

Tandy Hills / Stratford Park Strategic Master Plan

For
Parks and Community Services Department
City of Fort Worth
Tarrant County, Texas

Prepared by:

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Documents On File

The following documents are available from the Fort Worth Parks and Community Services Department.

Public Meeting #1 (September 2007) Power Point Presentation

Public Meeting #2 (December 2007) Power Point Presentation

Community Interest Survey Raw Data

Tandy Hills / Stratford Park Strategic Master Plan

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1.0 INTRODUCTION

Tandy Hills / Stratford Park (TH/SP), a natural area owned by the City of Fort Worth, is located only five miles from downtown Fort Worth, in one of the largest metropolitan areas in Texas. It has been well established that this park has significant ecological, historical, and educational value, due to the fact that it is a remnant of the Fort Worth (Grand) Prairie.

1.1. Purpose of the Strategic Master Plan

The purpose of this Strategic Master Plan is to develop a natural resource / operational management and public use program for TH/SP that balances the need for preservation with the intention to make the park accessible to the public. All recommendations are based on the intrinsic importance of responsible stewardship and the many opportunities for the City of Fort Worth to make this park a prized natural area.

After performing a baseline study, including the compilation and review of existing literature, both a natural resource / operational management plan and a public use plan were created. The management plan includes identification and prioritization of management needs and methods. The public use plan includes identification and recommendations for a trail system and interpretive outreach program. Staffing and cost needs were determined for both the management and public use plans.

The Strategic Master Plan does not cover promotional and fundraising topics. It also does not include any projections of population growth in the Fort Worth area that would potentially affect future issues regarding the park. The Strategic Master Plan focuses on the current status of the park and the immediate needs for park planning.

1.2. Location of Tandy Hills / Stratford Park within Texas

1.2.1. Cross Timbers and Prairies

TH/SP contains a remnant prairie from the Fort Worth Prairie, which is located within the Cross Timbers and Prairies vegetational area of Texas. The Cross Timbers is a mosaic of open grasslands and woodlands, and contains four subdivisions: East Cross Timbers, West Cross Timbers, Lampasas Cut Plain, and Fort Worth Prairie. Historically, the portions of the Cross Timbers that were wooded were thick and impenetrable. The woodlands provided food and shelter to Native Americans, who often settled along the edges of the prairies.

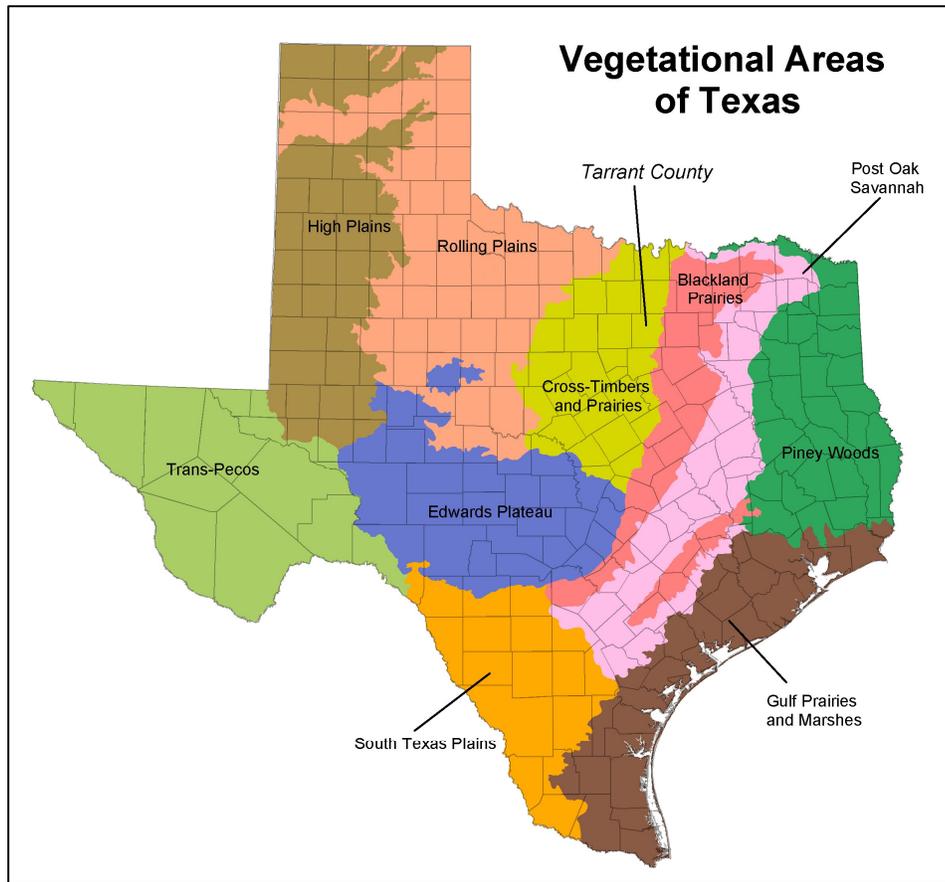


Figure 1-1. Vegetational Areas of Texas

1.2.2. Fort Worth Prairie

The Fort Worth Prairie is located between the East and West Cross Timbers vegetational areas. The prairie was characterized by tall grasses and an abundance of colorful wildflowers, with rivers and streams full of water year round. It was maintained in part by grazing bison, elk, and pronghorn antelopes, and by browsing animals such as deer. There were prairie dogs, wolves, black-footed ferrets, many reptiles and amphibians, as well as a variety of birds and insects.

Prairie animals have adapted to windy, semi-arid environments with few trees or shrubs. They withstand wide ranges of temperature, from freezing to extreme heat. Some of them have digestive systems designed to feed on grass. As protection from predators, many prairie animals have front legs and paws that allow them to dig burrows in the ground in which to flee danger. Some have developed nocturnal habitats as an avoidance technique, and others have evolved coloration patterns that blend in with the surrounding vegetation.

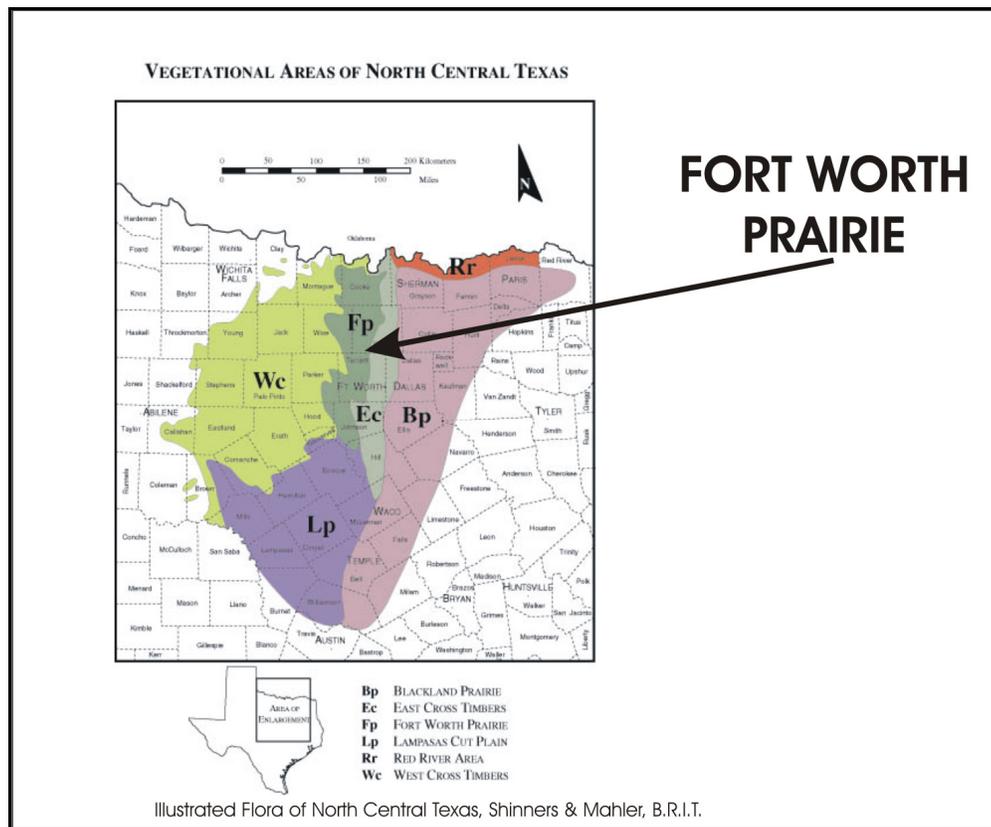


Figure 1-2. Vegetational Areas of North Central Texas

1.2.2.1. Heritage of Fort Worth Prairie

In addition to having ecological importance, the Fort Worth Prairie was part of Texas history. Settlers arrived to find a rich and undisturbed land. The following two quotes describe the heritage of the Fort Worth Prairie.

The following quote from *The Vegetation of the Fort Worth Prairie* refers to an excerpt from an 1841 diary belonging to a traveler crossing the prairie. (Dyksterhuis, 1946, p. 4)

“Our next day’s march was along the high-ridge of prairies which divides the waters of what was thought to be Noland’s River from those of the Brazos. The prospect on both sides was romantic in a high degree. To the east, for miles, the prairie gently sloped, hardly presenting a bush to relieve the eye. In the distance, the green skirting of woods, which fringed either border of a large stream, softened down the view.”

Another quote from the same document describes an 1854 observation. (Dyksterhuis, 1946, p. 5)

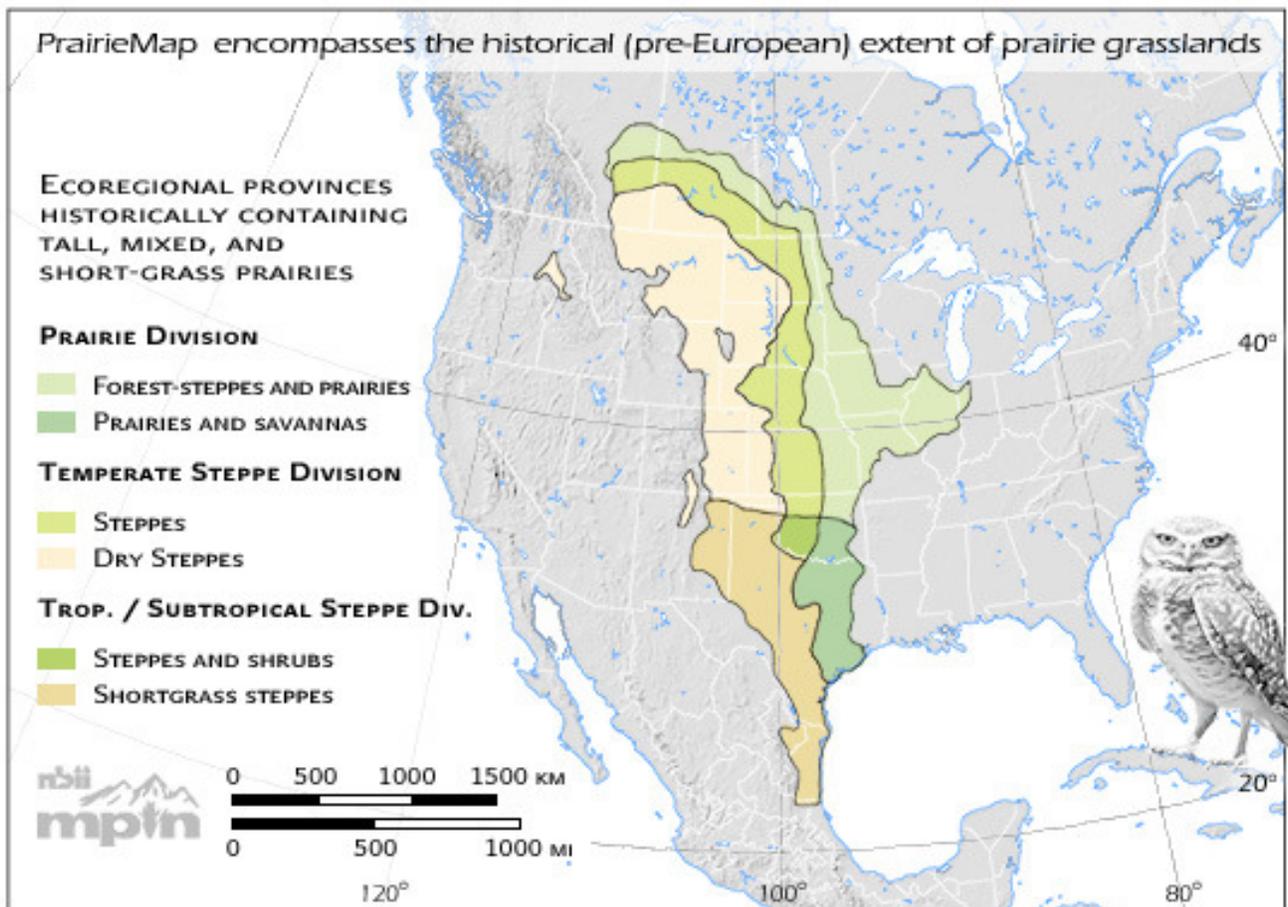
“...but by far the richest and most beautiful district of country I have ever seen, in Texas or elsewhere, is that watered by the Trinity and its tributaries. Occupying east and west a belt of one hundred miles in width, with about equal quantities of prairie and timber, intersected by numerous clear, fresh streams and countless springs, with a gently undulating surface of prairie and oak openings, it presents the most charming views, as of a country in the highest state of cultivation, and you are startled at the summit of each

swell of the prairie with a prospect of groves, parks, and forests, with intervening plains of luxuriant grass ...”

1.3. Current State of Texas Prairies

According to the Native Prairie Association of Texas (<http://www.texasprairie.org>), less than 1% of the original 20 million acres of Texas’ beautiful tall grass prairie remains. Prairies are declining as land has changed due to cultivation, overgrazing, urban development, and the suppression of fire.

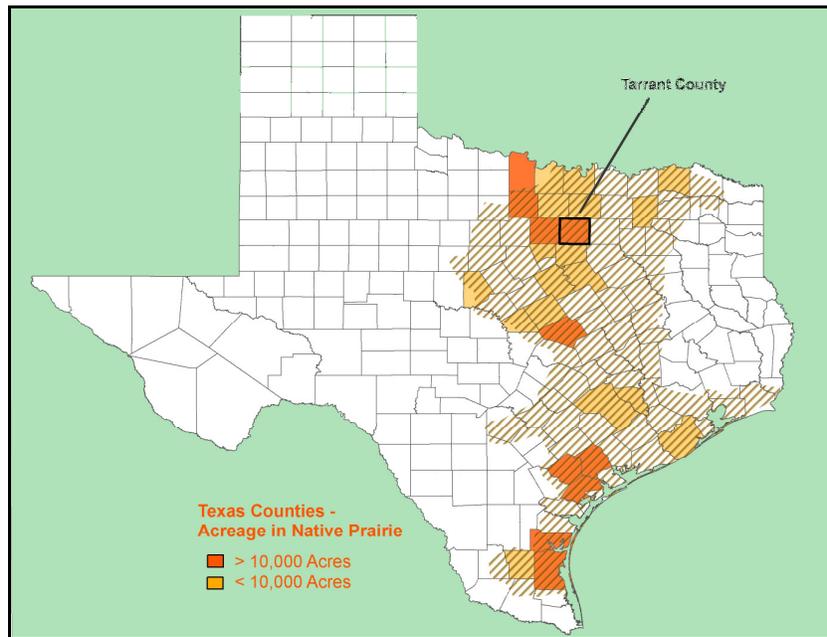
Historically, prairies extended throughout the Midwest, including most of Texas. The following map outlines the natural prairie as it was found before the European settlement of North America.



Adapted from: Ecoregions of the United States. (map). 1994. Washington DC: USFS. 1:7,500,00. By Robert G. Bailey.

Figure 1-3. Pre-European Prairie Map

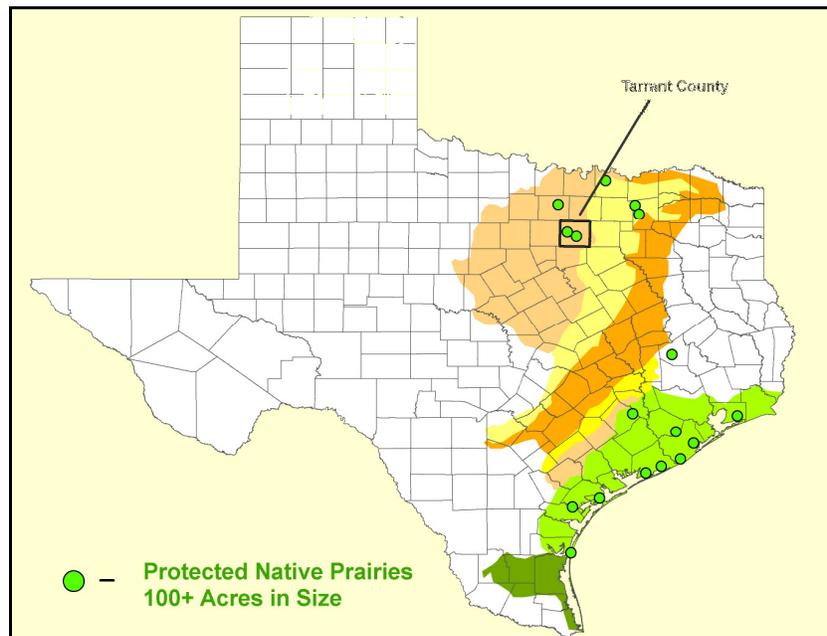
Currently, Texas has few counties with more than 10,000 acres of prairie. Only four counties in North Central Texas have 10,000 acres of prairie, including Tarrant County.



Nature Conservancy of Texas

Figure 1-4. Texas Counties: Acreage in Native Prairie

There are only six protected prairies in North Central Texas that are on the order of 100 acres or larger. One of these native prairies is Tandy Hills / Stratford Park. Clearly this is an important distinction.



Nature Conservancy of Texas

Figure 1-5. Protected Native Prairies



Prairie Preserves – The Fort Worth Prairie and Grand Prairie

Name	Location	Acres
Hagerman National Wildlife Refuge (USFWS)	Grayson County	<600
Cross Timbers Research Natural Area (USFS)	Wise County	152
Fort Worth Nature Center (City of Fort Worth)	Tarrant County	<500
Rainbow Valley Conservation Area (NAPA easement)	Denton County	30
Simpson Prairie (NPAT easement)	McLennan County	50
Stella Rowan Prairie (TDCJ)	Tarrant County	50
Tandy Hills/Stratford Park (City of Fort Worth)	Tarrant County	105

Nature Conservancy of Texas

Figure 1-6. Table of Fort Worth Prairie Sites

Although the above table shows TH/SP to be 105 acres, the source of that information is the Nature Conservancy of Texas. The Tarrant County Appraisal District records show Tandy Hills/Stratford Park to be 130 acres in size. The 130 acres encompasses four parks: Tandy Hills Nature Area, Tandy Hills Park, Stratford Nature Area, and Stratford Park.

In addition to being a prairie remnant whose size is worthy of note, there are plant species of note located within the park. According to the plant species list prepared by the Botanical Research Institute of Texas and the checklist of Texas endemics compiled by the Texas A&M Flora of Texas Consortium, there are approximately 10 Texas endemic species located in TH/SP.

1.4. History of Tandy Hills / Stratford Park

The TH/SP area began with the then City of Fort Worth Parks and Recreation Department obtaining Stratford Park in 1924, and some time later, Tandy Hills Park in 1960. Since that time, the two parks have been joined together and are considered as one.

Citizens of Fort Worth have played an important role in the development of TH/SP. This involvement is invaluable and should continue to be encouraged. Strong citizen involvement in a natural area will become the backbone of its success.

Listed below is a brief summary of the history of TH/SP since it has been owned by the City of Fort Worth.

1924	Fort Worth Parks and Recreation Department (FWPARD) obtained Stratford Park.
1960	FWPARD obtained Tandy Hills.
1987:	Citizens urged FWPARD to protect TH/SP as a natural area.
1987:	Staff from Fort Worth Nature Center and Refuge (FWNCR) determined Tandy Hills / Stratford Park merited status as a Natural Area (TH/SNA).
1989:	“First Annual Report: Environmental Assessment of Tandy Hills Park,” by Wayne Clark, FWNCR.
1989:	FWPARD recommended protective cable be installed on TH/SNA perimeter.
1990:	FWPARD recommended management of TH/SNA be turned over to FWNCR.
1993:	“Tandy Hills/Stratford Natural Areas: A Prospectus,” by Wayne Clark, FWNCR.
2007:	Fort Worth Parks and Community Services Department hired consultants to develop a Strategic Master Plan.

Table 1-2. History of Tandy Hills / Stratford Park

1.5. Previous and On-Going Studies

TH/SP has been studied by a number of people, including professionals, students, and citizens. These studies and activities are a strong indicator of the importance that TH/SP already plays within the community. Listed below are some of the existing and ongoing studies that are specifically about TH/SP, or include Tandy Hills in the study. These items are listed in chronological order.

The Vegetation of the Fort Worth Prairie

This classic document is considered the definitive research on the Fort Worth Prairie and should be known to the park staff. It contains historical as well as ecological information that can be used to assess current status of TH/SP. Even though this study covers the entire Fort Worth Prairie and is much larger than Tandy Hills, the information is applicable and can be used in planning management and restoration strategies. (Dyksterhuis, 1948)

First Annual Report: Environmental Assessment of Tandy Hills Park

This document begins with a description of the natural history of the Fort Worth region with an emphasis on grassland ecology. The study occurred between the summer of 1987 and lasted through January 1989. Study results include descriptions of vegetation and damage by off-road vehicles, a preliminary plant list of herbaceous species, and a preliminary management and educational/recreational plan. This study has important historical data that can be used as a comparison to the current status within the park. Understanding changes that have occurred since 1989 is valuable for management decisions. This report laid the groundwork for the current Strategic Master Plan. (Clark, 1989)

Tandy Hills / Stratford Natural Areas: A Prospectus

This is a follow-up report to the 1989 report listed above, and it contains a description of the park's vegetation and soils. It discusses management, trails, and interpretation recommendations, with preliminary cost estimates for management tasks. This report added important information to the previous document, which has also been considered in the current Strategic Master Plan. (Clark, 1993)

Plant Species-Area Relationships in Ten North Central Texas Protected Natural Areas

This journal article, a collaboration between Texas Wesleyan University and the Botanical Research Institute of Texas, included Tandy Hills as one of the ten North Central Texas protected natural areas. The study considers how the shape and size of a natural area can affect the invasion of exotic species and how exotic species invasion can reduce species diversity. This information can be used in developing management strategies. One suggestion in this article is to increase the size of the park. A second suggestion is to impose zoning restrictions by requiring only native vegetation in the urban areas surrounding the park. This would diminish the spread of exotic species into the park. (Granados, O'Kennon, & Benz, 2001)

Flora of Tandy Hills

The Flora of Tandy Hills is an extensive species list of the vegetation of Tandy Hills, with a total of 540 species. Species are listed alphabetically by family, then alphabetically by genus. Nomenclature is based on the Illustrated Flora of North Central Texas (Shinners & Mahler, 1999). This document is important baseline information that can be used over time to determine vegetative changes in Tandy Hills. It can also be used for restoration planning purposes by determining what species might be missing that historically were present in the Fort Worth Prairie. (O'Kennon, 2006) (See Appendix 1.)

Correspondence with Dr. Kuban, Science Department Head, Nolan Catholic High School

In correspondence to the Strategic Master Plan team, Dr. Kuban made the following written statement: "We've been recording species flowering times at Tandy Hills Park for the last 16 years. We don't yet have a summary analysis of our long-term study as the prairie study sites are still in transition and are different from prairies prior to the massive hailstorm of 1995. Tandy Hills is a natural laboratory for my students at Nolan. We have also spent much time picking up trash in the park and removing non-native vegetation from selected prairie sites." (J. Kuban, personal communication, 2007)

Correspondence with Tom Stevens, Texas Christian University student

Tom Stevens, a student under the supervision of Dr. Michael Slattery of Texas Christian University, is conducting an on-going bird survey of TH/SP. Mr. Stevens is expecting to finish an extensive report and conclusions regarding his research. (T. Stevens, personal communication, 2007)

2.0 BASELINE STUDIES

2.1. Floral Survey: Vegetation Zones

An analysis of TH/SP vegetation was performed using aerial photos, topographic maps, and onsite observations. Seven vegetation zones were determined by observing general characteristics and vegetational composition of plant communities, as follows:

1. Mowed Areas
2. Disturbed Grassland
3. Early Succession Grassland
4. Late Succession Grassland
5. Early Succession Woodland
6. Mid-Succession Woodland
7. Late Succession Woodland

These zones were used in the development of management strategies, design of a trail system, and determining the potential location for a nature center building, entry road, and parking. See Appendix 1: Flora of Tandy Hills for the existing plant list.

