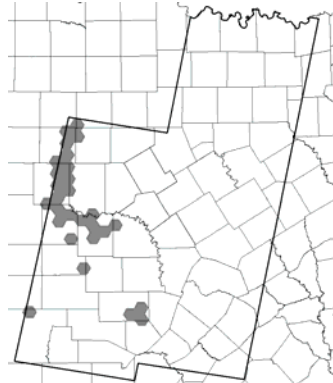
Swamp

Area in Phase 1: 15,975 acres (6,470 ha)

Description of Mapped Type: Areas mapped as swamp in Phase 1 are typically forested wet or alternately wet and dry soils at the upper ends of reservoirs in the northern part of region. A variety of species, including baldcypress, American elm, cedar elm, black willow, and bur oak may be present.

Where to Visit:

Ray Roberts Lake Wildlife Management Area: Texas Parks and Wildlife Department

Lavon Lake Recreation Area: U. S. Corps of Engineers

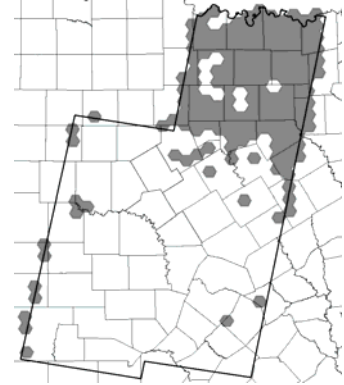Lake Lewisville Recreation Area: U. S. Corps of Engineers

Mountain Creek Lake Park: City of Duncanville

Hagerman National Wildlife Refuge: U. S. Fish and Wildlife Service

Grapevine Lake Recreation Area: U. S. Corps of Engineers

Fort Worth Nature Center: Tarrant County

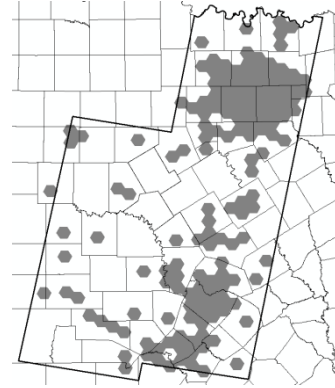Caddo National Grasslands – Lake Fannin: U. S. Forest Service

Urban High Intensity

Area in Phase 1: 290,550 acres (117,580 ha)

Description of Mapped Type: This type consists of built-up areas and wide transportation corridors that are dominated by impervious cover.
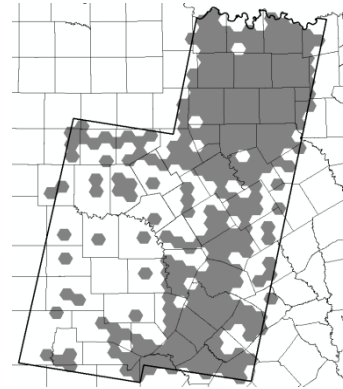
Where to Visit:

None

Urban Low Intensity

Area in Phase 1: 1,675,280 acres (677,960 ha)

Description of Mapped Type: This type includes areas that are built-up but not entirely covered by impervious cover, and includes most of the non-industrial areas within cities and towns.

Where to Visit:

None

Selected Literature Cited

Diamond, D. D., D. H. Riskind, and S. L. Orzell. 1987. A framework for plant community classification and conservation in Texas. Texas Journal of Science 39(3):203-221.

McMahan, C. A., R. G. Frye, and K. L. Brown. 1984. The Vegetation Types of Texas Including Cropland. PWD Bulletin 7000-120. Texas Parks and Wildlife Department. Austin, TX. 41 pp + map.