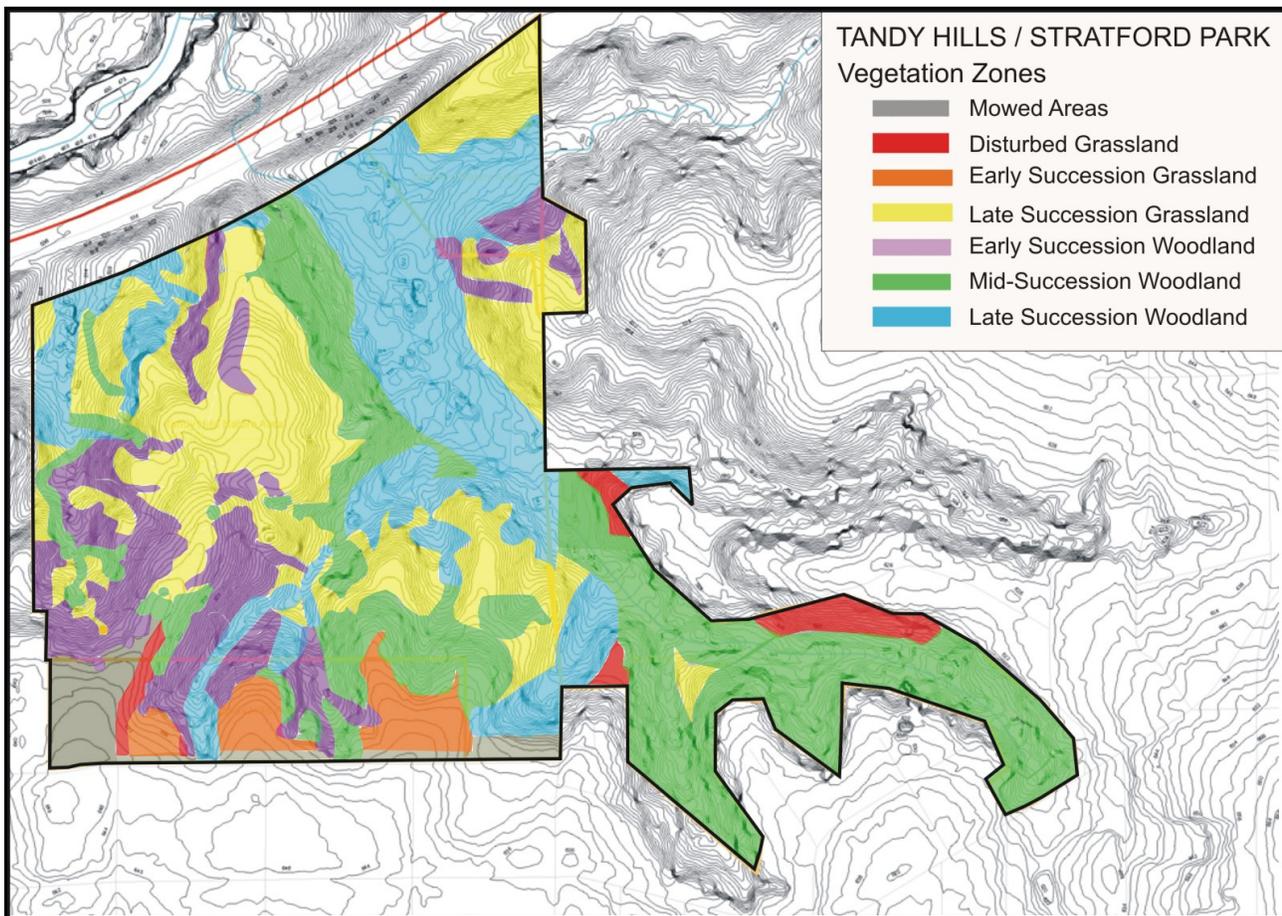


Figure 2-1. Vegetation Zones of Tandy Hills / Stratford Park

2.1.1. Mowed Areas

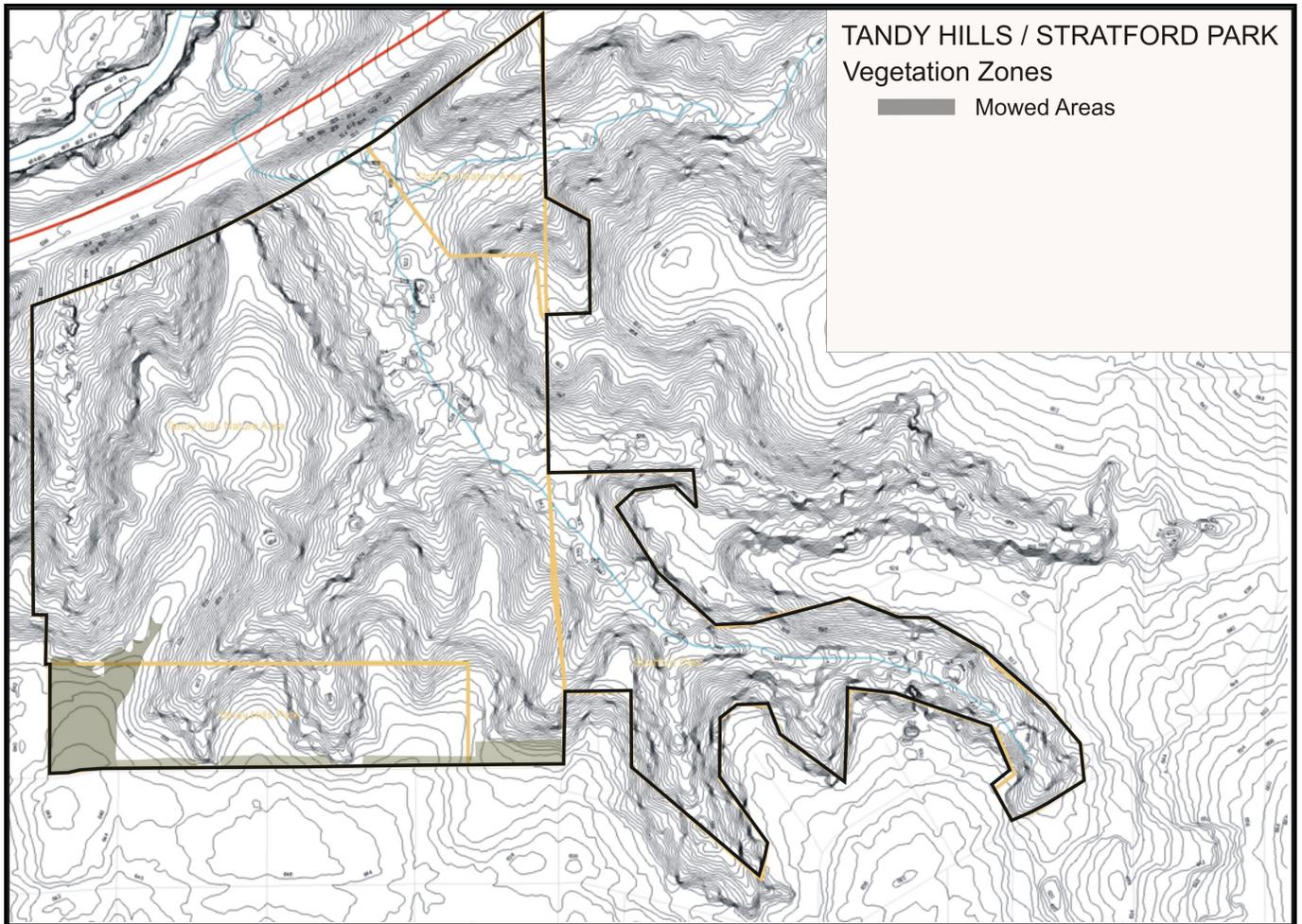


Figure 2-2. Mowed Areas

The areas within the park that are currently being mowed are located along View Street. This includes the playground area, located in the far southwest corner of the site, along the east side of the existing sidewalk, and from the curb extending back approximately ten to fifty feet. These areas are primarily composed of Bermuda grass and common lawn weeds. The mowing in the playground area west of the sidewalk is consistent with its current and likely future use.

Representative Species:

Exotic species: Bermuda grass (*Cynodon dactylon*)

2.1.2. Disturbed Grassland

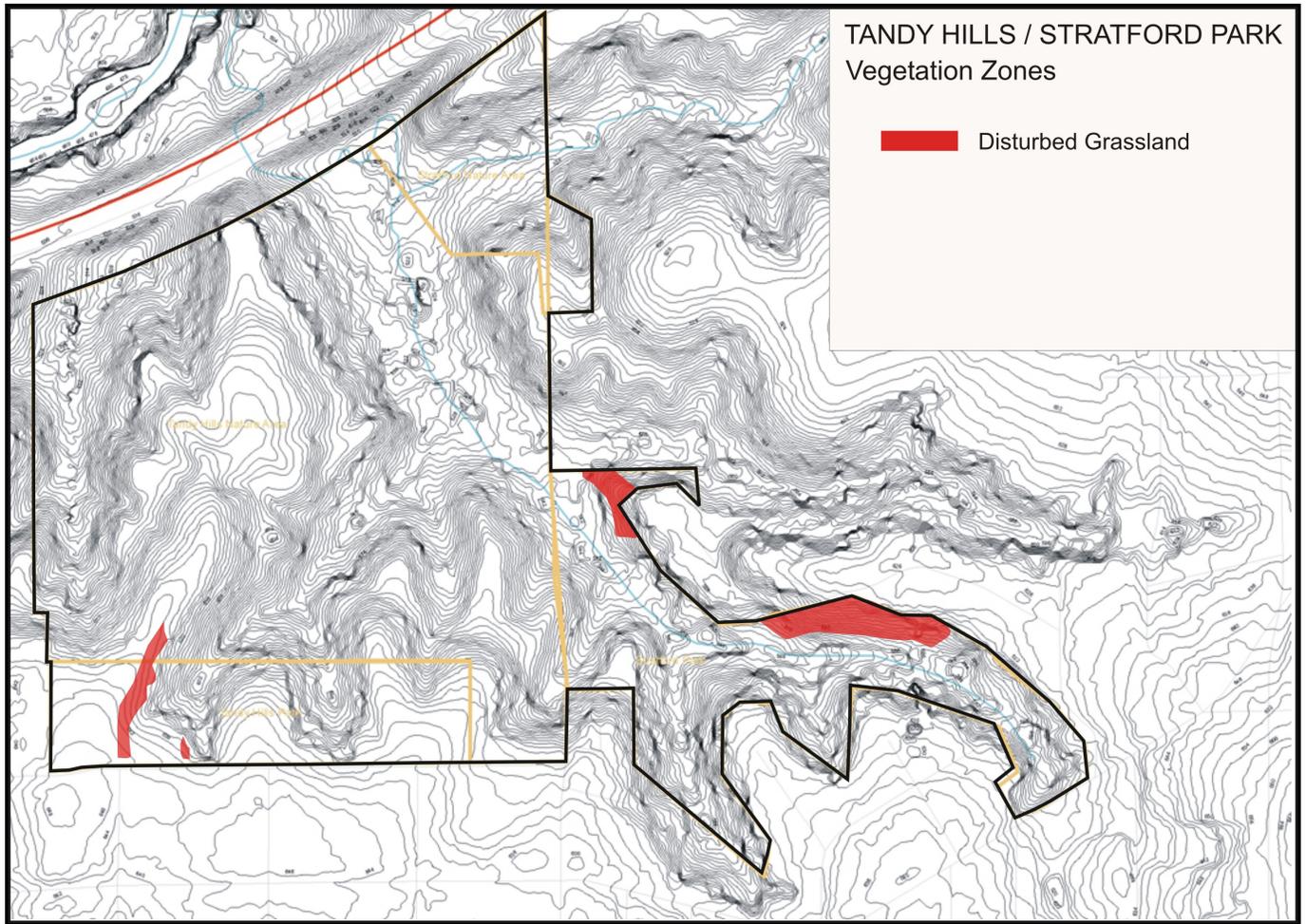


Figure 2-3. Disturbed Grassland

The first disturbed area is near the front entrance. The second is near the access point along Medford Road and behind the houses along Medford Road to Chelsea Road. The third disturbed area is behind the houses at the end of Medford Road. These areas have low diversity, many early succession forbs, and a high percentage of exotic species. The disturbed grasslands exhibit a disruption of the native plant community.

Representative Species:

Exotic Species: Johnson grass (*Sorghum halepense*), Bermuda grass (*Cynodon dactylon*), Dallis grass (*Paspalum dilatatum*), King Ranch bluestem (*Bothriochloa ischaemum* var. *songarica*), Japanese honeysuckle (*Lonicera japonica*)

Early Succession and Invasive Flowers: western ragweed (*Ambrosia psilostachya*), goosefoot (*Chenopodium* sp.), annual sunflower (*Helianthus annuus*), lizardtail gaura (*Gaura parviflora*)

2.1.3. Early Succession Grassland

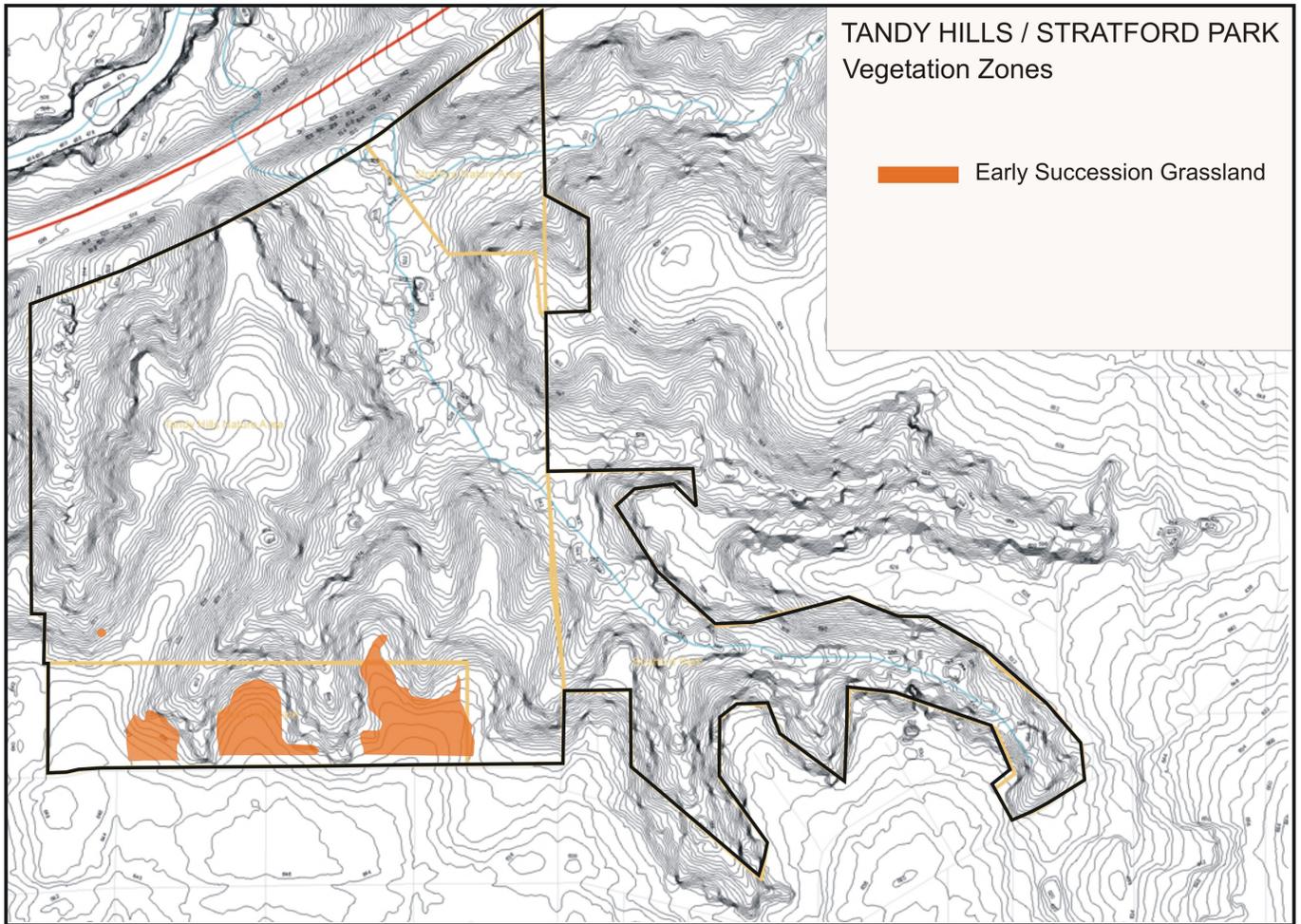


Figure 2-4. Early Succession Grassland

Three early succession grasslands are located along View Street. These three areas are all characterized by a high proportion of early succession grasses and wildflowers. Later succession grasses are only present in small quantities. This indicates some sort of past disturbance, but is not severe enough to allow infiltration of exotic and invasive species.

Representative Species:

Early and Mid-Succession Grasses: silver bluestem (*Bothriochloa laguroides* ssp. *torreyana*), three-awn (*Aristida* sp.), plains lovegrass (*Eragrostis intermedia*), tumble windmillgrass (*Chloris verticillata*)

Early Succession Wildflowers: common greenthread (*Thelesperma filifolium* var. *filifolium*), Indian blanket (*Gaillardia pulchella* var. *pulchella*), oneseed croton (*Croton monanthogynus*), slender mock pennyroyal (*Hedeoma acinoides*), annual broomweed (*Amphiachyris dracunculoides*)

2.1.4. Late Succession Grassland

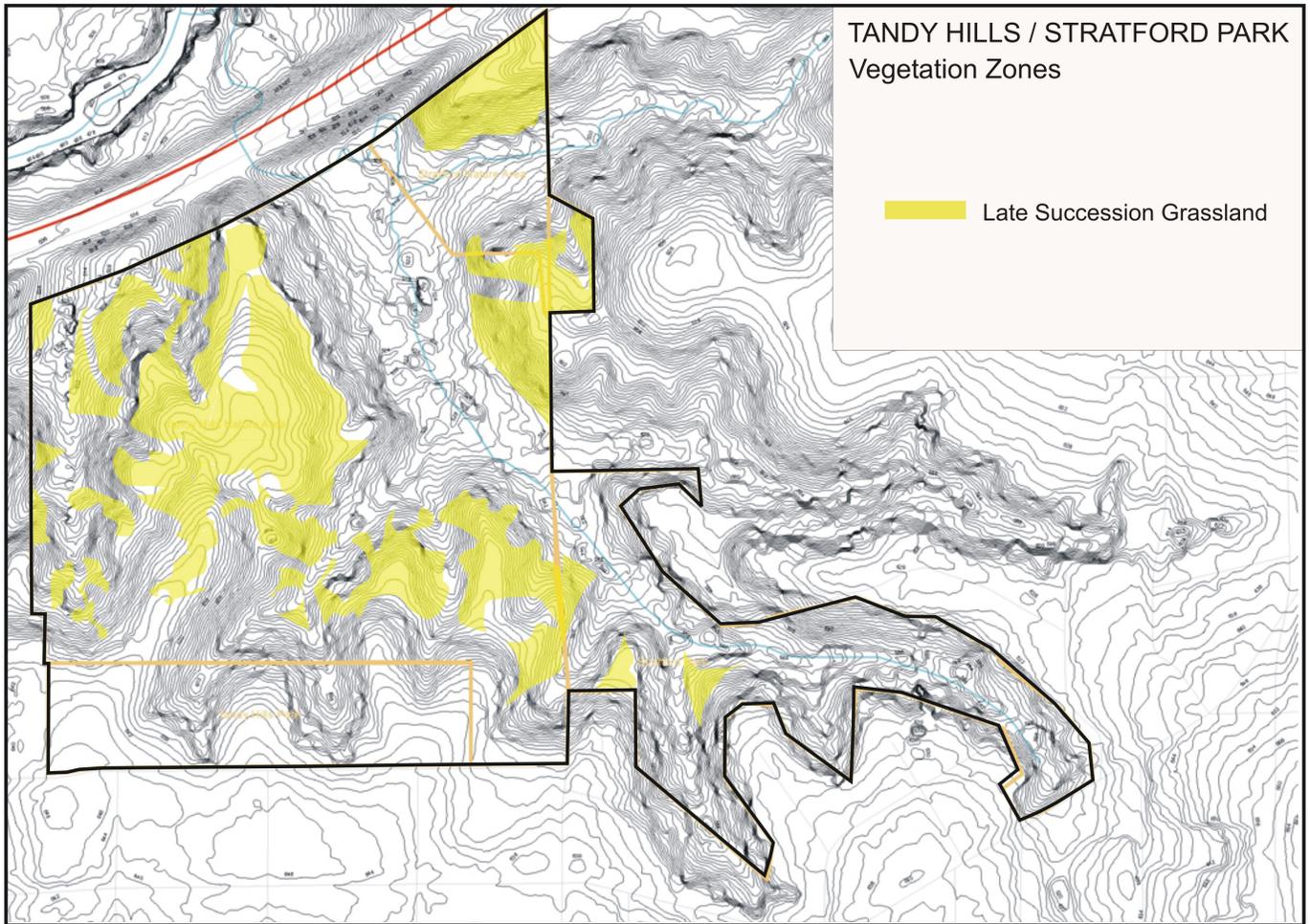


Figure 2-5. Late Succession Grassland

Late succession grasslands are located mostly on higher elevations and upper slopes. These are high quality, relatively open prairie remnants with a high diversity of late succession native grasses and perennial wildflowers. The encroachment of woody species is primarily due to the absence of fire. While this is a high diversity zone, the absence of fire as a natural control will, over time, cause degradation of the species composition.

Representative Species:

Late Succession Grasses: big bluestem (*Andropogon gerardii* var. *gerardii*), little bluestem (*Schizachyrium scoparium* ssp. *scoparium*), seep muhly (*Muhlenbergia reverchonii*), yellow indiagrass (*Sorghastrum nutans*), sideoats grama (*Bouteloua curtipendula* var. *curtipendula*), slim tridens (*Tridens muticus* var. *muticus*)

Perennial Wildflowers: compass plant (*Silphium laciniatum*), American basketflower (*Centaurea Americana*), sharp gayfeather (*Liatris mucronata*), false foxglove (*Penstemon cobaea*), narrowleaf coneflower (*Echinacea angustifolia* var. *angustifolia*), purple paintbrush (*Castilleja purpurea* var. *purpurea*), Arkansas yucca (*Yucca arkansana*), maximillian sunflower (*Helianthus maximilliani*), fluttermill (*Oenothera macrocarpa* ssp. *macrocarpa*), roundhead dalea (*Dalea multiflora*), Illinois bundleflower (*Desmanthus illinoensis*)

2.1.5. Early Succession Woodland

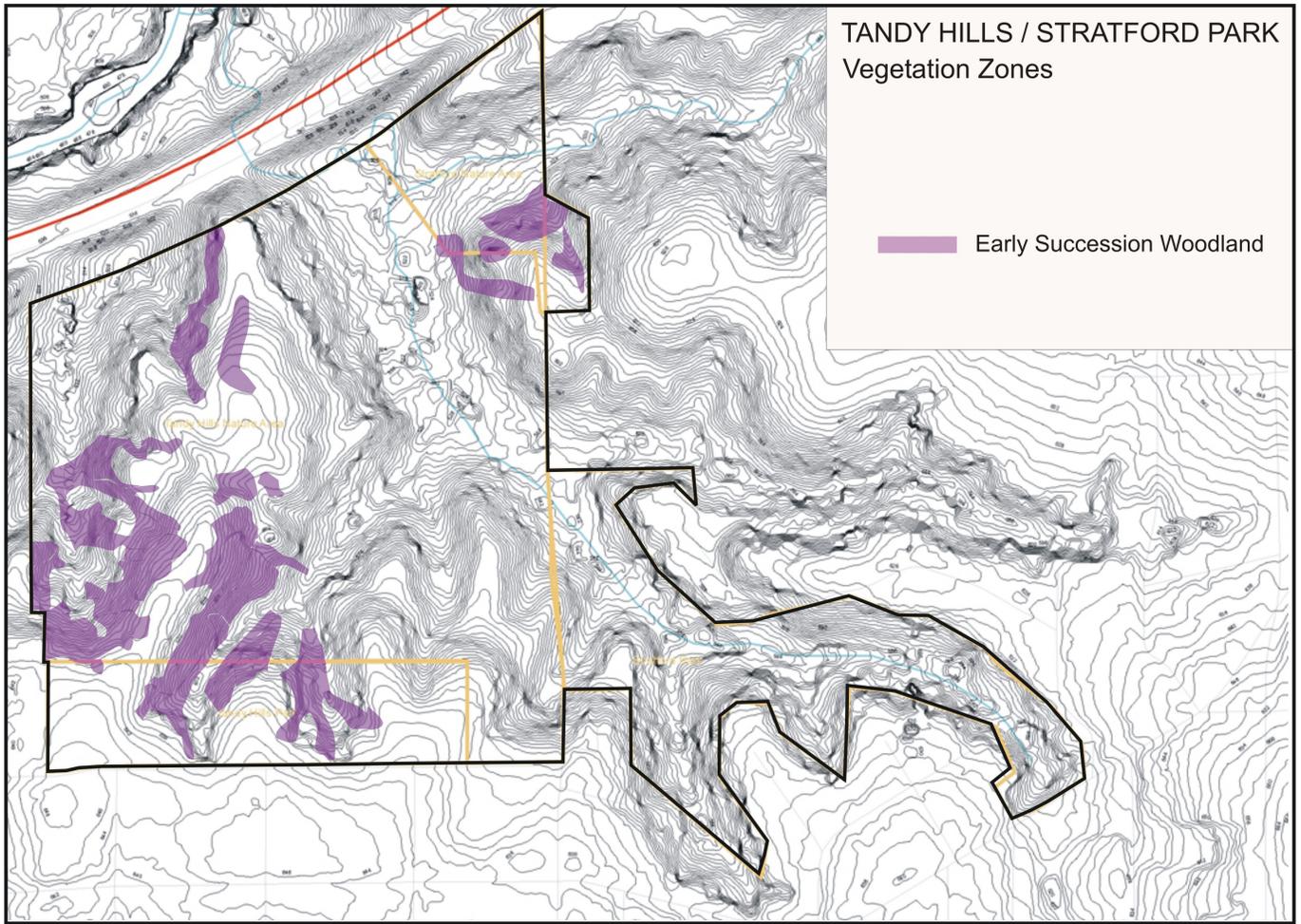


Figure 2-6. Early Succession Woodland

Early succession woodlands are located on the higher elevations and upper slopes. These young trees and shrubs are spreading up from the lower elevations where more dense mid-succession and late-succession woody growth exists. The most invasive species in this zone is green ash, a fast-growing native woody species. The green ash in this location is exhibiting invasive qualities and its population is out of balance. A comparison map showing the increase of woody growth between 1989 and 2007 is included in Section 3.5.3.2. Woodland Encroachment Maps.

Representative Species:

Trees: green ash (*Fraxinus pennsylvanica*), honey mesquite (*Prosopis glandulosa* var. *glandulosa*), ashe juniper saplings (*Juniperus ashei*), cedar elm saplings (*Ulmus crassifolia*)

Small Trees and Shrubs: elbow bush (*Forestiera pubescens*), fragrant sumac (*Rhus trilobata*), wooly bumelia (*Sideroxylon lanuginosa* ssp. *oblongifolia*)

Understory: Texas wintergrass (*Nassella leucotricha*), sedge species (*Carex* spp.), panic grass (*Panicum hallii* var. *hallii*)

Exotics: privet species (*Ligustrum* spp.), Dallis grass (*Paspalum dilatatum*), nandina (*Nandina domestica*)

2.1.6. Mid-Succession Woodland

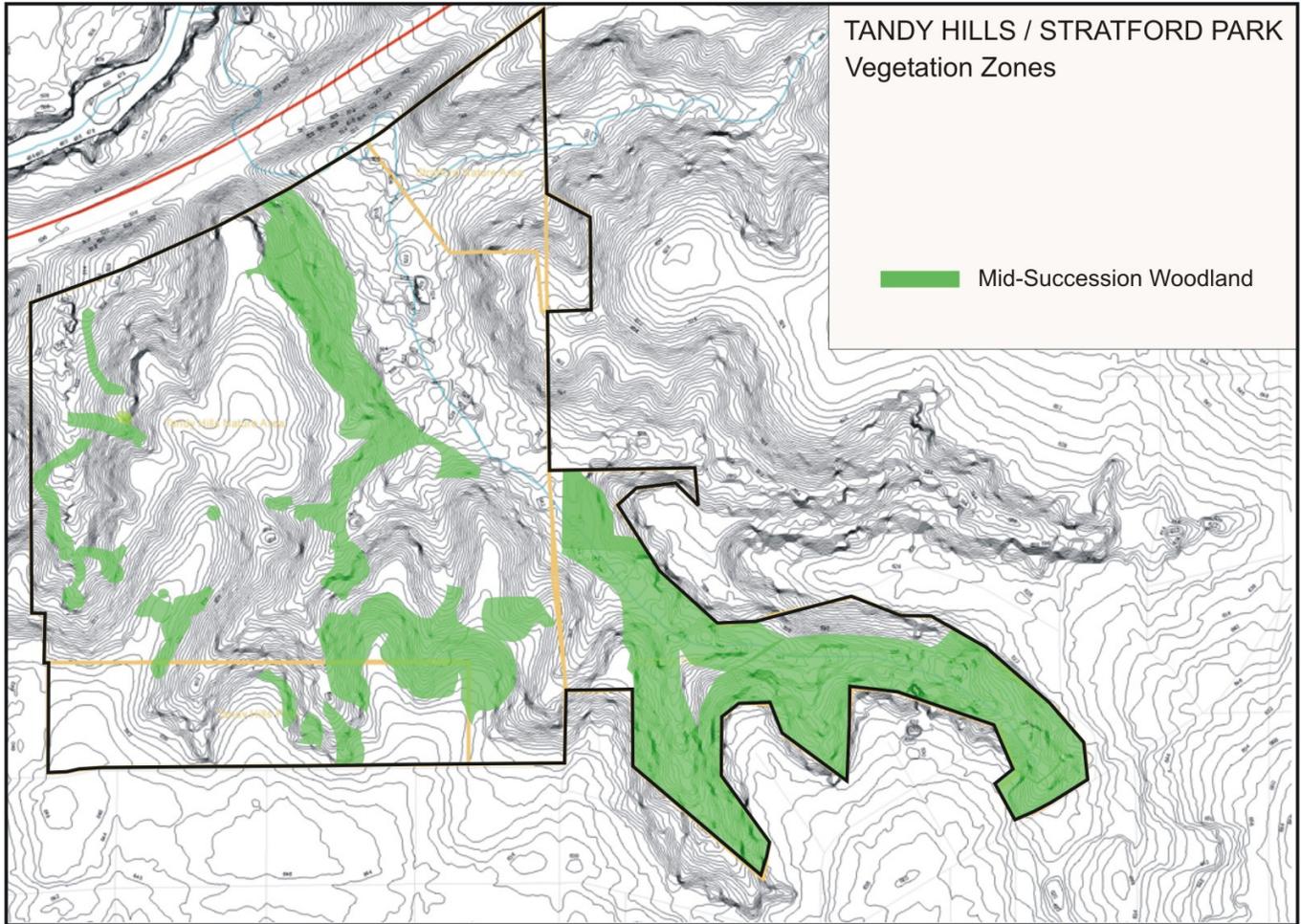


Figure 2-7. Mid-Succession Woodland

The mid-succession woodlands are located primarily in the drainages. Although they contain many of the same species as the early succession woodland, these areas are more diverse, possessing many less common species with high wildlife value. These woodlands originated in the drainages and are slowly migrating up the slopes to the higher elevations. As is the case in the early succession woodland, there is a sizeable amount of green ash in this zone. In addition, there are large populations of exotic species, most notably several privet species.

Representative Species:

Trees: green ash (*Fraxinus pennsylvanica*), cedar elm (*Ulmus crassifolia*), ashe juniper (*Juniperus ashei*), hackberry (*Celtis sp.*), osage orange (*Maclura pomifera*)

Small Trees and Shrubs: Texas redbud (*Cercis canadensis var. texensis*), Carolina false buckthorn (*Frangula caroliniana*), fragrant sumac (*Rhus trilobata*), roughleaf dogwood (*Cornus drummondii*), smooth sumac (*Rhus glabra*), elbow bush (*Forestiera pubescens*), rusty blackhaw (*Viburnum rufidulum*), Mexican plum (*Prunus mexicana*), Eve's necklace (*Sophora affinis*)

Understory: dayflower (*Commelina erecta*), yellow passionflower (*Passiflora lutea*), pigeonberry (*Rivina humilis*), coralberry (*Symphoricarpos orbiculatis*), twoflower milkvine (*Matelea biflora*)

Exotics: privet species (*Ligustrum spp.*), Chinese photinia (*Photinia serratifolia*), nandina (*Nandina domestica*)

2.1.7. Vegetation Zones: Late Succession Woodland

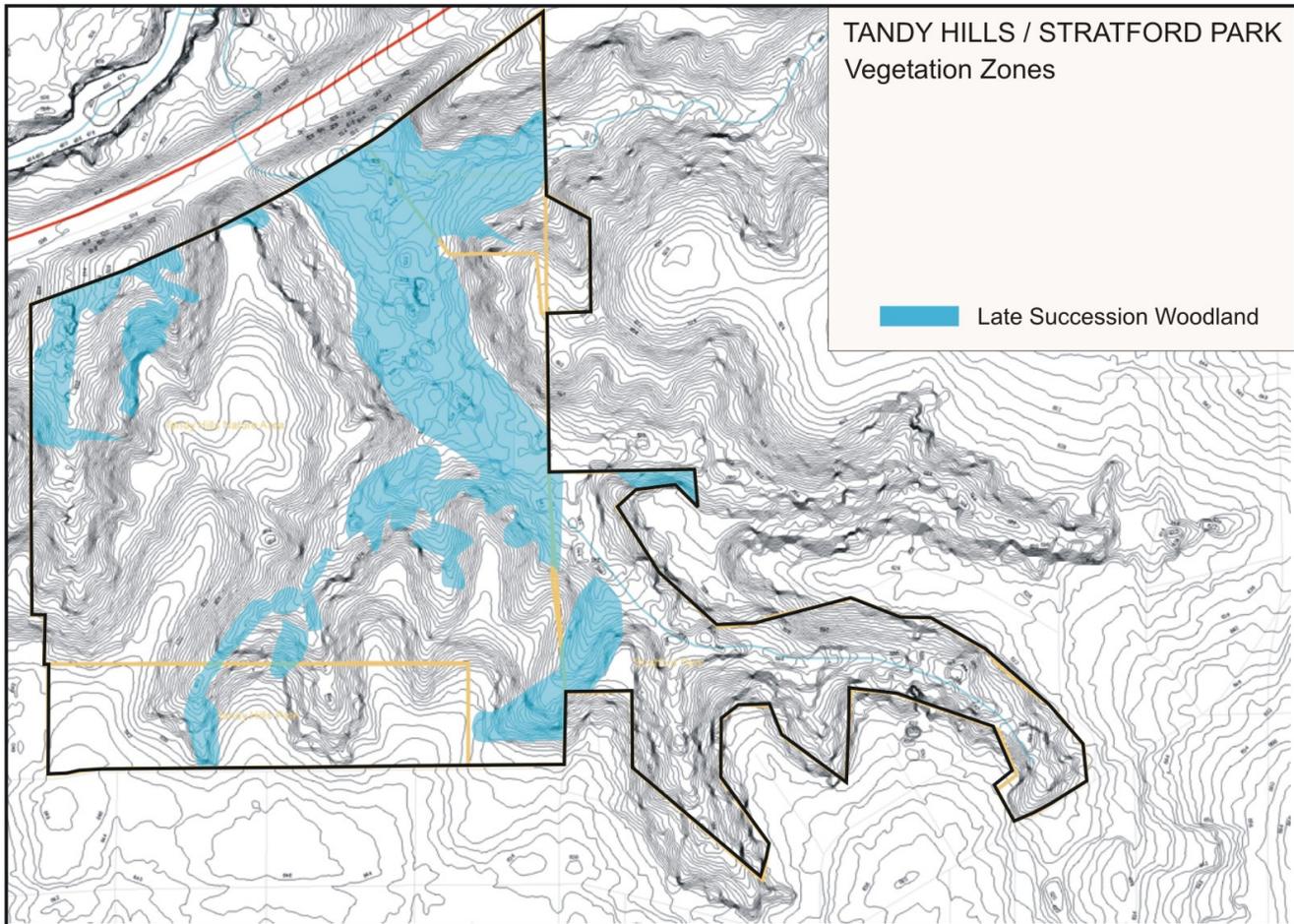


Figure 2-8. Late Succession Woodland

The late succession woodland is located mostly in the lower elevation drainages, where soil is deeper and moisture more available for the growth of large trees. There are a number of hardwood species that provide deep shade and support a dense understory growth with a high diversity of woody and herbaceous species. This zone also has a high amount of exotic invasion. There are areas where saplings and seedlings of native trees are beginning to grow but are being choked by the growth of privet. These seedlings will likely not be able to survive the competition.

Representative Species:

Trees: plateau live oak (*Quercus fusiformis*), pecan (*Carya illinoensis*), cedar elm (*Ulmus crassifolia*), Shumard red oak (*Quercus shumardii* var. *shumardii*), hackberry (*Celtis* sp.), ashe juniper (*Juniperus ashei*), eastern cottonwood (*Populus deltoides* ssp. *deltoides*), osage orange (*Maclura pomifera*), red mulberry (*Morus rubra*)

Small Trees and Shrubs: Texas redbud (*Cercis canadensis* var. *texensis*), green ash (*Fraxinus pennsylvanica*), Texas ash (*Fraxinus texensis*), cherry laurel (*Prunus caroliniana*), coralberry (*Symphoricarpos orbicularis*), Virginia creeper (*Parthenocissus quinquefolia*), rusty blackhaw (*Viburnum rufidulum*), Mexican plum (*Prunus mexicana*), Carolina false buckthorn (*Frangula caroliniana*)

Understory: poison ivy (*Toxicodendron radicans*), greenbriar (*Smilax bona-nox*), grape vine (*Vitis* sp.), frostweed (*Verbesina virginica*), purpletop (*Tridens flavus*), ironweed (*Vernonia* sp.), inland seaots (*Chasmanthium latifolium*), sedge (*Carex* spp.)

Exotics: privet species (*Ligustrum* spp.), Chinese photinia (*Photinia serratifolia*), nandina (*Nandina domestica*), giant reed (*Arundo donax*), common chaste tree (*Vitex agnus-castus* var. *agnus-castus*)

2.1.8. Endemic Species

Based on listings from the USDA Natural Resources Conservation Service's Plants Database, there are eight endemic plant species located in TH/SP, which are listed in Table 2-1. It is recommended that these plants be mapped and monitored over time to determine their on-going status. (See Section 3.5.12. Management Priorities)

<u>FAMILY</u>	<u>GENUS SPECIES</u>	<u>COMMON NAME</u>
ASTERACEAE	<i>Krigia caespitosa</i> = <i>oppositifolia/gracilis</i>	Weedy dwarf dandelion
AGAVACEAE	<i>Yucca pallida</i>	Pallid yucca
ASTERACEAE	<i>Silphium albiflorum</i>	White rosinweed
BRASSICACEAE	<i>Lesquerella recurvata</i> = <i>Physaria</i>	Slender bladderpod
FABACEAE	<i>Dalea tenuis</i> = <i>tenuis</i> = <i>Petalostemon</i>	Slender Dalea
FUMARIACEAE	<i>Corydalis curvisiliqua</i> ssp. <i>curvisiliqua</i>	Curvepod corydalis
LAMIACEAE	<i>Salvia engelmannii</i>	Engelmann's sage
VALERIANACEAE	<i>Valerianella stenocarpa</i>	Narrowfruit cornsalad

Table 2-1. TH/SP Endemic Species

2.1.9. Species of Note

The prairie is the major habitat of note at TH/SP. Deciding which species are of note is more difficult. Criteria can include rarity, uncommonality, beauty, and/or historic value, to name a few. Various species of note include two species of trout lily (*Erythronium albidum* and *E. mesochoreum*), purple paintbrush (*Castilleja purpurea* var. *purpurea*), big bluestem (*Andropogon gerardii* var. *gerardii*), and bluebell (*Eustoma grandiflorum*). Other species of note include some of the representative species for the various habitat types identified in Section 2.1. Vegetation Zones.

Many species can be of interpretive use to teach visitors about various habitat types, seasonal changes, animal needs, and historic uses. See Section 5.4. for a discussion of the proposed environmental education program.

2.2 Faunal Study Survey

A preliminary faunal study was performed during the summer of 2007. Further studies should be conducted during other seasons for a more complete listing. Birds were mostly concentrated on the ridge tops, where the tall and short grass remnants are, and on the edges with urban interface. Few animals were sighted in the lower elevations of the park during the study period.

During the site visits of summer 2007 the survey team found the following animal species:

Insects

Cicadas	<i>Family: Cicadidae</i>
Deerfly	<i>Family: Tabanidae</i>
Gnats	<i>Order: Diptera</i>
House Fly	<i>Musca domestica</i>
Mosquitos	<i>Family: Culicidae</i>
Orbweaver	<i>Argiope sp.</i>
South American Fire Ants	<i>Solenopsis invicta</i>
Stinkbugs	<i>Family: Pentatomidae</i>
Water-striders	<i>Family: Gerridae</i>

Butterflies

Common Buckeye	<i>Junonia coenia</i>
Delaware Skipper	<i>Anatrytone logan</i>
Eastern Tiger Swallowtail	<i>Papilio glaucus</i>
Giant Swallowtail	<i>Papilio cresphontes</i>
Gulf Fritillary	<i>Agraulis vanillae</i>
Pipevine Swallowtail	<i>Battus philenor</i>
Queen	<i>Danaus gilippus</i>
Question Mark	<i>Polygonia interrogationis</i>
Sleepy Orange	<i>Abaeis nicippe</i>
Southern Broken-dash	<i>Wallengrenia otho</i>
Southern Dogface	<i>Zerene cesonia</i>
Variiegated Fritillary	<i>Euptoieta claudia</i>

Damselflies

Great Spreadwing	<i>Archilestes grandis</i>
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Dragonflies

Black Saddlebags	<i>Tramea lacerata</i>
Common Green Darner	<i>Anax junius</i>
Eastern Pondhawk	<i>Erythemis simplicicollis simplicicollis</i>
Four-striped Leaf-tail	<i>Phyllogomphoides stigmatus</i>
Neon Skimmer	<i>Libellula croceipennis</i>
Red Saddlebags	<i>Tramea onusta</i>
Variiegated Meadowhawk	<i>Sympetrum corruptum</i>

Birds

Cattle Egret	<i>Bulbulcus ibis</i>
Turkey Vulture	<i>Cathartes aura</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Killdeer	<i>Charadrius vociferus</i>
Rock Pigeon	<i>Columba livia</i>
White-winged Dove	<i>Zenaida asiatica</i>

Mourning Dove	<i>Zenaida macroura</i>
Inca Dove	<i>Columbina inca</i>
Chimney Swift	<i>Chaetura pelagica</i>
Ruby-throated Hummingbird	<i>Archilochus colubris</i>
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>
Downy Woodpecker	<i>Picoides pubescens</i>
Great Crested Flycatcher	<i>Myiarchus crinitus</i>
White-eyed Vireo	<i>Vireo griseus</i>
Blue Jay	<i>Cyanocitta cristata</i>
American Crow	<i>Corvus brachyrhynchos</i>
Barn Swallow	<i>Hirundo rustica</i>
Carolina Chickadee	<i>Poecile carolinensis</i>
Tufted Titmouse	<i>Baeolophus bicolor</i>
Carolina Wren	<i>Thryothorus ludovicianus</i>
Bewicks' Wren	<i>Thryomanes bewickii</i>
Blue-gray Gnatcatcher	<i>Polioptila caerulea</i>
American Robin	<i>Turdus migratorius</i>
Northern Mockingbird	<i>Mimus polyglottos</i>
European Starling	<i>Sturnus vulgaris</i>
Summer Tanager	<i>Piranga rubra</i>
Lark Sparrow	<i>Chondestes grammacus</i>
Sparrow species	
Northern Cardinal	<i>Cardinalis cardinalis</i>
Dickcissel	<i>Spiza americana</i>
Common Grackle	<i>Quiscalus quiscula</i>
Great-tailed Grackle	<i>Quiscalus mexicanus</i>
House Finch	<i>Carpodacus mexicanus</i>
House Sparrow	<i>Passer domesticus</i>

Reptiles and Amphibians

Ground Skink	<i>Scinella lateralis</i>
Gulf Coast Toad	<i>Bufo valliceps</i>
Spiny Lizard	<i>Sceloporus sp.</i>

Mammals

Cottontail	<i>Sylvilagus floridanus</i>
Domesticated Dog	<i>Canis familiaris</i>
Eastern Fox Squirrel	<i>Sciurus niger</i>
Raccoon	<i>Procyon lotor</i>

2.3. Hydrology

Tandy Hills / Stratford Park lies within the West Fork of the Trinity River drainage basin, which begins northwest of Fort Worth in Archer County. Downstream from Fort Worth, the West Fork flows east towards Dallas where it joins with the Elm Fork to form the main stem of the Trinity River. The river then flows down to Galveston Bay and the Gulf of Mexico.

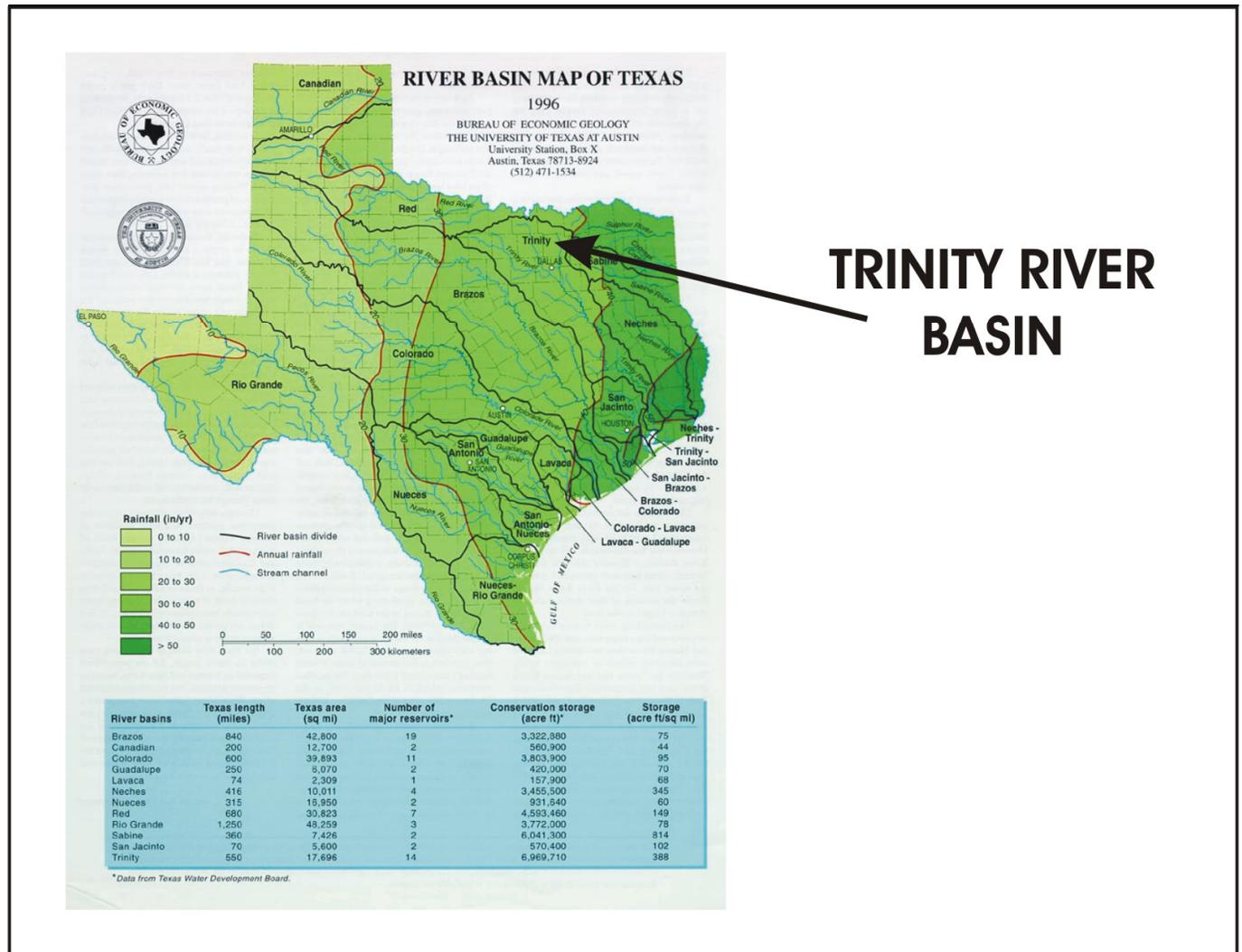


Figure 2-9. River Basin Map of Texas: Trinity River Basin

2.3.1. Tandy Hills / Stratford Park Drainage Basins

TH/SP has two main drainage areas that flow under Highway 30 and into the West Fork of the Trinity River.

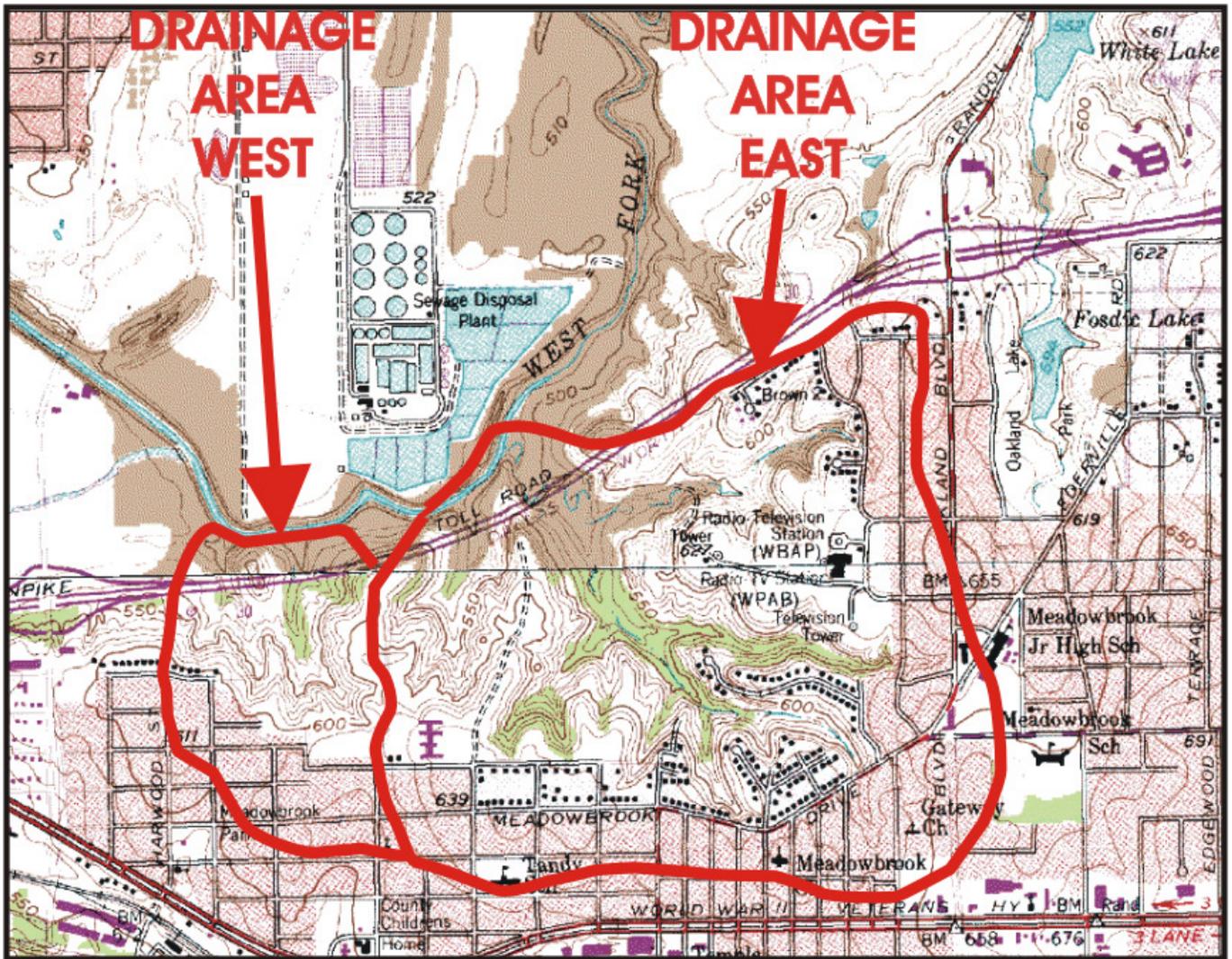


Figure 2-10. U.S.G.S. Drainage Basin Map of Tandy Hills / Stratford Neighborhood

2.3.1.1. Drainage Area West

The smaller western drainage flows along the western boundary of the park for a length of approximately 0.25 mile, draining approximately one fourth of the park and eventually flowing into a culvert under Highway 30. It ranges from five to twenty feet in width, and becomes wider at its lowest elevation, where it turns east and flows under the highway. There are a number of small side drainages feeding this drainage, but none are large enough to present serious problems for trail crossings. The west drainage system picks up run-off from the playground, the nursing home at the southeast corner of the park, and the east side of Ben Avenue along the west boundary of the park. It includes approximately ten houses along View Street east of Ben Avenue. It is a very small drainage basin and has very little impact from the few neighboring streets and houses within its drainage area.

2.3.1.2. Drainage Area East

The eastern side of the park contains an extensive creek system draining the majority of the park. This drainage includes all of Stratford Park, Stratford Nature Area, and two thirds of Tandy Hills Park. The main tributary begins at Meadowbrook Drive and Chelsea Road, extending through the park and flowing into a culvert under Highway 30. At the upper elevations, this tributary is ten to thirty feet wide. As it approaches lower elevations towards the Bottomlands, it becomes 100 to 200 feet wide and undefined. There is evidence of high flooding, with debris in trees up to approximately 20 feet in height. During the hydrology study period (July – September 2007) this creek had sporadic pools of water but was not flowing freely.

The area of the eastern drainage includes a few schools, a television station, a greater number of streets and houses, and the proposed gas drilling operation. Since several of the neighboring streets are close to the headwaters of several of the lateral draws, a greater amount of garbage and debris has been deposited or washed into the primary drainageway.

2.3.1.3. Seeps

There are several seeps within the park. During the study period for the Strategic Master Plan (July 2007 – October 2007) there were scattered areas which consistently contained small pools of water or saturated soils. These seep locations are marked on the following map.

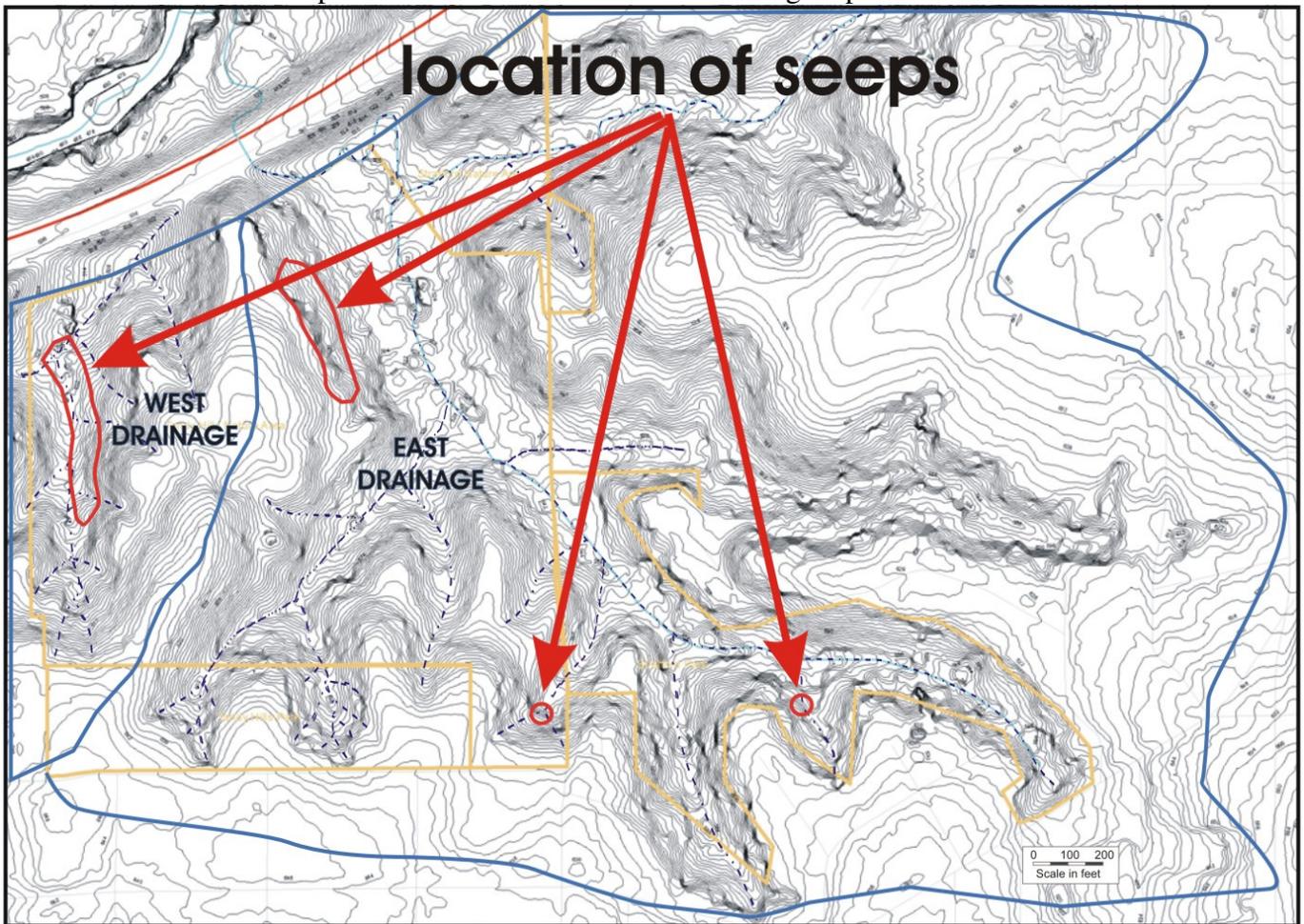


Figure 2-11. Drainage Basin Map of Tandy Hills / Stratford Park

2.3.2. Floodplain

The lowest elevations in TH/SP are within the 100-year floodplain, as determined by the Federal Emergency Management Agency (F.E.M.A.). The following map indicates a portion of the floodplain for the West Fork of the Trinity River, a portion of which extends into TH/SP. The shaded area outlines flood hazard areas inundated by 100 year floods. The park outline is superimposed over the floodplain map.

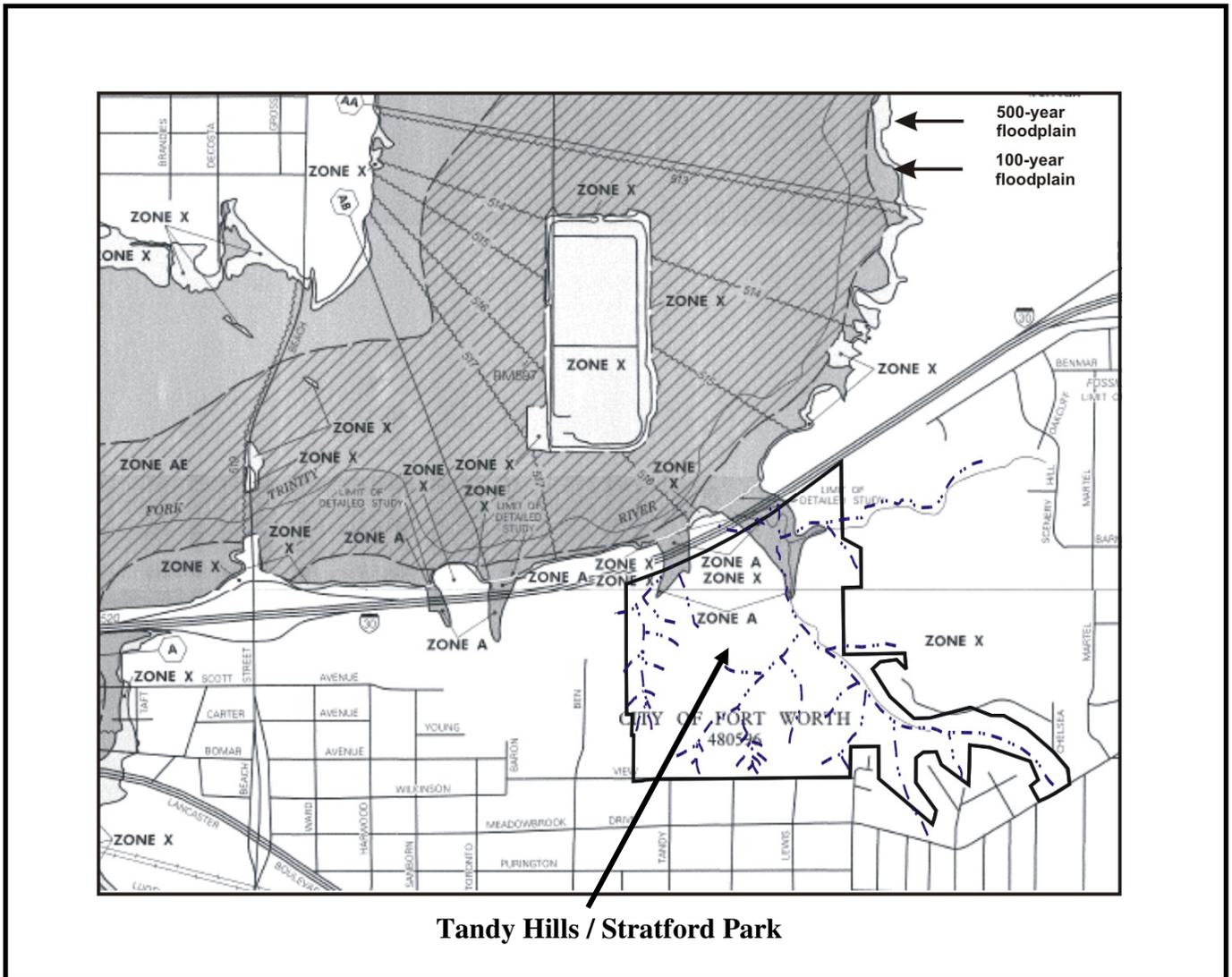


Figure 2-12. F.E.M.A. Floodplain Map

2.3.3. Tandy Hills / Stratford Park Detailed Drainage Map

The following is a detailed map of the two main drainages and their side draws within the park. The topography is steep along the drainages, with relatively flat ridges between the major drainages and lateral draws.

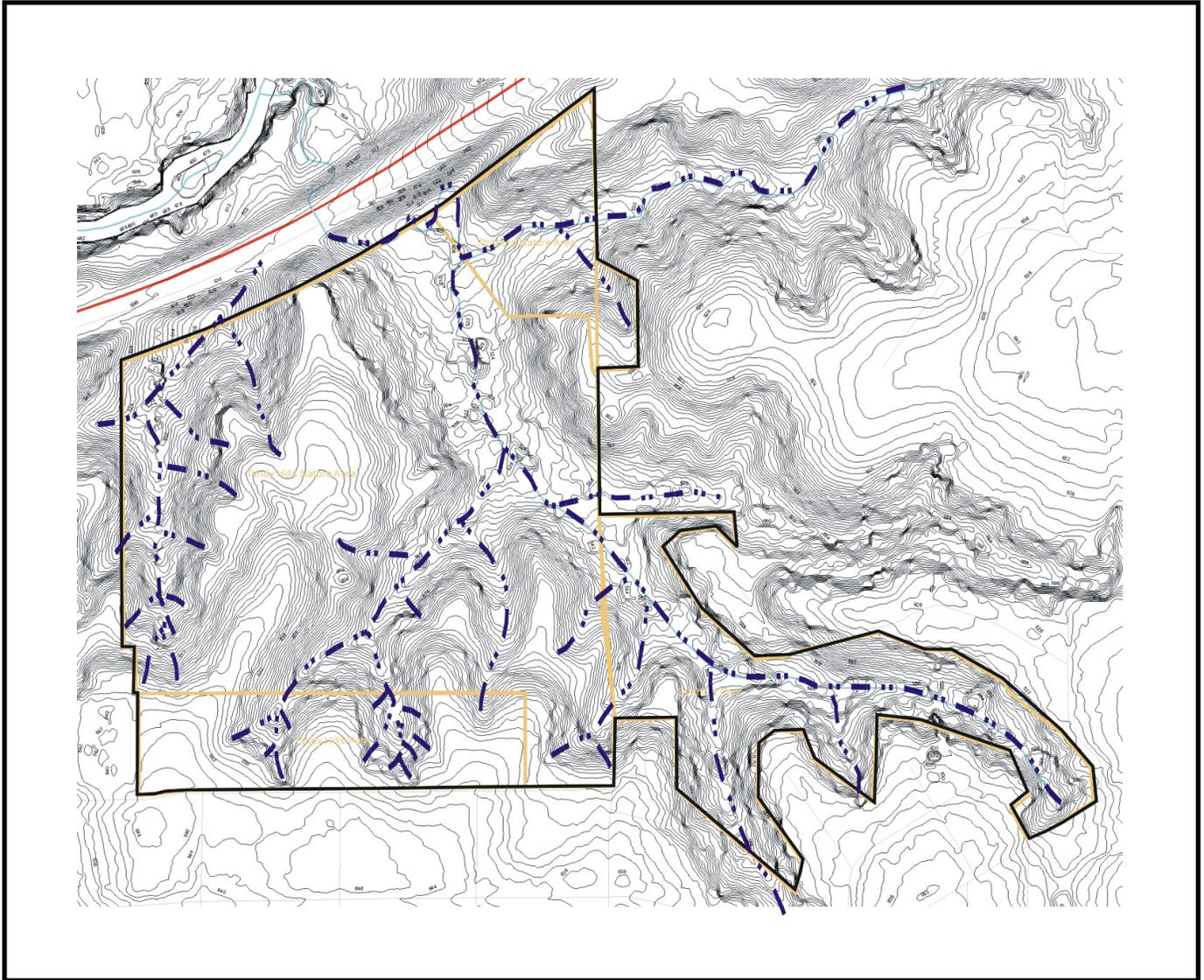


Figure 2-13. Tandy Hills / Stratford Park Detailed Drainage Map

2.4. Soils of Tandy Hills / Stratford Park

The soils of TH/SP are described in two reports by Wayne L. Clark. There are three soil types in the park: Aledo, Aledo-Bolar, and Frio.

2.4.1. Aledo Series

The Aledo series, found on upland with slopes from one to eight percent, is shallow, well drained and overlying limestone beds. It is usually nine to twenty inches thick and found on both gentle and steep slopes. Aledo soil is located in higher elevations in the park. Vegetation associated with Aledo soil consists of grasses such as little bluestem, sideoats grama, Indian grass, and buffalo grass, as well as scattered mesquite and live oak trees. In the original Fort Worth Prairie, the vegetation in Aledo soil was 95% grass, 5% forbs, and 0% woody.

2.4.2. Aledo-Bolar Series

The Aledo-Bolar series is the predominant soil type in TH/SP. It is a deeper but still well-drained soil formed over limestone and calcareous marls. The soil can range from twenty to forty inches thick and is found on slopes from one to five percent, sometimes up to fifteen percent. Vegetation is similar to that of the Aledo series. In the original Fort Worth Prairie, vegetation in the Aledo-Bolar series was 90% grass, 5% forbs, and 5% woody.

2.4.3. Frio Series

The Frio series is found in calcareous alluvial floodplain areas. It is deep, well drained and somewhat slowly permeable soils containing clays and loam over sand, gravel, and limestone. It is found on slopes from zero to two percent and is often moist. Vegetation associated with Frio soil consists of open deciduous woodlands of pecan, elm, and oak, with understory grasses including big bluestem, little bluestem, switchgrass, Indian grass, Texas wintergrass, and Virginia wildrye. It has about five percent forbs, such as Englemann daisy, maximillian sunflower, penstemon, and frostweed. Frio soils are found in the lower elevation creek bottoms. In the original Fort Worth Prairie, the vegetation in Frio soil was 70% grass, 20% forbs, and 5% woody, which shaded 25% of the ground.

2.5. Project Area Boundaries

Site visits of the park were made to verify the existing park boundary map using sub-meter accuracy GPS units. The following map shows the areas where verification was determined (marked in yellow). The two yellow areas on the east side of the map not corresponding to a current-day boundary are old fencelines.

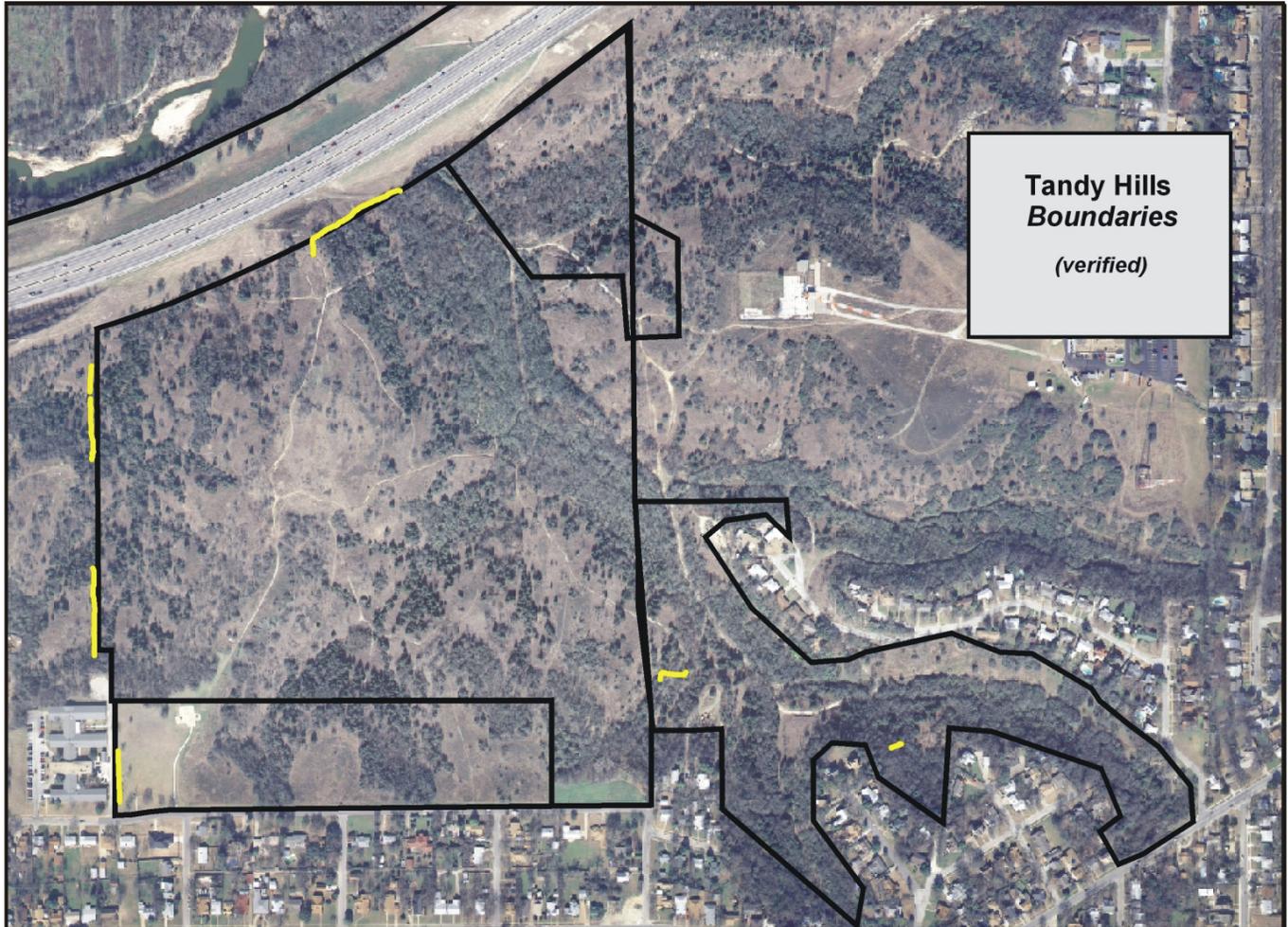


Figure 2-14. Tandy Hills Boundaries: Verified

2.6. Human Impact Map

Site visits were made to map locations of human impact using sub-meter accuracy GPS units. Included in the map are dump sites, roofing shingles, old manholes, a variety of broken glass, a wooden bridge, abandoned cars, and current entrances. Also included is the location of a permanent sanitary sewer easement, with access points at each end. There is currently a dirt access road along the sewer line, with access at Medford Road. This entrance should be retained as is. (See Section 4.5.1. for discussion of entrances.) There are no other utility easements within the park boundary. Existing trails are mapped in Figure 4-1 Map of Existing Trails in Tandy Hills/Stratford Park.

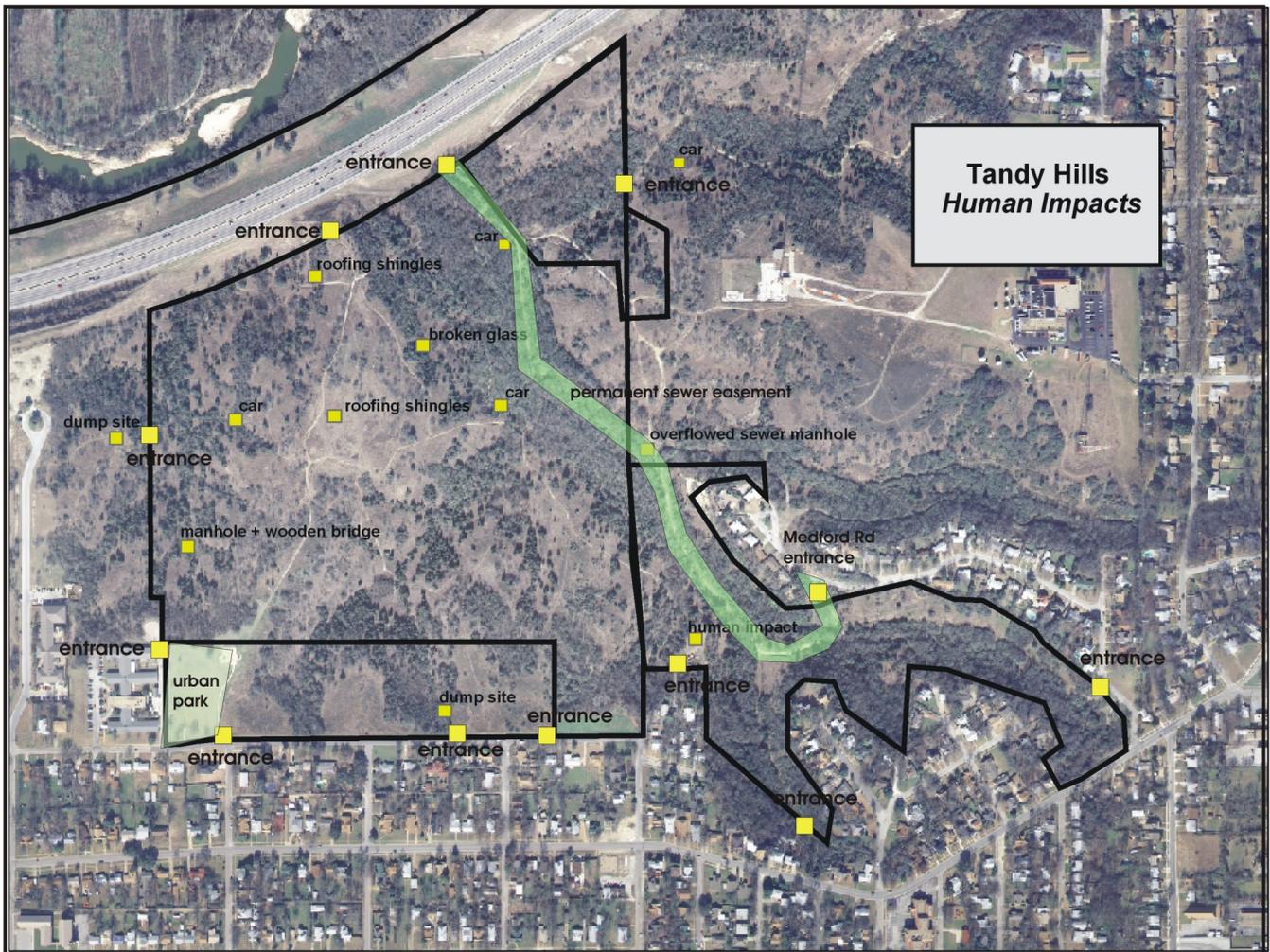


Figure 2-15. Tandy Hills Human Impacts

3.0 NATURAL RESOURCE MANAGEMENT

While TH/SP is an area with management challenges, it is also valued by many people as a highly diverse and important prairie remnant. It is loved and visited by many citizens and has earned awards from local newspapers as a valuable asset to the Fort Worth community.

As Wayne Clark stated in his 1989 environmental assessment,

“Wildflowers are what really make Tandy Hills a special area. Although many areas have the climax grasses for our region, few have many wildflowers. Tandy Hills wildflowers are in the right place and the right amounts ... and it is from my observations the best place in Fort Worth for native wildflowers.”

TH/SP is located in an urban environment, which creates conditions contrary to a natural area. In a truly natural area, fires started by lightning would occur regularly; water would be clean and without garbage, sewage, or contaminants in urban run-off; and the native vegetation would not be threatened by invasions from nearby exotic landscapes. These are some of the problems that have existed in TH/SP for many years.

Despite all the negative stresses, TH/SP has continued to be an ecological jewel and a community treasure that will respond favorably when responsible management practices are implemented.

When making management decisions, all of the intricacies of natural processes need to be considered. It is important to understand what will happen if certain actions are taken, and, alternatively, what will happen if those same actions are not taken. For instance, if the privet species are not removed from the park, they will propagate and increase in population and continue to push out native species that cannot compete. If they are removed, the original native species will have a chance to return.

3.1. Management Goals

Before it is possible to rank and prioritize management issues, management goals need to be established. The two main management goals for the TH/SP are:

1. Restore the park to its original habitat.
2. Protect the park from negative impacts.

3.2. Analysis of Management Issues

The management concerns of the site were analyzed and mapped by looking at the seven basic vegetation zones (See Section 2.1. Floral Survey: Vegetation Zones), as indicated in the following map. Each zone was studied to determine the extent of existing problems and to outline various management options. The different zones were then measured in acreage in order to estimate the cost of implementing each management option.

In the following sections are descriptions of the management issues for each vegetation zone and a brief list of management options. An in-depth discussion of how to implement the various management options is presented in Section 3.5. Management Methods.

3.2.1. Vegetation Zones with Description of Management Issues

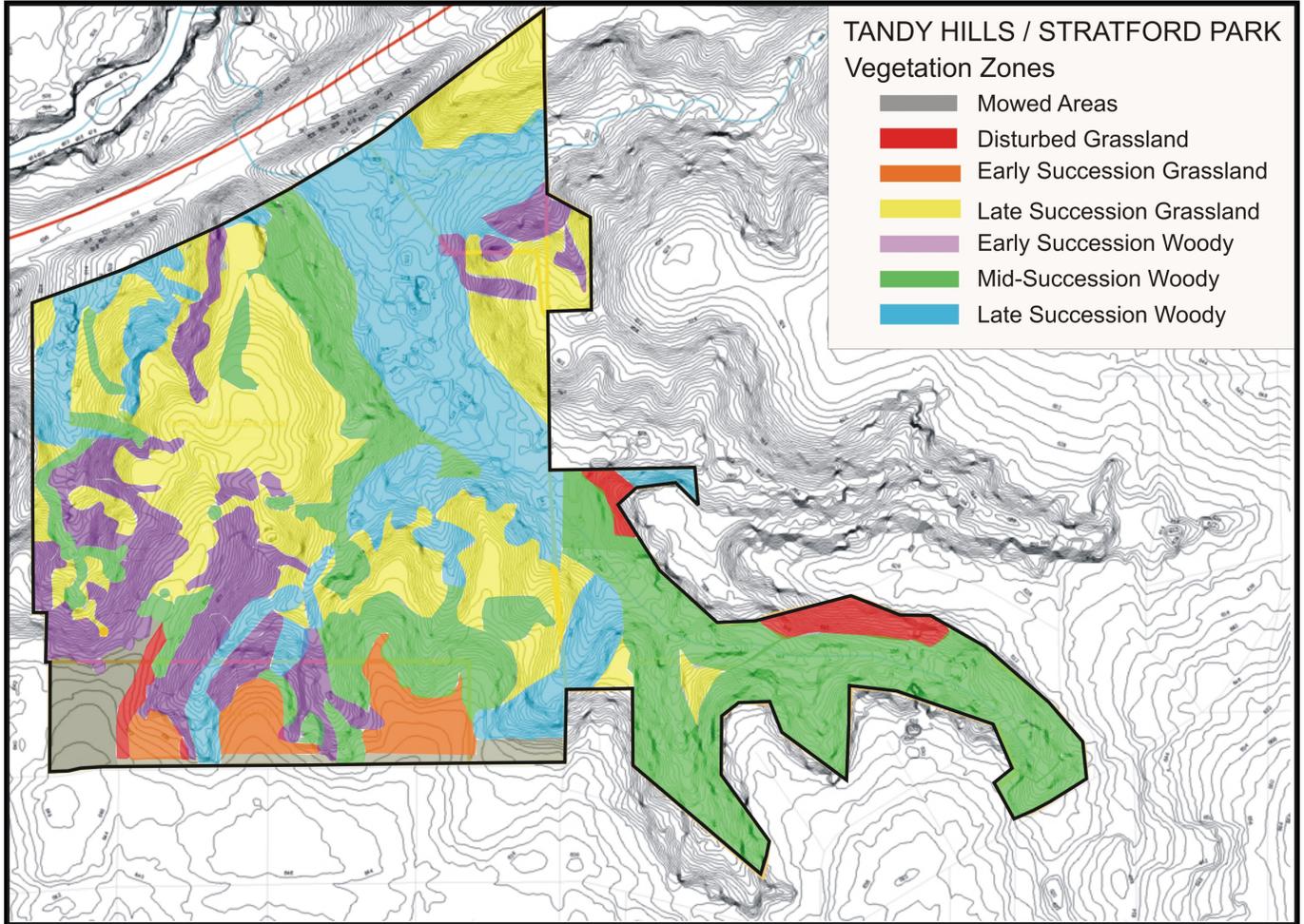


Figure 3-1. Map of Vegetation Zones

3.2.1.1. Mowed Areas

(Vegetation Zone Map: Grey)

Mowing guidelines need to be developed for various locations in the park. Currently all of the mowed areas are kept at a height of approximately two to four inches.

Playground

It is appropriate to keep the playground area at the southwest corner of the park mowed.

East of the Existing Sidewalk

This area will become part of the entrance to the park in the management plan. There is an opportunity during the construction of the proposed entrance road (See Section 4.7.2. Entrance Road) to completely remove the exotic species along the east side and restore this area to a native grassland. Short grasses and wildflowers can be seeded and planted near the edge of the entrance road if a short vegetation community is preferred. Buffalo grass is an appropriate short native grass.

Having a strip of prairie along the proposed entrance road will make a public statement about the philosophy and goals of the park. There will be no need to mow this area.

Along View Street

The width of the mowed areas along View Street is too wide and the grass is mowed too short. Mowing the vegetation to two to four inch heights has encouraged the growth of exotic species such as Bermuda grass, which are spreading back into the meadow. All of these exotic species should be removed in the mowed strip and where they have spread into the meadow and be replaced with native species. Otherwise, this prairie remnant will be lost.

If it is required by the City of Fort Worth to have a strip of short vegetation along the street, short native grasses and wildflowers should be seeded and planted. Mowing could then be done less frequently and not less than four to six inches in height.

Management Options:

1. It is recommended that there be mowing guidelines and that the guidelines are well communicated to the personnel doing the mowing.
2. Remove all exotic species and replace with buffalo grass and other short grasses and wildflowers. (See Section 3.5.2. Removal of Exotic and Invasive Woody Species and Section 3.5.6. Restoration Strategies)
3. Where mowing is needed, mow only once a year and never mow to less than four to six inches in height.

3.2.1.2. Disturbed Grassland

(Vegetation Zone Map: Red)

The disturbed grasslands are found in open areas close to streets and houses. There are a number of exotic and invasive species in the Disturbed Grassland Zone. There is evidence of past disturbance which has eliminated the high diversity of late succession grasses and perennial wildflowers that are found in the park's more mature grasslands. Disturbance probably included close-crop mowing and damage during the construction of houses bordering the park.

Management Options:

1. Remove all exotic and invasive species. (See Section 3.5.2. Removal of Exotic and Invasive Woody Species)
2. Reintroduce native grass and wildflower species through seeding. (See Section 3.5.6. Restoration Strategies)
3. Give the disturbed areas along View Street a higher priority rating for restoration because they are visible to the public and therefore make a statement about the philosophy and goals of the park.
4. Give the disturbed areas in Stratford Park a lower priority rating because they are less visible. Restoration in these areas also has less probability of success due to the proximity to neighboring houses and the ongoing introduction of exotic species.

3.2.1.3. Early Succession Grassland

(Vegetation Zone Map: Orange)

The three early succession grasslands are located along View Street. They are extremely colorful in the spring, full of early succession wildflowers. These areas make a visual statement to the public since they are the prairie remnants most visible from the street.

The early succession grasslands are currently being encroached by exotic grasses from the mowed areas. This topic was discussed above in the Mowed Areas section.

Management Options:

1. Remove Bermuda grass that has spread into the prairie.
2. Beyond exotic species removal, do nothing in this area. It could offer an educational opportunity as an example of prairie succession.
3. Supplement this area with later succession grass and wildflower species that are determined to be missing. (See Section 3.5.6. Restoration Strategies)
4. Conduct controlled burns or simulate burning with mowing.
5. Remove all woody species. (See Section 3.5.3 Woody Encroachment)

3.2.1.4. Late Succession Grassland

(Vegetation Zone Map: Yellow)

The late succession grasslands are all the open meadows throughout the park. They are found in the higher elevations and on the upper hillsides. Many of these prairie meadows contain scattered woody species.

Management Options:

1. Remove all woody species within the open meadows, except perhaps a few large trees that might be used to shade a bench along a trail. Removing these woody species will increase the amount of open prairie. (See Section 3.5.3 Woody Encroachment)
2. Conduct controlled burns or simulate burning with mowing.
3. Leave some woody vegetation in strategic locations for vegetative screening.

3.2.1.5. Early Succession Woodland

(Vegetation Zone Map: Purple)

The early succession woodland is found mostly in the upper elevation hillside areas where open prairie existed only a few decades ago. This immature woody growth is rapidly encroaching into the prairie area. It is composed of both native species and large populations of exotic species. The green ash population is out of balance and needs to be contained.

Management Options:

1. Remove all exotic species. (See Section 3.5.2. Removal of Exotic/Invasive Woody Species)
2. Remove all immature woody species to create more open prairie.

3.2.1.6. Mid-Succession Woodland

(Vegetation Zone Map: Green)

The mid-succession woodland is found mostly in the lower elevation hillside areas and the upper reaches of the main creek in Stratford Park. Historical documents state that Stratford Park was encroached by woody species when the majority of Tandy Hills was still mostly open prairie. There are large populations of exotic species found in the mid-succession woodland. The green ash population is out of balance here as well and needs to be contained.

Management Options:

1. Remove exotic species, beginning at the edges along the trail and in areas where populations of native saplings and seedlings exist. (See Section 3.5.2. Removal of Exotic and Invasive Woody Species)
2. Re-vegetate areas where colonies of exotic species have been removed. (See Section 3.5.6.4. Restoring Closed Trails for restoration techniques and Section 3.5.6. Restoration Strategies)
3. Selectively remove invasive native species, specifically green ash.
4. Take care to preserve notable species such as interesting native shrubs and small trees. These include coralberry, rusty blackhaw, Mexican plum, redbud, and dogwood. Each of these species have high wildlife value.

3.2.1.7. Late Succession Woodland

(Vegetation Zone Map: Blue)

The late succession woodland is located in drainage and seep areas where there is enough reliable and substantial moisture to support the growth of large hardwood trees. There are large populations of exotic species found in the late succession woodland.

Management Options:

1. Remove exotic species, beginning at the edges along the trail and in areas where populations of native saplings and seedlings exist. (See Section 3.5.2. Removal of Exotic & Invasive Woody Species.)
2. Re-vegetate areas where colonies of exotic species have been removed. (See Section 3.5.6.4. Restoring Closed Trails for restoration techniques and Section 3.5.6. Restoration Strategies)

3.3. Analysis of Drainage Basins Management Issues

Management issues in the drainage basins present slightly different challenges than management on the upper hillsides and open meadows. The drainages have been divided into six distinct areas for identification and discussion purposes.

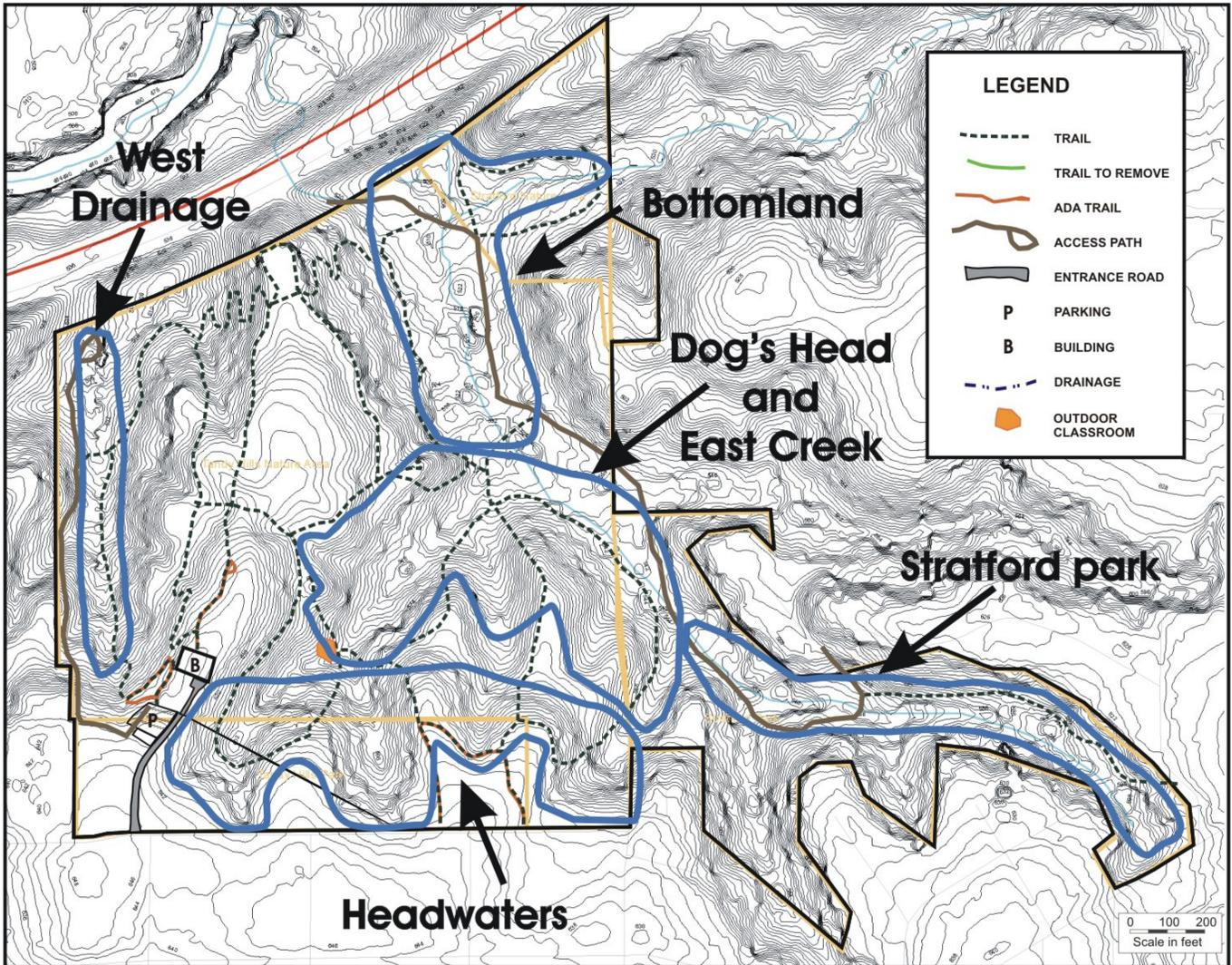


Figure 3-2. Six Drainage Areas of Tandy Hills / Stratford Park

3.3.1. West Drainage

Care should be taken to preserve interesting woody species within fifty feet on either side of the drainage. This is especially true of species with wildlife value, such as rusty blackhaw, Mexican plum, and Carolina buckthorn.

3.3.2. Headwaters

1. The Headwaters are geographically in the heart of the park. Being next to the street, people can easily see their condition. These areas are a staging point for the woodlands and are a public face of the park. This area should be considered as one of the first priorities for management.
2. The Headwaters are packed with invasive plants. Invasives should be removed starting from the top of the slopes and working towards the center line of the creeks.
3. The drainages should be cleared of garbage. Install garbage screens where the street empties into the drainages.
4. These drainages are a seed source for undesirable species that are washing down into the center of the park. A variety of solutions are listed in Section 3.5. Management Methods.
5. Exotic species should be first removed in places where there will be success. Approach the problem as a triage.

3.3.3. Dog's Head and East Creek Drainages

1. Dogs Head and East Creek are a branched network of drainages passing through rolling hills. The drainages are threatened by seeds washing down from the Headwaters.
2. These areas are second in priority, after the Headwaters are substantially under control.
3. The areas are varied and hilly, with many red oaks and open meadows.
4. Leave large trees and diversity of understory along the creeks.

3.3.4. Bottomland

1. The Bottomland is prone to frequent floods and the lower portion is within the 100-year flood plain. The bed is wide and undefined.
2. This area is completely over-run with privet species. Since the exotic species problem is so vast, mechanized removal techniques will need to be used, even though some native seedlings will be removed as well. Restoration would need to be applied in cleared areas.
3. Fixing this area will be very expensive and require constant maintenance. Since this area drains Stratford Park, there will not be a real solution in this area until Stratford Park is under control.
4. Educating neighbors about the effect of exotic species upon the park might affect their choices of landscape plants.

3.3.5. Stratford Park

1. Stratford Park has less ecological integrity than Tandy Hills. Problems in this area most likely stem from its close proximity to the surrounding urban environment.
2. Fixing this area is an ambitious project. It will need constant maintenance after it is under control.
3. Care must be taken to not let Tandy Hills suffer from the effects of Stratford Park.
4. Stratford Park's restoration cannot be allowed to consume a disproportionate quantity of the overall park's time and resources.
5. Management should begin at the border between Tandy Hills and Stratford Park and work upstream.
6. Boundaries in this area need to be clearly defined and marked. There are some neighbors that appear to be encroaching into park property.

3.4. Consequences of Doing Nothing

As previously discussed, TH/SP was part of the Fort Worth Prairie for many thousands of years. That was its natural state. The only reason the prairie is changing to woodland is because natural processes have been stopped by urbanization and the control of fire. It might seem that leaving TH/SP alone and doing nothing is harmless, but that approach is already evidencing the effects. Here is a list of some of these consequences.

- Exotic species are spreading into the park.
- Trail erosion continues.
- Uncontrolled creation of trails continues.
- Trash dumping continues.
- Prairie remnants are being lost to woody vegetation.
- Species diversity declines.
- Wildlife value declines.
- Park boundary violations by neighbors continue.
- Public use could decline as the park loses its attractive qualities.

3.5. Management Methods

The following management methods are recommended to achieve the management goals listed above.

3.5.1. Controlled Burns

Controlled burns are a traditional, natural, and efficient method for maintaining prairies. Periodic burns clear out the litter layer that develops over time, which is needed since only so much vegetative material can decompose naturally. Burning will open up the soil and create the potential for even greater diversity of wildflowers and grasses. Even the current areas that look attractive would benefit from fire. If there is no fire program, over time patterns of vegetative growth will shift. There has already been a decline in desirable prairie species where undesirable woody species have been encroaching.

Controlled burns offer an educational opportunity. Most people are drawn to fire. With each fire event, the park could develop an educational program to explain the importance of fire ecology.

3.5.1.1. Fire Management Plan

With careful planning, controlled burns can be carried out in an urban setting. A Fire Management Plan approved by the City of Fort Worth Parks and Community Service Department would need to be developed for TH/SP. Issues of importance include:

1. Protection of human life.
2. Protection of surrounding property.
3. Training and certification of employees to conduct each controlled burn.
4. Definition of the conditions and appropriate management response to be used within a designated unit.
5. Assessment of fuel load. If the fuel load is too great, pretreatment, such as hand removal of woody species, should be considered.
6. Education of the public in neighboring areas regarding the procedures and goals of controlled burns in TH/SP.

-
7. Development of a risk management plan and cost analysis, including the cost of not doing a controlled burn.
 8. Research of the literature to ensure controlled burns are based upon the best available science.
 9. Inclusion of public health and environmental quality considerations.
 10. Establishment of interagency collaboration.

3.5.1.2. General Plan for Controlled Burns

1. Divide the park into burn sections.
2. Each open meadow could be burned as a separate section.
3. For burning sections of woodland, choose areas that do not have a heavy fuel load, or reduce the fuel load by hand before burning the section.
4. Burned meadows define edges of woodland sections and provide a fire break.
5. Do not burn the thickest woodland areas.

3.5.1.3. Collaborating with Other Organizations and Agencies

Fort Worth has an opportunity to join many other agencies and municipalities that have been valuing controlled burns. Listed below are some of the organizations and agencies that can potentially assist with the planning and implementation of controlled burns in TH/SP.

- Red Buffalo LLC: Texas Prescribed Burn School: For training to become a certified burn manager, contact the Texas Prescribed Burn School, which is approved by the Texas Prescribed Burn Board and administered through the Texas Department of Agriculture.
 - http://www.myredbuffalo.com/burn_schools.htm
- Native Prairie Association: This organization has information regarding controlled burns, including a sample “Prescription Burning Management Plan.”
 - <http://www.texasprairie.org/Resources/ManagingSmallPrairiePrescribedBurns/ManagingSmallPrairiePrescribedBurns.shtml>
- Texas Parks and Wildlife Department: Tarrant County: Contact area biologists for assistance in planning a controlled burn.
 - http://www.tpwd.state.tx.us/landwater/land/habitats/cross_timbers/regulatory/?county=tarrant
 - Visit the following URL for a sample of TPWD’s “Prescribed Burn Plan.”
http://www.tpwd.state.tx.us/publications/pwdforms/media/pwd_0822_p4000_prescribed_burn_plan.doc
- Texas Department of Agriculture: Prescribed Burning Board: This board has information on setting standards for controlled burns.
 - http://www.agr.state.tx.us/agr/program_render/0,1987,1848_5538_0_0,00.html?channelId=553
- Natural Resources Conservation Services of Texas, U.S. Department of Agriculture: Contact NRCS for conservation planning and technical assistance.
 - <http://www.tx.nrcs.usda.gov/about>

-
- The Nature Conservancy: Texas: Contact the Nature Conservancy for resources and consulting advice on controlled burns.
 - <http://www.nature.org/wherewework/northamerica/states/texas>
 - This website shares the Nature Conservancy's position on controlled burns.
<http://www.nature.org/initiatives/fire>
 - Lady Bird Johnson Wildflower Center: Contact Dr. Steve Windhager for information on training and implementation. The Wildflower Center's burns always include firefighters, who use the burn as a training tool. It is important for firefighters to have experience with wild fires, even in an urban area.
 - <http://www.wildflower.org/fire>
 - Caddo/LBJ National Grasslands, U.S. Forest Service: Contact Scott Fry, Fire Management Officer. (940) 627-5475.
 - http://www.fs.fed.us/r8/texas/recreation/caddo_lbj/caddo-lbj_gen_info.shtml
 - Texas Forest Service, Contact Nick Harrison, Regional Fire Specialist, (817) 579-5772 or nharrison@tfs.tamu.edu.
 - <http://txforestservicetamu.edu/main/default.aspx>
 - University of North Texas, Contact Bruce Hunter, Wildland Fire Ecology, (940) 565-2991 or hunter@unt.edu.
 - <http://www.unt.edu/>
 - Fort Worth Nature Center & Refuge, Contact Suzanne Tuttle, Refuge Manager, (817) 237-6940
 - <http://www.fwnaturecenter.org/>
 - City of Fort Worth Fire Department, Contact Jerry Brooks, Deputy Chief, Educational and Support Services Division Fire & Police Training Center, (817) 871-6863 or Jerry.brooks@fortworthgov.org.
 - http://www.forthworthgov.org/fire/info/default.aspx?id=29184&ekmense1=166_submenu_812_link_1

3.5.1.4. Examples of a Controlled Burn in an Urban Area, Austin, Texas



Setting fire near a wooden privacy fence.



Well-trained crew carefully placed around burn.



Fire truck on call; fire fighters were on the crew.



Understanding wind conditions is important.



Local news media films the burn.



Neighbors gather to watch the burn.

(photos by Dr. Steve Windhager, Director, Landscape Restoration Program Lady Bird Johnson Wildflower Center)

Figure 3-3. Photos of Urban Controlled Burn

3.5.2. Removal of Exotic and Invasive Woody Species

Tandy Hills / Stratford Park contains a number of exotic woody species that should be removed.

3.5.2.1. Exotic Woody Species

Exotic species found most frequently in the park include the following:

Scientific Name	Common Name	Family Name
<i>Ligustrum lucidum</i>	Glossy ligustrum	Oleaceae
<i>Ligustrum quihoui</i>	Thinleaf privet	Oleaceae
<i>Ligustrum sinense</i>	Chinese privet	Oleaceae
<i>Nandina domestica</i>	Nandina	Berberidaceae
<i>Photinia serratifolia</i>	Chinese photinia	Rosaceae

Table 3-1. Frequent Exotic Woody Species

Additional exotic woody species that are found less frequently in the park include:

Scientific Name	Common Name	Family Name
<i>Albizia julibrissin</i>	Silktree mimosa	Fabaceae
<i>Arundo donax</i>	Giant cane	Poaceae
<i>Lonicera japonica</i>	Japanese honeysuckle	Caprifoliaceae
<i>Melia azedarach</i>	Chinaberry	Meliaceae
<i>Morus alba</i>	White mulberry	Moraceae
<i>Vinca major</i>	Large periwinkle	Apocynaceae
<i>Vitex agnus-castus</i> var. <i>agnus-castus</i>	Common chaste tree	Verbenaceae
<i>Wisteria sinensis</i>	Chinese wisteria	Fabaceae

Table 3-2. Infrequent Exotic Woody Species

3.5.2.2. Invasive Native Woody Species

Green ash, a native woody species, is out of control in the open meadows and upper elevation woodlands. It needs to be completely removed from the open meadows and managed back to a smaller, more balanced population in the higher elevation woodlands.

Latin Name	Common Name	Latin Family Name
<i>Fraxinus pennsylvanica</i>	Green ash	Oleaceae

Table 3-3. Invasive Native Woody Species

3.5.3. Woody Encroachment

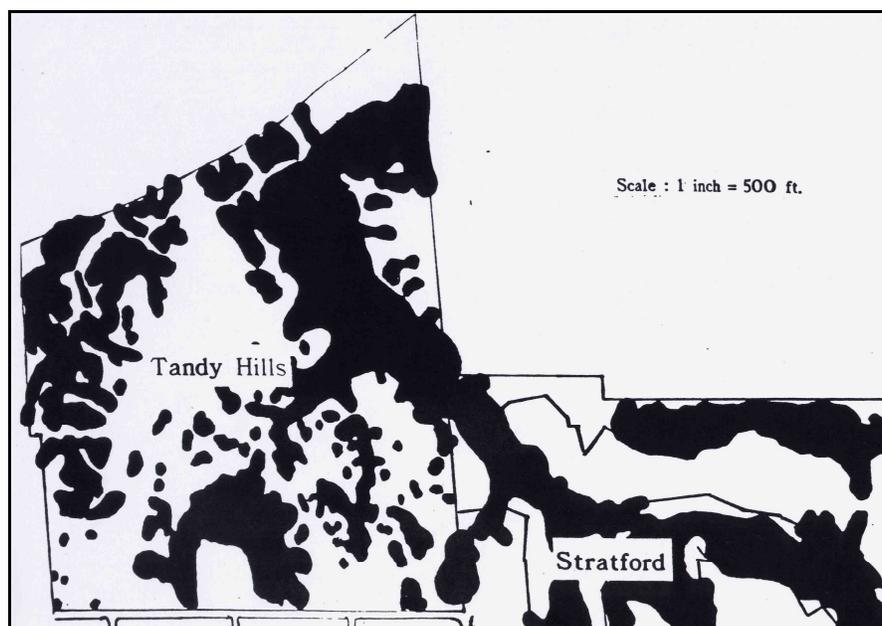
There are a number of woody species encroaching into the open meadows. While these species are not considered invasive in many situations, in this case their unchecked expansion threatens the prairie.

3.5.3.1. Removal Strategy for Woody Species

1. Remove all woody species, both exotic and native, in the open meadows. This will dramatically increase the prairie area.
2. For all immature woody growth:
 - a. Remove all unwanted woody growth along trails.
 - b. Remove all stands of immature woody growth that border the open meadows. Begin at the edges of the meadows and work back until the entire stand is gone.
3. For all exotic species:
 - a. Begin in the open meadows.
 - b. Remove exotics along the trails where they are visible to visitors and slowly work back into the stand.
 - c. In the lower elevation woodlands, choose areas where saplings of native woody species are growing under the exotic species. Removal of exotics in these locations will create an opportunity for native saplings to grow.
4. Take care at the tops of slopes. Do not remove too much woody material at a time to avoid creating erosion problems.
5. In areas where large amounts of unwanted woody species are removed, establish a restoration strategy. (See Section 3.5.6.4. Restoring Closed Trails)
 - a. Re-introduce missing species to create a diverse understory.
6. Place cut material in large piles, approximately six per acre. Let the material age and dry out for a period of time and then burn the piles when conditions are right.
7. If burns are not possible, haul all cut material off-site. Do not chip the material and leave it on-site because this will leave a seed bank of the species that need to be removed.

3.5.3.2. Woodland Encroachment Maps

The following map roughly shows the extent of woodland growth in 1989.



Map by Wayne Clark, FWNCR

Figure 3-4. 1989 Map of Tandy Hills / Stratford Park Woodlands

This 2007 map, superimposed on the above, roughly shows how woodland growth has changed. Purple represents immature growth; green is medium-age growth; blue is mature growth.

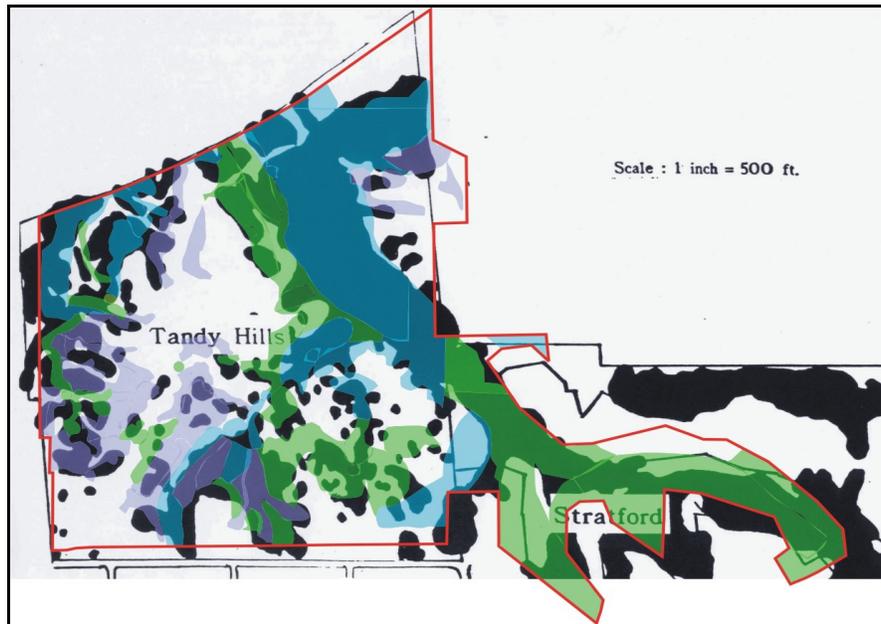
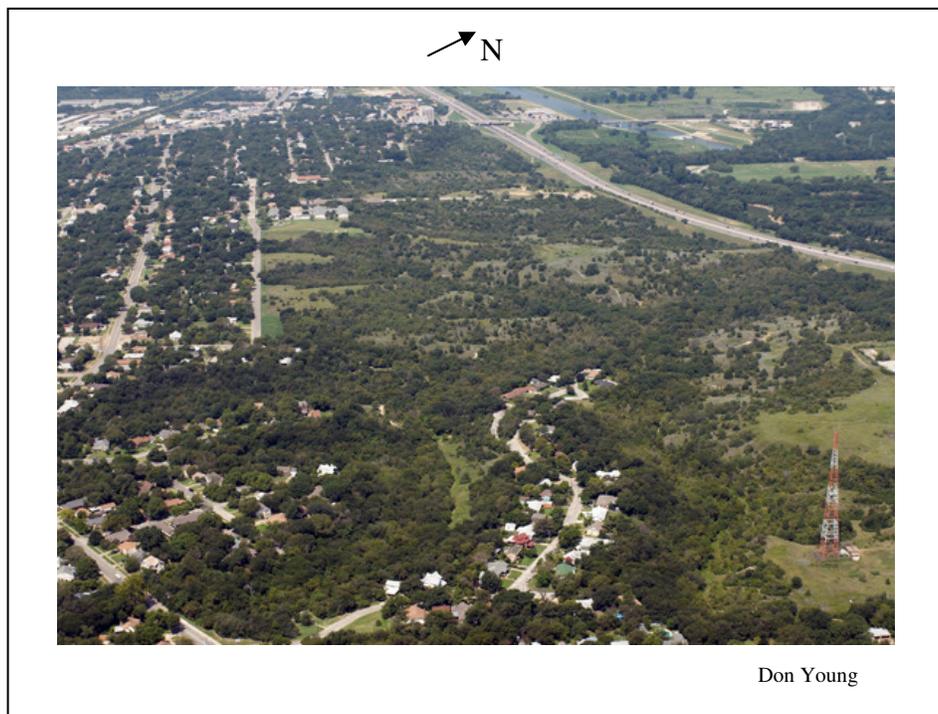


Figure 3-5. Map of Woodland Growth: 1989 - 2007

This aerial photo of Tandy Hills / Stratford Park clearly demonstrates that woody species are encroaching into the open prairie areas.



Don Young

Figure 3-6. Aerial Photo of Tandy Hills / Stratford Park 2007

Increasing the prairie area would be a dramatic change for the park. The following map shows potential prairie if all scattered and immature woody species were removed.

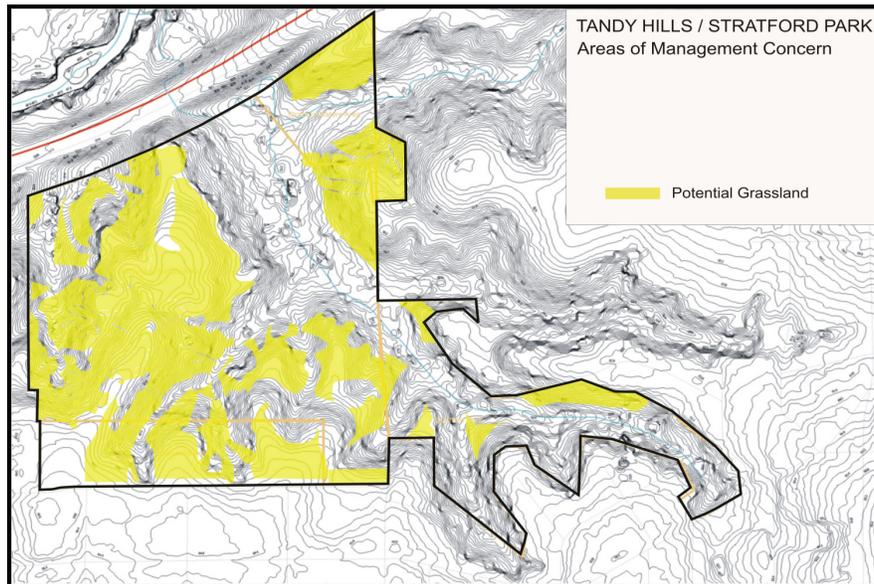


Figure 3-7. Potential Grassland Map of Tandy Hills / Stratford Park

3.5.4. Method for Removal of Woody Species

3.5.4.1. Weed Wrench

Unwanted trees and shrubs less than a few inches in diameter can be hand removed with relative ease by using a Weed Wrench. (See <http://www.weedwrench.com>) This device will pull the plant up by the roots with minimal disturbance to the soil, leaving desirable nearby plants unharmed. Removing trees by hand is easiest after a rain when the soil is loose. Be sure all roots have been removed since fragments might re-sprout.

3.5.4.2. Cut and Treat

Cut a tree or shrub down to eight to twelve inches above the ground. Make sure the stump is level, to allow for even coverage of herbicide. Treat the layer next to the bark thoroughly, since this is the location where plant tissue will carry the herbicide to the roots. On larger trees, only the outer two to three inches of the stump need to be treated.

On small diameter woody species, herbicide can be applied directly to the vertical stem. Applications of herbicide to the outside of the bark is less effective on thick barked species. There is a tool for applying herbicide to outside bark, called "The Woody Painter." (<http://tncweeds.ucdavis.edu/tools/painter.html>)

Herbicide treatment should be applied immediately after cutting, although herbicide will still be effective up to approximately four hours after cutting. If treatment happens after the effective time, re-cut the stump and then apply herbicide.

3.5.4.3. Seasonal Concerns

1. Late spring and early summer are more effective than late summer and early fall for cutting and treating, since the trees are actively moving sap.
2. Herbicides should not be used when the ground is frozen.
3. Remove trees before seeds develop.

3.5.4.4. Herbicide Treatment

All herbicides should be used in a manner that is consistent with the product label and other legal requirements. It is often the case that unwanted herbaceous plants will be growing close to species that are wanted. Therefore, application of herbicides should be done carefully so as to not kill the surrounding plants. Wicking, or wiping the targeted plants, is a safe application method since spraying can easily spread inadvertently to a wider area. The most widely used herbicides include:

- Glyphosate
 - <http://pmep.cce.cornell.edu/profiles/extoxnet/dienochlor-glyphosate/glyphosate-ext.html>
- Triclopyr
 - <http://pmep.cce.cornell.edu/profiles/extoxnet/pyrethrins-ziram/triclopyr-ext.html>
- Oil Base Herbicide Products
 - <http://www.dowagro.com/ivm/invasive/prod/path.htm>

3.5.4.5. Girdling

Removal of larger unwanted trees can be done by girdling. Make a circular cut in the bark approximately six inches from the ground. The cut should be deep enough to penetrate the cambium layer. While girdling will kill the top of the tree, re-sprouts are common and will need to be treated with herbicide until the root system is exhausted.

3.5.5. Removal of Exotic Herbaceous Species

There are 70 exotic herbaceous species in Tandy Hills / Stratford Park. Some of the more invasive species include King Ranch Bluestem, Johnson grass, Bermuda grass, and purple nutgrass. Management strategies for removing herbaceous material include hand removal or spraying with herbicide. Most exotic herbaceous species are found near roads, neighboring developed properties, and along creeks where neighbor seeds wash in.

3.5.5.1. Removal by Hand

For species that are not too invasive and don't have a substantial root system, removal by hand can be effective. Pull the plants before they go to seed to minimize the seed bank. Weeds will grow back each season until the seed bank has been exhausted.

3.5.5.2. Exotic Herbaceous Species

When making decisions regarding removing exotic species, it is important to know which species are in the park and most invasive. In general, annual species are less invasive than perennials. The following list should be annotated regarding level of invasiveness.

List of Exotic Herbaceous Species in Tandy Hills / Stratford Park

Family Latin	Family Common	Genus	Species	Common Name	Type
Amaryllidaceae	Amaryllis	<i>Crinum</i>	<i>bulbispermum</i>	Hardy swamplily	Introduced perennial forb
		<i>Narcissus</i>	<i>pseudonarcissus</i>	Daffodil	Introduced perennial forb
Apiaceae	Carrot	<i>Torilis</i>	<i>arvensis</i>	Beggar's ticks	Introduced annual forb
		<i>T.</i>	<i>nodosa</i>	Knotted sockbane	Introduced annual forb
Asteraceae	Sunflower	<i>Achillea</i>	<i>millefolium var. occidentalis</i>	Yarrow	Introduced perennial forb
		<i>Carduus</i>	<i>nutans</i>	Nodding thistle	Introduced biennial/perennial forb
		<i>Hedypnois</i>	<i>cretica</i>	Cretan composite	Introduced annual forb
		<i>Lactuca</i>	<i>serriola</i>	Prickly lettuce	Introduced annual/biennial forb
		<i>Onopordum</i>	<i>acanthium</i>	Scotch thistle	Introduced biennial forb
		<i>Parthenium</i>	<i>hysterophorus</i>	False ragweed	Introduced annual forb
		<i>Senecio</i>	<i>vulgaris</i>	Old-man-in-the-spring	Introduced annual/biennial forb
		<i>Sonchus</i>	<i>asper</i>	Prickly sowthistle	Introduced annual forb
		<i>S.</i>	<i>oleraceus</i>	Common sowthistle	Introduced annual forb
		<i>Taraxacum</i>	<i>laevigatum</i>	Red-seed dandelion	Introduced perennial forb
		<i>T.</i>	<i>officinale</i>	Common dandelion	Introduced perennial forb
		<i>Tragopogon</i>	<i>dubius</i>	Yellow goat's beard	Introduced annual/biennial forb
		<i>Youngia</i>	<i>japonica</i>	Oriental false hawksbeard	Introduced annual forb
Boraginaceae	Borage	<i>Buglossoides</i>	<i>arvensis</i>	Field bugloss	Introduced annual forb
Brassicaceae	Mustard	<i>Capsella</i>	<i>bursa-pastoris</i>	Shepherd's purse	Introduced annual forb
		<i>Rapistrum</i>	<i>rugosum</i>	Yellow rocket	Introduced annual forb
Caryophyllaceae	Pink	<i>Arenaria</i>	<i>serpyllifolia</i>	Thymeleaf sandwort	Introduced annual forb
		<i>Cerastium</i>	<i>glomeratum</i>	Cluster chickweed	Introduced annual forb
		<i>Stellaria</i>	<i>media</i>	Chickweed	Introduced annual/perennial forb
Chenopodiaceae	Goosefoot	<i>Chenopodium</i>	<i>album</i>	Lamb's quarters	Introduced annual forb
		<i>C.</i>	<i>ambrosioides</i>	Epazote	Introduced annual/perennial forb
Cyperaceae	Sedge	<i>Cyperus</i>	<i>rotundus</i>	Purple nutgrass	Introduced perennial graminoid
Fabaceae	Pea	<i>Medicago</i>	<i>lupulina</i>	Black medick	Introduced annual forb
		<i>M.</i>	<i>minima</i>	Least burclover	Introduced annual forb
		<i>Melilotus</i>	<i>albus</i>	White sweetclover	Introduced annual forb
		<i>M.</i>	<i>officinalis</i>	Yellow sweetclover	Introduced annual forb
		<i>Trifolium</i>	<i>repens</i>	White clover	Perennial forb
		<i>Vicia</i>	<i>angustifolia</i>	Narrowleaf vetch	Introduced annual herbaceous vine
		<i>V.</i>	<i>sativa ssp. sativa</i>	Spring vetch	Introduced annual herbaceous vine
Geraniaceae	Geranium	<i>Erodium</i>	<i>cicutarium</i>	Pin Clover, alfilaria	Introduced annual/biennial forb

List of Exotic Herbaceous Species in Tandy Hills / Stratford Park, Continued

Family Latin	Family Common	Genus	Species	Common Name	Type
Iridaceae	Iris	<i>Iris</i>	<i>germanica</i>	German iris	Introduced perennial forb
Lamiaceae	Mint	<i>Lamium</i>	<i>amplexicaule</i>	Henbit	Introduced annual/biennial forb
		<i>L.</i>	<i>purpureum</i>	Purple deadnettle	Introduced annual forb
		<i>Marrubium</i>	<i>vulgare</i>	Common horehound	Introduced perennial forb
Liliaceae	Lily	<i>Asparagus</i>	<i>officinalis</i>	Asparagus	Introduced perennial forb
		<i>Muscari</i>	<i>neglectum</i>	Grape-hyacinth	Introduced perennial forb
		<i>Ornithogalum</i>	<i>umbellatum</i>	Star of Bethlehem	Introduced perennial forb
Poaceae	Grass	<i>Aegilops</i>	<i>cylindrica</i>	Jointed hoatgrass	Introduced annual graminoid
		<i>Avena</i>	<i>sativa</i>	Wild oats	Introduced annual graminoid
		<i>Bothriochloa</i>	<i>ischaemum var. songarica</i>	King ranch bluestem	Introduced perennial graminoid
		<i>Bromus</i>	<i>catharticus</i>	Rescuegrass	Introduced annual/perennial graminoid
		<i>B.</i>	<i>japonicus</i>	Japanese brome	Introduced annual graminoid
		<i>B.</i>	<i>tectorum var. tectorum</i>	Downy brome	Introduced annual graminoid
		<i>Cynodon</i>	<i>dactylon</i>	Bermuda grass	Introduced perennial graminoid
		<i>Digitaria</i>	<i>ciliaris</i>	Southern crabgrass	Introduced annual graminoid
		<i>Echinochloa</i>	<i>colona</i>	Junglerice	Introduced annual graminoid
		<i>E.</i>	<i>crus-galli var. crus-galli</i>	Barnyardgrass	Introduced annual graminoid
		<i>Eleusine</i>	<i>indica</i>	Goosegrass	Introduced annual graminoid
		<i>Eragrostis</i>	<i>barrelieri</i>	Mediterranean lovegrass	Introduced annual graminoid
		<i>E.</i>	<i>cilianensis</i>	Stinkgrass	Introduced annual graminoid
		<i>Hordeum</i>	<i>murinum ssp. leporinum</i>	Hare barley	Introduced annual graminoid
		<i>Lolium</i>	<i>arundinaceum</i>	Tall fescue	Introduced perennial graminoid
		<i>L.</i>	<i>perenne ssp. multiflorum</i>	Perennial ryegrass	Introduced annual/perennial graminoid
		<i>L.</i>	<i>perenne ssp. perenne</i>	Italian ryegrass	Introduced annual/perennial graminoid
		<i>Paspalum</i>	<i>dilatatum</i>	Dallisgrass	Introduced perennial graminoid
		<i>Poa</i>	<i>annua</i>	Annual bluegrass	Introduced annual graminoid
		<i>Sorghum</i>	<i>halepense</i>	Johnson grass	Introduced perennial graminoid
Polygonaceae	Knotweed	<i>Polygonum</i>	<i>aviculare</i>	Prostrate knotweed	Introduced annual/perennial graminoid
		<i>Rumex</i>	<i>crispus</i>	Curly dock	Introduced perennial forb
Portulacaceae	Portulaca	<i>Portulaca</i>	<i>oleracea</i>	Common purslane	Introduced annual forb
Rubiaceae	Madder	<i>Sherardia</i>	<i>arvensis</i>	Field madder	Introduced annual forb
Scrophulariaceae	Figwort	<i>Verbascum</i>	<i>thapsus</i>	Common mullein	Introduced biennial forb
		<i>Veronica</i>	<i>arvensis</i>	Common speedwell	Introduced annual forb
		<i>V.</i>	<i>persica var. persica</i>	Persian speedwell	Introduced annual forb
Zygophyllaceae	Caltrop	<i>Tribulus</i>	<i>terrestris</i>	Puncture-vine	Introduced annual forb

List annotated from Flora of Tandy Hills, B.R.I.T.

Table 3-4. List of Exotic Herbaceous Species in Tandy Hills / Stratford Park

3.5.6. Restoration Strategies

There will be two general types of restoration activities in TH/SP. The first will be restoration of woodland areas. The second will be restoration of open grassland areas. Any restoration strategies will depend on the vegetation zone that is being restored. The following guidelines should be considered.

3.5.6.1. Understand Composition of Each Vegetation Zone

Section 2.0 Floral Survey: Vegetation Zones lists representative species for each zone. The study period and budget for this Master Plan did not allow for a complete analysis of all vegetation zones through all seasons. A continued analysis of existing characteristic species for each vegetation zone will be necessary for the determination of species to include in any restoration projects.

3.5.6.2. Decide Goals and Objectives For Restoration Projects

Decisions will need to be made on a project by project basis since vegetation zones have different aspects and characteristics.

Questions affecting restoration decisions could include, but not be limited to, the following:

- Should the early succession grassland be managed as early succession instead of evolving into a late succession grassland? There could be interpretive reasons to keep it early succession.
- Should the mid-succession woodland be managed to keep it from losing its mid-succession characteristics? Again, this could be decided for interpretation reasons.
- Within similar vegetation zones, should some areas be managed to remain in early succession while other areas be allowed to progress to later succession?

3.5.6.3. Determine Reference Ecosystems

In the process of continuing an analysis of each vegetation zone, it will be important to determine a reference ecosystem which will serve as a model for restoration goals. These models might be located within the park or perhaps in nearby natural areas.

3.5.6.4. Choose Species for Restoration Projects

Choosing species for restoration projects will depend upon the goals and objectives, as well as the specific vegetation zone involved. Some projects might be handled with seeding only; other projects might involve planting saplings or larger sized specimens.

For instance, if the decision is to keep the early grassland zone as is, the species needed for any restoration project will be different than a restoration project in a late succession grassland zone. Similarly, species chosen for restoration in a mid-succession woodland would likely be somewhat different than in a late succession woodland restoration project.

3.5.6.5. Calendar and Budget Planning

Restoration projects should be planned well in advance. Variables that will affect planning will include some of the following:

- Seasonal issues
- Seed harvesting
- Staff needs to complete the project, especially in relation to other park projects
- Preparatory management tasks before restoration can happen

3.5.6.6. Performance Standards

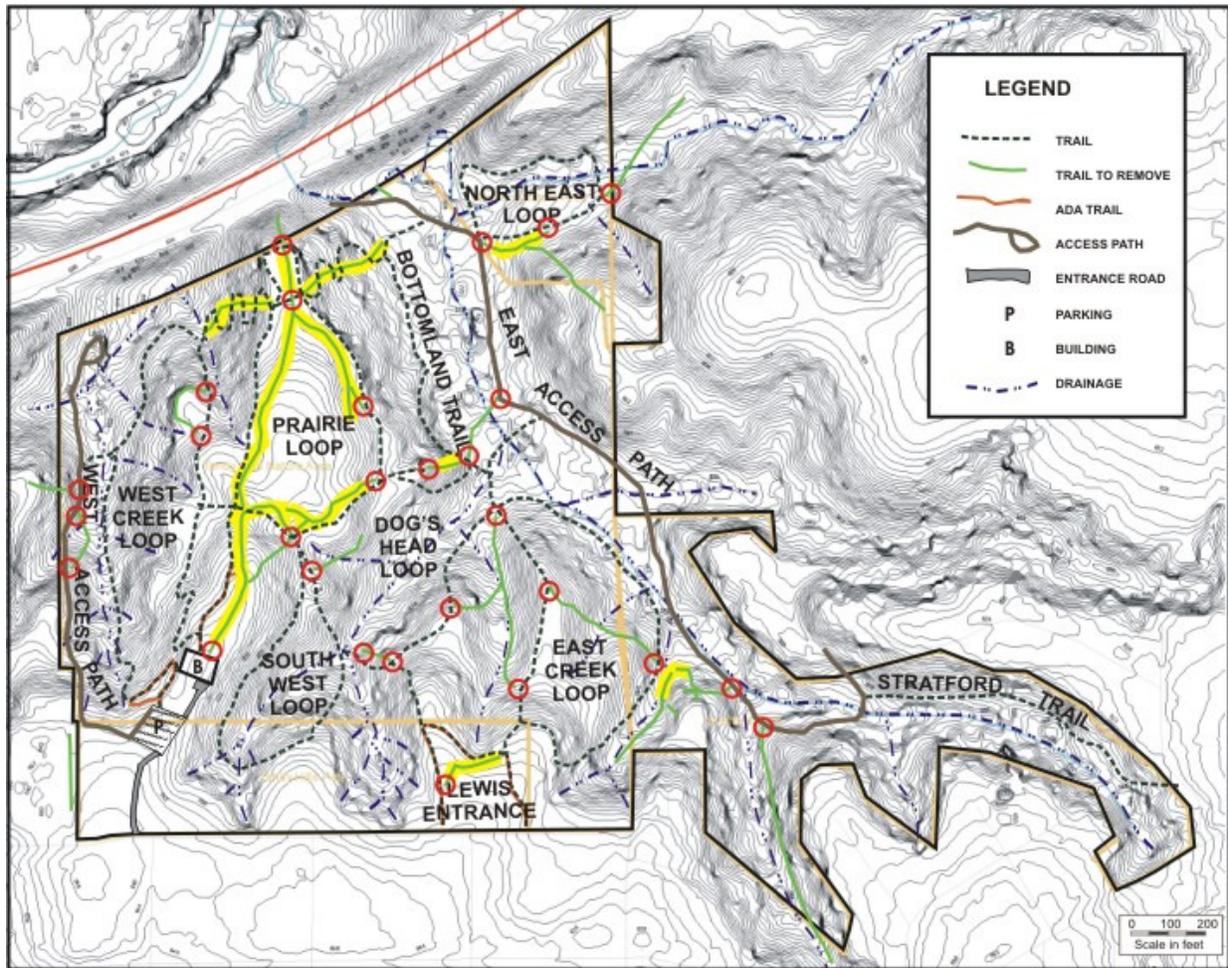
Included in the planning of all restoration projects there should be an outline of what the expected outcome will be. Records should be kept to evaluate the status of all restoration projects.

3.5.6.7. Interpretation of Restoration Projects

There are interpretive opportunities with restoration projects that are located near any trails. Temporary signage can explain the process and goals. This will also be an opportunity to explain why visitors need to stay off of restoration projects.

3.5.7. Closing and Restoring Unwanted Trails and Roads

Approximately 1.5 miles of existing trails are recommended for removal. Some unwanted trails are badly eroded and need to be re-routed more carefully along topographic contours. Some unwanted trails are simply in locations that are not preferred for the proposed trail system. All unwanted trails need to be closed and restored.



○ = Trail closing at junction

 = Old trail section to restore

Figure 3-8. Map of Trails to Close and Restore

3.5.7.1. Closing Trail Junctions

There are 28 junctions where a proposed trail intersects with a trail to be removed. Sixteen of these junctions only need enough brush placed at the junction to keep hikers from using the closed trail. Use cedar branches, trimmed on one side so they lay as flat as possible on the ground. This solution is temporary and the brush will decompose over time. If the brush still remains after the trail has grown in, it can be removed. The rest of the unused trail, out of sight from visitors, will slowly close in as vegetation spreads back into the trail. Place signs at each of these junctions to explain to visitors that the trail is closed and being restored.

3.5.7.2. Erosion Control on Closed Trails

Some of the existing trails that are recommended to be closed and restored are highly eroded. Where unwanted trails are to be restored on slopes steeper than 15 percent, bio-degradable erosion control matting can be installed after the area is seeded.

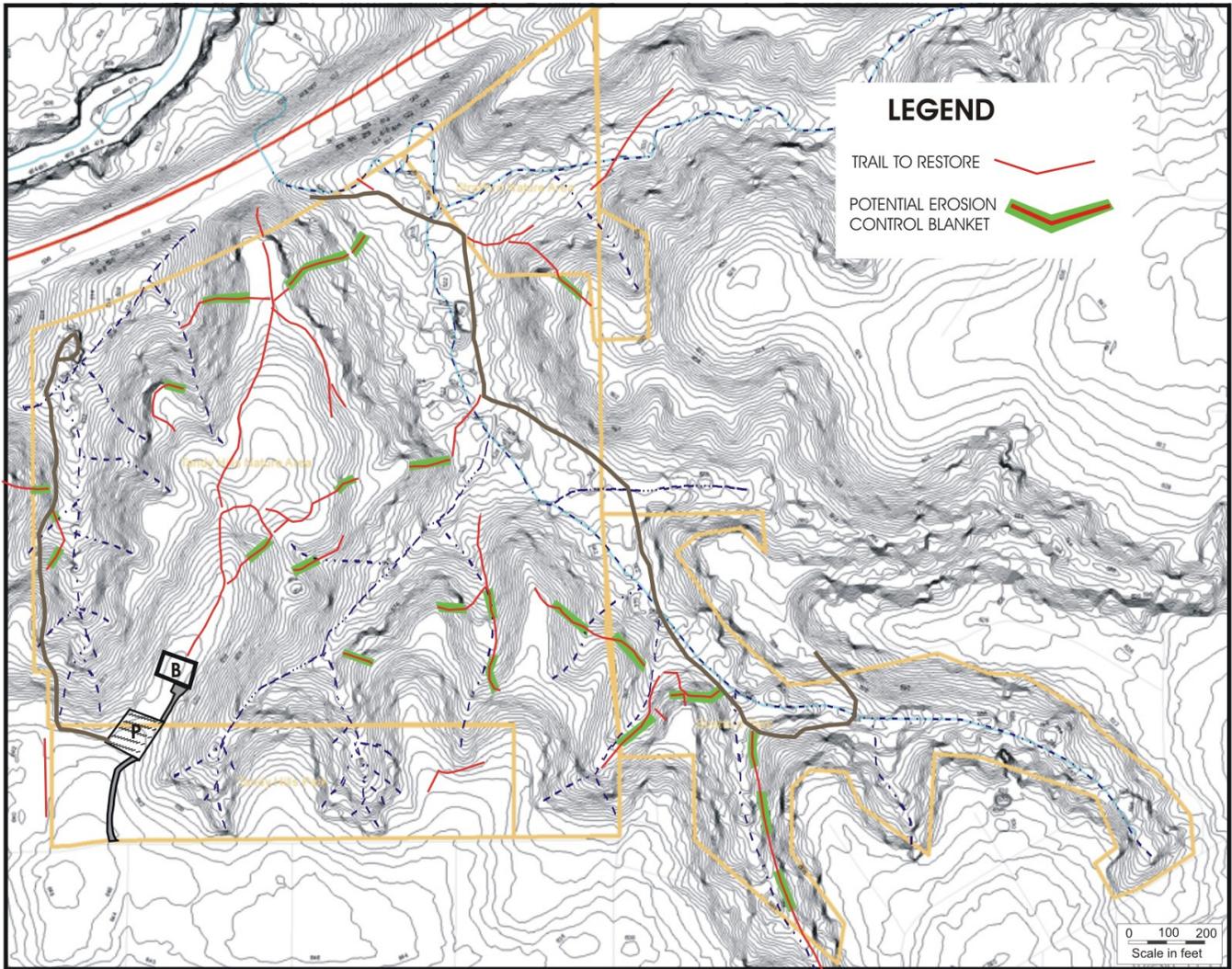


Figure 3-9. Map of Potential Erosion Control Blanket Areas

When installing erosion control matting, make sure that water flows over the matting. To ensure this, dig a trench at the top of the slope and place the top edge of the matting in the trench and secure with staples. Fill the trench in to the original soil level. The roll of erosion control blanket is started at the top of the slope and rolled down to the bottom of the slope. The edge of the uphill blanket should be overlapped underneath the adjoining blanket.

3.5.7.3. Sources for Erosion Control Matting

Some companies that sell bio-degradable erosion control matting:

- American Excelsior
 - <http://www.americanexcelsior.com>
- North American Green
 - <http://www.nagreen.com>
- Nilex Short Term Erosion Control Blankets
 - <http://www.nilex.com>

3.5.7.4. Restoring Closed Trails

Restoring closed trails should follow the restoration techniques listed below:

1. On slopes of 15 percent or steeper, rocks twelve inches and larger in diameter should be placed in terraces to mimic natural topography and control erosion.
2. Seeding should consist as much as possible of locally harvested wild native seed, either from the site or from a nearby site with similar vegetative composition. There should be at least two seed harvests for each restoration site to collect maximum diversity. Seeds can be harvested by hand or by hand-held harvesting devices.
3. Wild harvested native seed should be collected at a rate of approximately twelve bushels per acre to be restored.
4. Wild harvested seed heads should be shredded so the seed heads are broken apart. This will enable the harvested seed to be spread farther.
5. If commercial seed is needed, it should have a geographical origin in Texas. Commercial seed should meet requirements of the Texas Seed Law and Regulations.
6. From January 1 to June 30, the selection of species should emphasize warm season species. From July 1 to December 31, the selection of species should emphasize cool season species.
7. There should be three separate seeding operations during a fifteen month period, in order to achieve maximum diversity.
 - a. First Seeding: The first seeding should be timed, if possible, just before a rainy season. Soil should be of correct moisture level, either through rainfall or supplemental watering. A rake should be used to loosen soil. Seed should be hand scattered evenly over the site, raked again, and rolled with a cultipacker or equivalent the same day as seeding.
 - b. Second and Third Seeding: The second and third seeding will depend on the start date of the first seeding. Second and third seeding will be hand scattered evenly over the site, with the seed hand raked into bare areas. Seed will be rolled with a cultipacker or equivalent the same day as seeding.
8. It will most likely not be possible to get water to the restoration sites. Therefore, the restoration projects will need to rely on rain events. If drought conditions persist, supplemental watering will need to be applied to ensure germination and survival of the seeded areas.
9. Monitor all seeded areas for weed species, especially exotic species. Remove all exotic and invasive species either by hand pulling or spot wicking with herbicide.

3.5.8. Garbage Removal

There are a number of old garbage dump sites scattered around the park, including a few containing old cars. (See Section 2.6. Human Impact Map) All of this debris should be removed from the park as soon as possible. Vehicles will need to access the dump sites by driving along existing trails and roads in the park. This should be done before these trails and roads are closed and restored.

3.5.9. Mowing As Burn Alternative

It might be decided to periodically mow some of the meadow areas as an alternative to burning. Mowing will not be as effective as a controlled burn, but when performed carefully can be a fair substitute. Mow to approximately one inch from the ground to expose the soil to the sun, then rake off all cut material. Mow in midspring to remove the previous year's growth. Never mow after new spring growth has reached a height of one foot, as this would damage the new plants. Take care not to mow in late spring, when ground birds may have already built their nests.

3.5.10. Special Consideration for Utility Easements

There is one sewer line that runs north/south along the eastern side of the park. There is an unimproved road along this line. It is recommended to keep this road as an access path. The access path will be used by park personnel for maintenance and emergency reasons and will also remain open as access to the sewer line.

3.5.11. Potential Neighboring Off-Site Impacts

3.5.11.1. Unauthorized Entrances

Currently, people are accessing the park on all sides. It has been recommended that some of these entrances be closed. (See Section 4.5.2. Closures of Existing Entrances for identification of needed closures and detailed needs at each closure.) It will be important to post signs and to install strategically placed stretches of fence to discourage people from entering the park in unauthorized locations. Signs should direct visitors to authorized entrances.

3.5.11.2. Garbage Dumping

Most of the garbage dumping in the park appears to have happened when the public was able to drive into the park. Since cable fencing has been placed around the park, there is no evidence that garbage has been dumped within the park. There are a few locations along the edges of the park where it appears garbage has either been dumped or washed into a few of the drainages. Signs should be posted at these locations to deter dumping. All existing garbage piles should be removed. See Figure 2-15. Tandy Hills Human Impacts for locations of existing garbage piles. Trucks should be used in the flatter locations where access is less erosive. The remaining locations will need hand removal with wheelbarrows or potentially a small front-end loader.

5.11.3. Exotic Landscaping

There are no rules concerning what plants people use in their landscape. However, it is recommended that the park staff develop an educational program to inform residents about the effects of exotic species

on the park. Most of the exotic woody species are washing into the park from surrounding landscapes. Residents should be encouraged to landscape their properties with native species.

3.5.11.4. New Construction Adjacent to Park Boundary

Whenever new buildings are constructed along the border of the park, strict erosion control strategies should be enforced. Park staff will need to be aware of all impending construction designs and monitor all construction activities. Developing a working relationship with all parties will enable park staff to anticipate any potential problems and work toward solutions. Buffer zones should be established between the park and any construction. All local erosion control watershed protection ordinances should be strictly followed.

3.5.12. Consideration of Adjacent Gas Drilling Operation

There are a number of issues that should be considered regarding the process of drilling for gas that could possibly impact the park. Each issue is discussed below as it relates to the City of Fort Worth's "Gas Drilling and Production" Ordinance Number 16986-06-2006.

There is always a potential for adverse impact to the park from any adjacent development. This potential needs to be addressed before, during, and after any construction. The impact on flora, fauna, and water must be monitored and studied to determine if there might be a need to request any amendment to the "Gas Drilling and Production" Ordinance as it pertains to TH/SP.

3.5.12.1. Runoff

Gas drilling operations are not allowed to cause any runoff to adjacent properties (Ordinance Sec.15-34.K.d and Sec.15-42.A.4). This includes any oil, naphtha, petroleum, asphalt, tar, hydrocarbon substances, brine, or sediment from fill material. Park staff should monitor runoff from the drilling site.

3.5.12.2. Detention Pond

Construction of a detention pond is recommended to filter run-off water from constructed roads, buildings, gas drilling equipment, and any other impervious cover before flowing into the headwaters of the TH/SP drainages.

3.5.12.3. Noise

Noise effects on wildlife populations have been well documented. The effects are particularly significant on bird populations. Park staff should monitor bird and other faunal populations to determine any decreases as a result of gas drilling operations.

3.5.12.4. Night Lights

Night lights can have a deleterious effect on nocturnal animals. Park staff should monitor lighting to determine if other lighting might be suggested.

3.5.12.5. Distance to Park

The proposed pad site is a relatively flat open area between two very steep drainages, whose waters flow into the park. The elevation change in the open, more flat area ranges from 654 feet to approximately 626 feet, for a drop of 28 feet. The southern-most drainage drops steeply from 626 feet to 540 feet, for an 86 foot elevation change. The northern-most drainage drops steeply from 626 feet to 530 feet, for a 96 foot elevation change. These steep slopes have a high potential for erosion from construction disturbance.

It is recommended that all proposed gas drilling construction be kept to the higher, flatter areas above 630 - 634 foot elevations and at least 200 feet from the tops of any of the steep slopes. This would create a vegetative buffer between any construction and erosion-prone slopes.

3.5.12.6. Landscape

A landscape plan is required of the gas drilling operation, as described in Ordinance Sec.15-43.C. It is important that all landscape plans be reviewed by PACS staff to ensure proper species selection. Any exotic or inappropriate species planted around the gas drilling facilities has the potential of spreading into the park.

The list of trees in Ordinance Sec.15-43.C.2 has a number of inappropriate species for TH/SP. The following chart contains the trees listed in the gas drilling ordinance, as well as a column that assesses its appropriateness to the park.

Trees Suggested Under Ordinance Sec. 15-43.C.2

Appropriate?	Common Name	Scientific Name	Canopy Size
Yes	Redbud	<i>Cercis canadensis</i>	Small
Yes	Mexican plum	<i>Prunus mexicana</i>	Small
No	Golden raintree	<i>Koelrueteria paniculata</i>	Medium
No	Crab apple	<i>Malus angustifolia</i>	Medium
No	Bradford pear	<i>Pyrus calleryana var. Bradford</i>	Medium
Yes	Cherry laurel	<i>Prunus caroliniana</i>	Medium
Yes	Eve's necklace	<i>Sophora affinis</i>	Medium
No	Bigtooth maple	<i>Acer grandidentatum</i>	Large
No	Red maple	<i>Acer rubrum</i>	Large
No	Cado maple	<i>Acer saccharum</i>	Large
No	Black walnut	<i>Carya nigra</i>	Large
No	Green ash	<i>Fraxinus pennsylvanica</i>	Large
No	Southern magnolia	<i>Magnolia grandiflora</i>	Large
No	Blackjack oak	<i>Quercus marilandica</i>	Large
Yes	Chinquapin oak	<i>Quercus muhlenbergii</i>	Large
Yes	Texas Red oak	<i>Quercus texana</i>	Large
No	Bald cypress	<i>Taxodium distichum</i>	Large
No	Lacebark elm	<i>Ulmus pervifolia</i>	Large
Yes	Pecan	<i>Carya Illinoisis</i>	Large
Yes	Texas ash	<i>Fraxinus texana</i>	Large
Yes	Bur oak	<i>Quercus macrocarpa</i>	Large
Yes	Shumard red oak	<i>Quercus shumardii</i>	Large
Yes	Post oak	<i>Quercus stellata</i>	Large
Yes	Live oak	<i>Quercus virginiana</i>	Large
Yes	American elm	<i>Ulmus americana</i>	Large
Yes	Cedar elm	<i>Ulmus crassifolia</i>	Large

Table 3-5. Trees Listed in Ordinance Number 16986-06-2006

The following chart lists appropriate substitute species for landscaping around the gas drilling operation. These are species that will not harm the park.

Substitute Tree Suggestions for Ordinance Sec. 15-43.C.2

Appropriate?	Common Name	Scientific Name	Canopy Size
Yes	Texas redbud	<i>Cercis canadensis var. texensis</i>	Small
Yes	Centex hawthorn	<i>Crataegus glabriuscula</i>	Small
Yes	Cockspur hawthorn	<i>Crataegus crus-galli</i>	Small
Yes	Reverchon hawthorn	<i>Crataegus reverchonii</i>	Small
Yes	Flameleaf sumac	<i>Rhus lanceolata</i>	Small
Yes	Smooth sumac	<i>Rhus glabra</i>	Small
Yes	Toothache-tree	<i>Zanthoxylum clava-herculis</i>	Small
Yes	Honey locust	<i>Gleditsia triacanthos</i>	Medium
Yes	Ashe juniper	<i>Juniperus ashei</i>	Medium
Yes	Honey mesquite	<i>Prosopis glandulosa var. glandulosa</i>	Medium
Yes	Carolina buckthorn	<i>Rhamnus caroliniana</i>	Medium
Yes	Gum elastic	<i>Sideroxylon lanuginosum ssp. oblongifolium</i>	Medium
Yes	Rusty blackhaw	<i>Viburnum rufidulum</i>	Medium
Yes	Boxelder maple	<i>Acer negundo var. negundo</i>	Large
Yes	Northern catalpa	<i>Catalpa speciosa</i>	Large
Yes	Sugar hackberry	<i>Celtis laevigata var. laevigata</i>	Large
Yes	Hackberry	<i>Celtis reticulata</i>	Large
Yes	Eastern red cedar	<i>Juniperus virginiana</i>	Large
Yes	Bois d'Arc	<i>Maclura pomifera</i>	Large
Yes	Red mulberry	<i>Morus rubra</i>	Large
Yes	Eastern cottonwood	<i>Populus deltoides ssp. deltoides</i>	Large
Yes	Black willow	<i>Salix nigra</i>	Large
Yes	Western soapberry	<i>Sapindus saponaria var. drummondii</i>	Large

Table 3-6. Additional Tree List for Ordinance Number 16986-06-2006

3.5.12.7. Restoration of Adjacent Drill Sites

The oil and gas company is required to restore the property after completion of all drilling operations and if there is any damage from fence installation or any other activity. However, since the proposed drilling site is adjacent to the park and near steep slopes that lead directly into the park, what is used for restoration will wash directly into the park during rainy seasons. Therefore, the PACS staff should have contact with the oil and gas company to assist in developing appropriate restoration guidelines. (See Section 3.5.6.4. Restoring Closed Trails)

3.5.13. Monitoring Management Areas

This Strategic Master Plan has considered a large amount of management issues and has estimated the time and budget needed to carry the project through the first ten years of work. The focus is on the most problematic exotic and invasive species, which should be the first order of business.

The management challenges at TH/SP have developed over many years, and it will likely take more than ten years to completely reverse the damage. Ten years of work will accomplish a sizeable portion of what needs to be done. However, there will be a need for occasional monitoring to watch for newly sprouting, unwanted vegetation, to assess the success of restoration efforts, and to turn the management focus to less pressing problems, such as removal of other exotic species. There is currently a seed bank of undesirable plants in the soil that will need to be watched. It will be easier and quicker to remove young sprouts of unwanted vegetation before they mature.

PACS staff will need to develop a monitoring strategy to map the various challenges in the park and to study the progress of the work completed in the first ten years (which should be considered triage work). In addition, PACS staff should begin a monitoring program of the vegetation of note, including endemic species, as well as other species such as the white trout lily (*Erythronium albidum*).

3.5.13.1. Management Priorities

Management priorities, including construction timeline, costs and staffing needs, are outlined in the 10-year budget expenditure and allocation tables in Section 6.0. Budget.

4.0 PUBLIC USE: ACCESS / INFRASTRUCTURE

4.1. Trails

In 1989, the Fort Worth Parks and Community Services Department established Tandy Hills / Stratford Park as a natural area and determined that no vehicular traffic would be allowed in the park. This protection should be continued. All trails in TH/SP should be for hiking only, with no bicycles, horses, or motorized vehicles.

Careful design of a hiking trail system is crucial to protecting the park and safely presenting the park to visitors. Visitors will want to have access to various habitat niches in order to appreciate all aspects of the park. A well designed trail system offers an opportunity to bring the beauty of the park to visitors, which will in turn create a visitor base that will want to help protect TH/SP. There needs to be a balance between making the park accessible and protecting the sensitive aspects of the park. The trail system should be designed to protect the park from erosion and foot damage from hikers.

Future decisions will need to be made with the proposed staff and the users regarding allowing dogs in the park. Currently, visitors are bringing dogs into the park, usually without leashes. Positive and negative arguments can be made regarding dogs in the park. Discussion can also include allowing dogs on leash. When developing rules and regulations, be sure to explain the environmental reasons for their importance. Most people will gladly follow rules when they understand how their behavior helps with the protection of the park.

4.1.1. Method of Study

In order to recommend a trail system for TH/SP, site surveys were carried out to determine the following:

1. Location of existing trails.
2. Location of sensitive areas to be avoided.
3. Location of points of interest.
4. Location of potential access points.
5. Location of existing trails to be removed.
6. Location of entrance road, parking, and visitor center.

4.1.2. Physical Issues of Trail Design

There are a number of physical issues to consider when designing a trail system.

1. Avoiding areas with high erosion potential, such as steep slopes.
2. Avoiding ecologically sensitive areas, such as seeps, and areas with unusual vegetation.
3. Placing the trail with optimum shade opportunities.
4. Placing various trail loops to maintain a sense of isolation.
5. Placing the trail to minimize management issues.

4.1.3. Interpretive Issues of Trail Design

In addition to considering physical opportunities and constraints of a trail system, there are interpretive aspects to consider.

1. Giving visitors a complete experience.
2. Creating as much of a solitary experience as possible.
3. Creating views and overlooks.
4. Providing bench and rest areas.
5. Determining potential for group areas.

4.2. Existing Trails

The existing trails in TH/SP were assessed and analyzed for their potential in the overall trail system design.

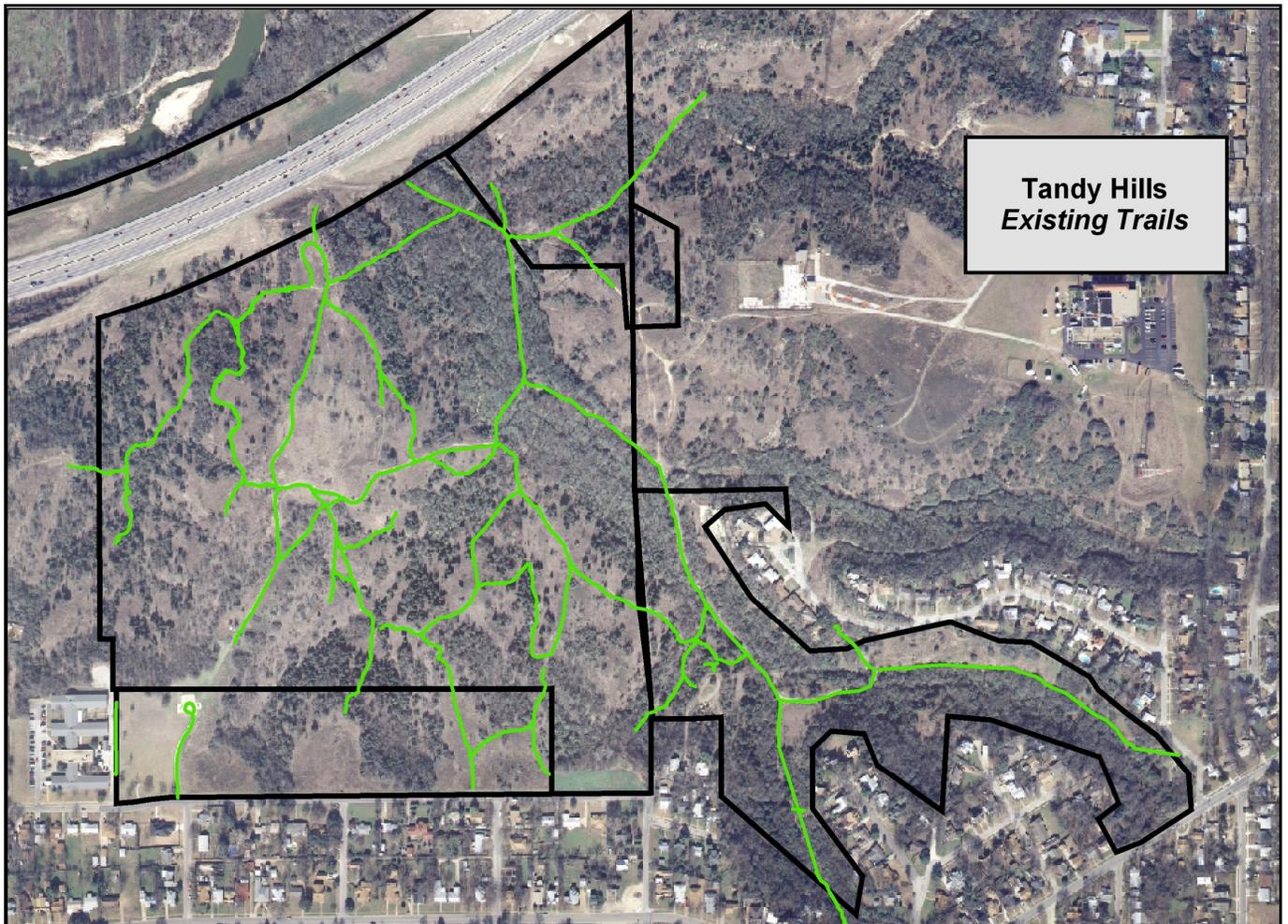


Figure 4-1. Map of Existing Trails in Tandy Hills / Stratford Park

Some of the existing trails seem to be remnants of old ranch roads. Most were probably created by visitors who have been walking throughout the park without any established trails. A number of existing trails are badly eroded. In these eroded locations, visitors have been walking around the worst spots and thereby creating wider and braided trails, which can in turn become eroded.

It is important to create well designed and constructed trails to control erosion and to control visitor traffic. Trail rules also need to be established.

4.3. Proposed Trails

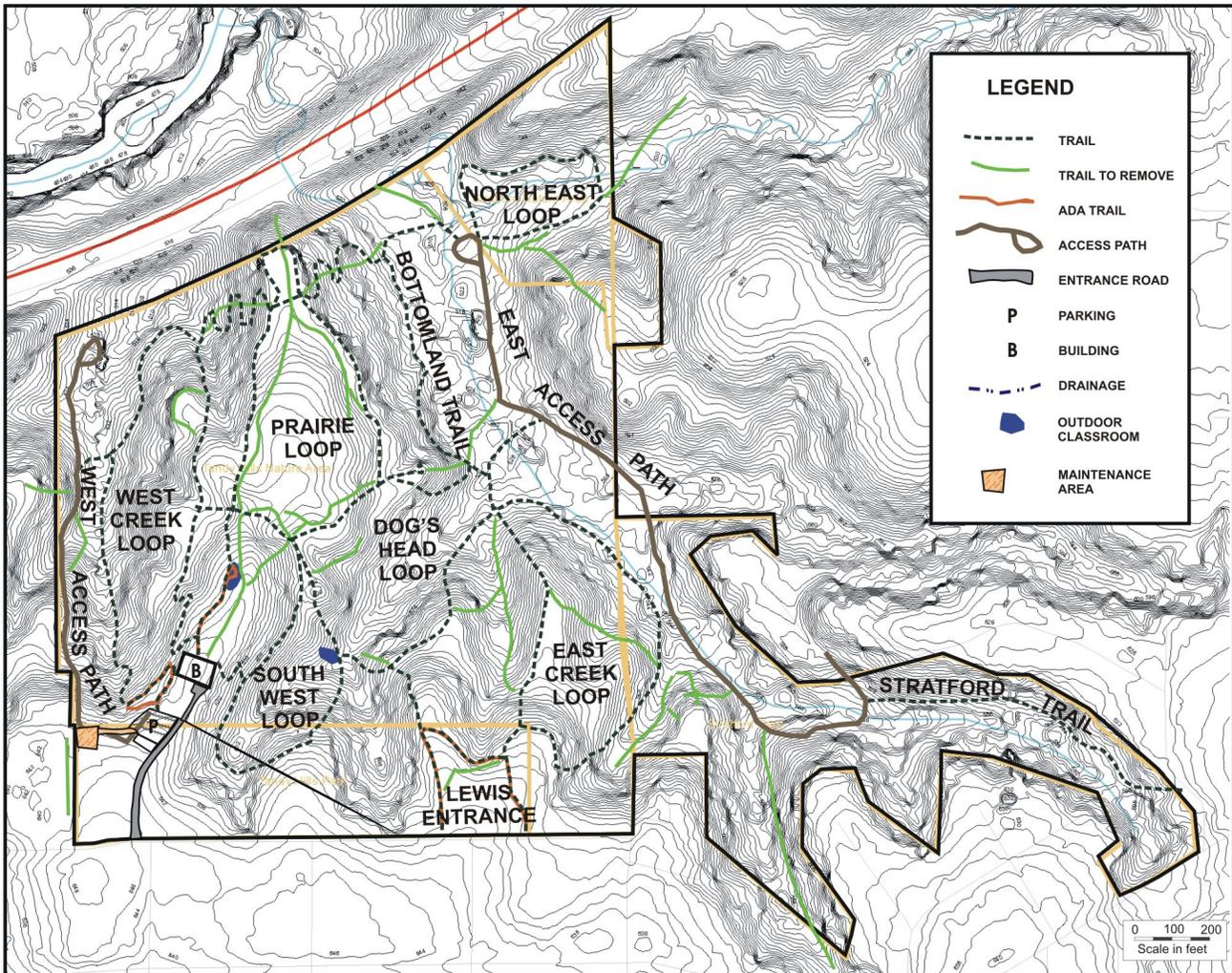


Figure 4-2. Proposed Trails

4.3.1. Eight Trail Loops

The recommended trail system contains eight main trail loops, with connecting trails, for a total of approximately 4.6 miles of trail. Some of these proposed trails currently exist, all of which need reconstruction. Other proposed trails involve re-routing existing trails and/or completely new trail locations. All of the proposed trails take into consideration the design aspects discussed above. Trail locations have been chosen to take visitors along and through all vegetation zones.

4.3.2. Three Handicap Accessible Trails

Three handicap accessible trails are proposed that will comply with ADA standards. Two begin at the proposed visitor center. The third is a loop off of View Street. (See Section 4.6.1. Accessible Trails)

4.3.3. Two Maintenance Access Paths

Included in the recommendations are two five-foot-wide access paths on each side of the park, to accommodate access for maintenance and emergency vehicles.

4.3.4. Proposed Entrance Road and Visitor Center Location

The proposed entrance would replace the existing sidewalk, with a parking area at the north edge of the existing open park area, just south of where the natural area begins. The proposed visitor center building location would be set back into the natural area approximately 100 feet from the parking area, with handicap accessible parking and delivery access to the building. (See Section 4.7.1. Schematic Map of Park Infrastructure)

4.3.5. Outdoor Classroom

There are two proposed outdoor classroom locations. See Section 5.4.3. Outdoor Classroom for a discussion of interpretive uses of the outdoor classrooms. The first proposed outdoor classroom is at the turn-around at the end of the ADA trail that extends, along with the hiking trail, north from the building toward the Prairie Loop. It is located at the crest before the hiking trail drops down into the prairie, thus providing a wide open vista. It is suggested that several tiers of benches and accessible seating areas be placed in a semi-circle facing the prairie.

The second proposed outdoor classroom is located at the junction of Dog's Head Loop and South West Loop. There is a large stand of red oaks with a drainage flowing through. It is unique in the park and is an inviting place to construct an outdoor classroom. It is suggested that several tiers of benches be placed in a semi-circle facing the creek.

4.3.6. Trails and Sensitive Areas

The majority of proposed trails are located either on or near existing trails. Sensitive areas regarding trail location include steep slopes and creek beds. Care needs to be taken in these areas to design trails that minimize erosion and impact on water quality. During the study period, no areas with sensitive plant species were identified along proposed trail routes. Many changes in trail routes are due to erosion problems where existing trails were not placed carefully or in the right location. Some changes will keep trails in more shady locations, which will be more pleasant for visitors in hot weather and will minimize maintenance needs due to less grass species growing in shady zones.

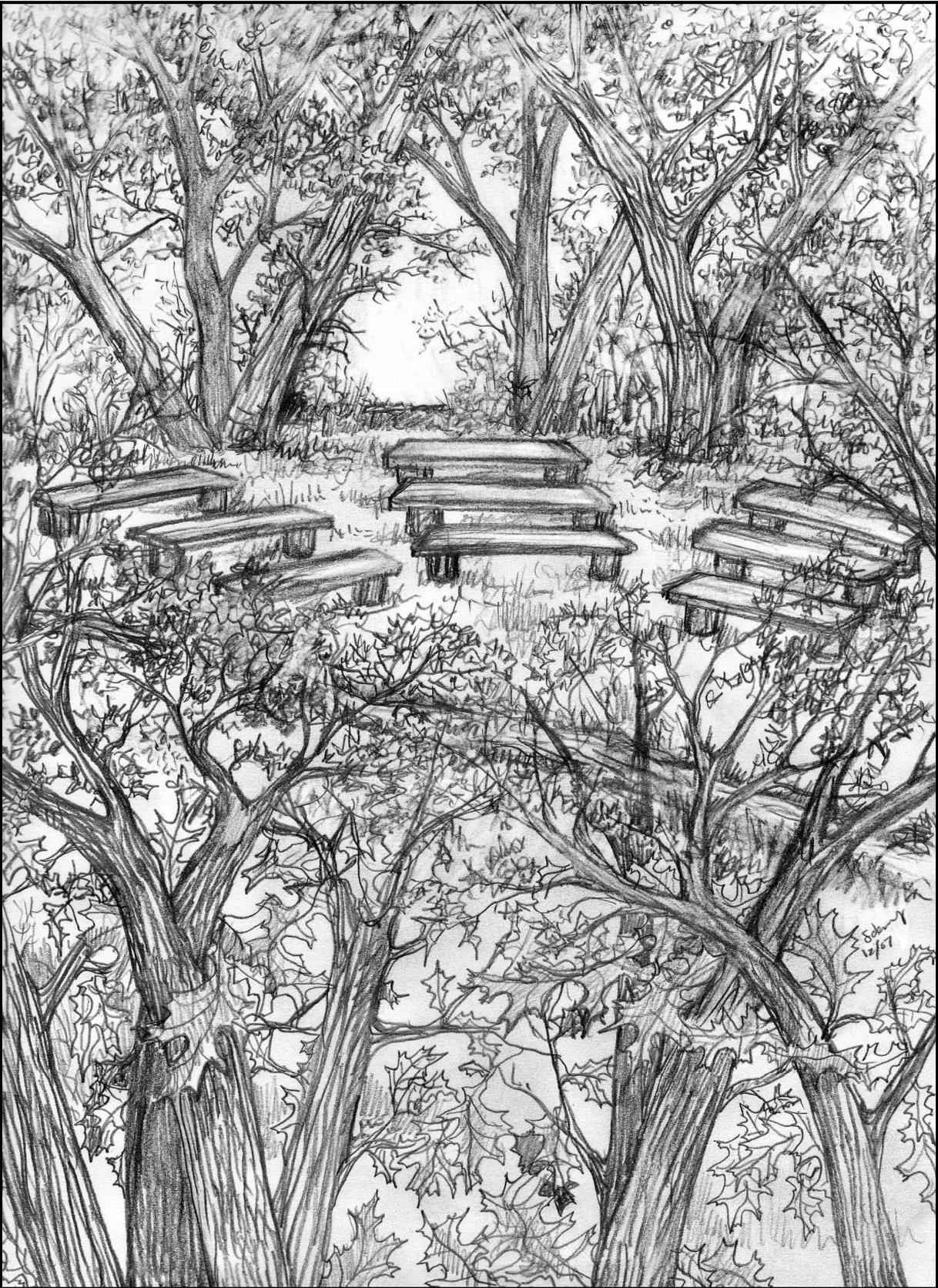


Figure 4-3. Outdoor Classroom

4.3.7. Chart of Trails

The following chart lists all of the proposed trails and their round-trip length.

NAME OF TRAIL	START AND END LOCATION	ROUND TRIP LENGTH	DIFFICULTY RATING
Prairie Loop ADA Spur	Building	0.2	Accessible
Sanderson-Lewis Trail ADA Trail	View Street at Sanderson and Lewis Streets	0.3	Accessible
West Creek ADA Loop	Building	0.1	Accessible
East Access Path	Stratford Trail Entrance	1.7	Easy
Prairie Loop	Building	0.8	Easy
Bottomland Trail	Building	0.75	Moderate
Dog's Head Loop	Building	0.75	Moderate
East Creek Loop	Building	1	Moderate
North East Loop	Building	1	Moderate
South West Loop	Building	0.65	Moderate
West Access Path	Parking Lot	0.6	Moderate
West Creek Loop	Building	0.7	Moderate

Table 4-1. Chart of Trails

4.4. Description of Trails

4.4.1. Prairie Loop and Prairie Loop ADA Spur

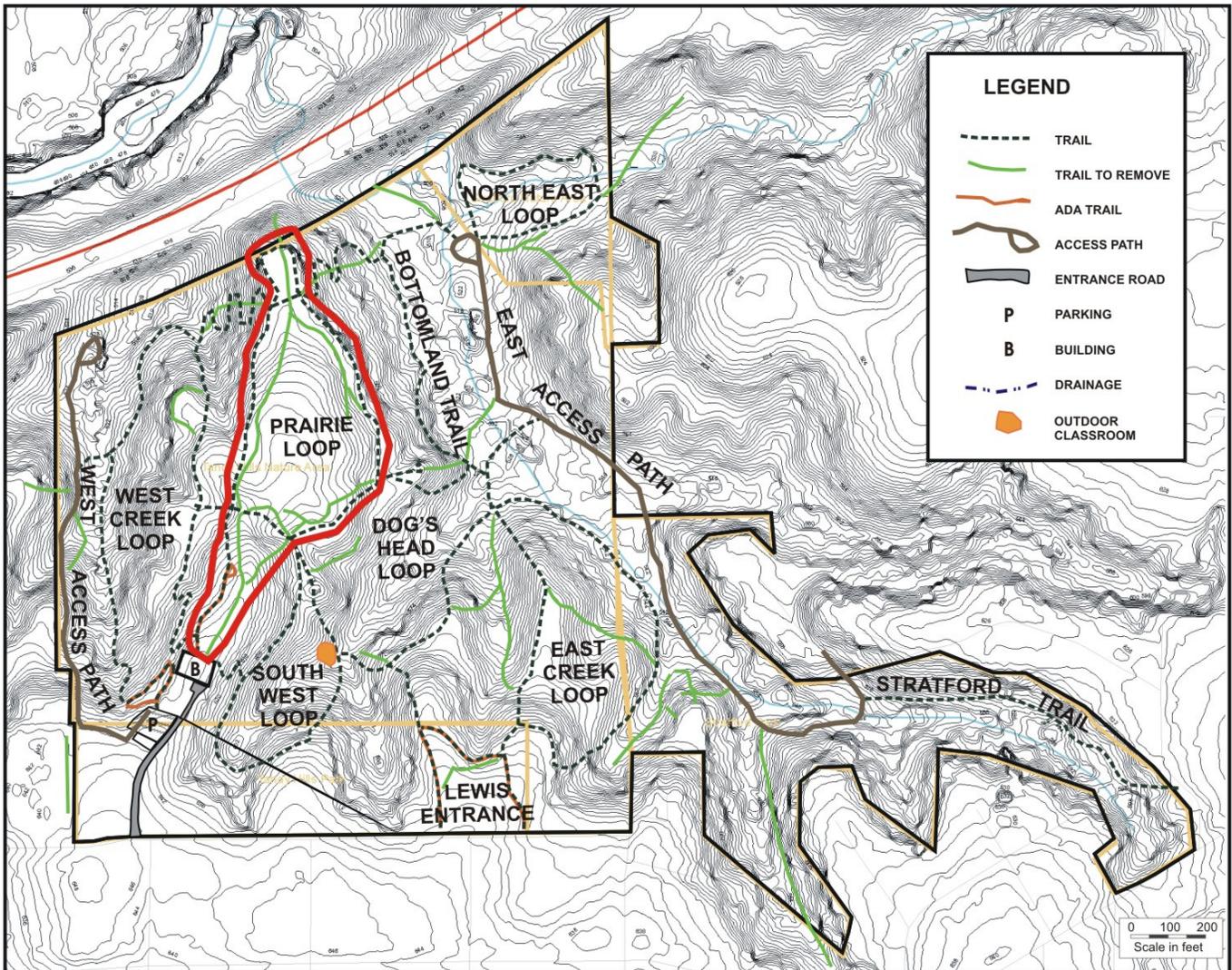


Figure 4-4. Prairie Loop Trail Map

4.4.1.1. Prairie Loop

Prairie Loop will have the biggest visual impact. Visitors will walk from the building, up and over a crest, and will suddenly drop down into the wide open prairie. There are large stands of big bluestem, perhaps the biggest that many visitors will ever see anywhere else. This trail highlights the park's most unique feature.

(Round-Trip Length: 0.8 mile)

(Difficulty Rating: Easy)

Beginning at the proposed building location, Prairie Loop skirts the edges of the largest prairie opening in the park. The trail will give visitors a close view of the diverse prairie grasses and wildflowers

without creating too much disturbance. By placing the trail at the outside edges of the open prairie, benches can be placed in the shade of the few medium-sized trees, where visitors can sit and take in the grand vista.

4.4.1.2. Prairie Loop ADA Spur

(Round-Trip Length: 0.2 mile)

(Difficulty Rating: Accessible)

This trail begins at the proposed building location, extends approximately 0.1 mile, and stops at a lookout and bench location. Visitors will then return along the same route.

4.4.1.3. Existing Trails to Remove

Approximately 0.5 mile of existing trails needs to be removed around the Prairie Loop.

4.4.2. West Creek Loop

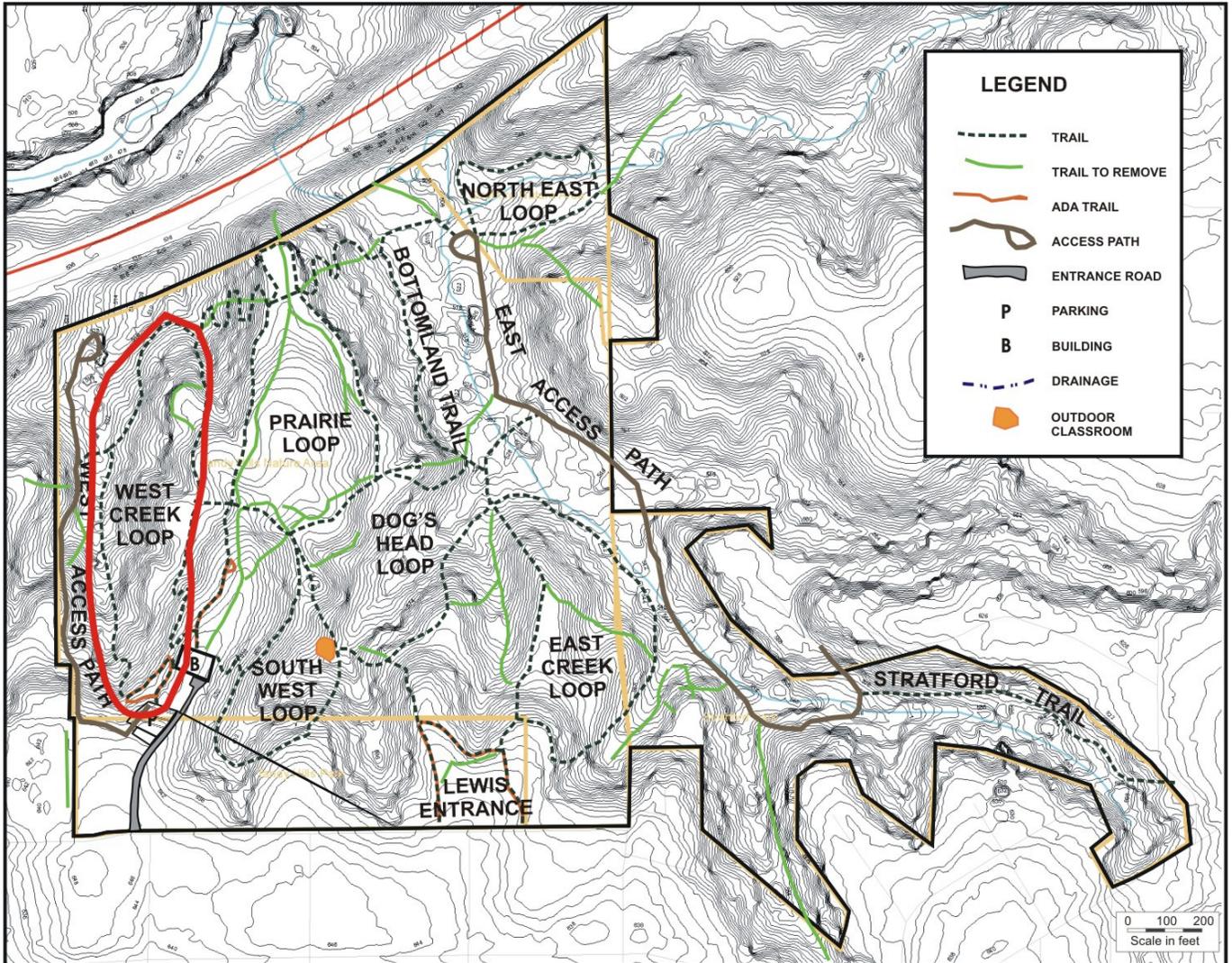


Figure 4-5. West Creek Loop Map

West Creek Loop showcases everything the park has to offer in one trail, except the Bottomland. Once visitors are down in this drainage they will forget they are in the city. The trail winds through little meadow clearings as it follows the limestone bottom creek. Diverse and interesting shrubs line the drainage, with beautiful large oak trees near the highway. No other trail has as much dramatic elevation change, varying from riparian lowlands to upland plateaus and tabletops.

(Round-Trip Length: 0.7 mile)

(Difficulty Rating: Moderate)

West Creek Loop follows a small drainage basin within the park. The trail passes through woodlands and open grasslands and in its lower elevation portion wends close to the limestone exposed creek. It is relatively pristine since it does not drain much of the surrounding neighborhood. While there are exotic species along this drainage, they are not at the high population densities found in the larger drainage to the east. The upper elevation portion of this trail has a number of viewing and bench opportunities. Hikers will have a solitary experience due to the rolling hills and vegetative screening. The trail starts at

the proposed building location and loops around for approximately 0.7 miles back to the building. There are several spur options for the hiker to connect with either the West Access Path or the Prairie Loop.

4.4.2.1. West Creek ADA Loop

(Round Trip Length: 0.1 mile)

(Difficulty Rating: Accessible)

There is an opportunity to construct an approximately 0.1 mile long ADA trail in this area. Beginning at the proposed building location, this loop would follow elevation contours to the West Creek drainage. Here there are some viewing and bench location opportunities before the trail gently loops back to the building.

4.4.2.2. Existing Trails to Remove

Approximately 0.1 mile of existing trails needs to be removed within the West Creek Loop area. One section to be removed is a looped spur that is too visible to the lower trail. The other section to remove is along the highly eroded trail extending up to the Prairie Loop.

4.4.3. South West Loop

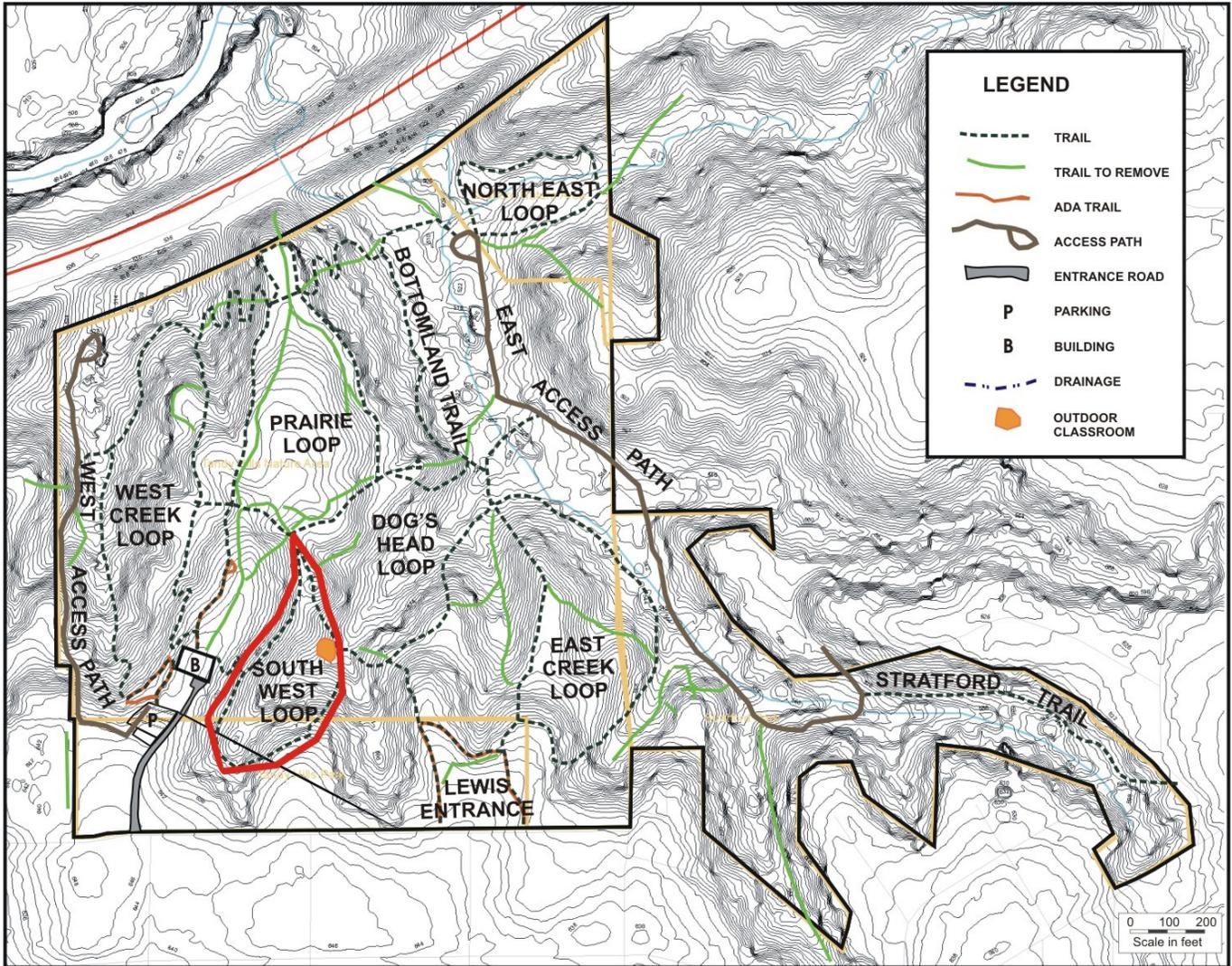


Figure 4-6. South West Loop Map

South West Loop is one of the trails closest to the proposed visitor center and should receive priority attention to restore. It is another trail that feels intimate and remote, with no view of the city. It passes through woodlands, dips down across the headwaters of two drainages, and has views of both early and late succession grasslands. It passes over a knob with panoramic views into the park's interior, including spacious sloped grassland that descends into a canyon below. Near the junction with Dog's Head Loop there is a stand of mature red oaks and the location of the proposed outdoor classroom. This unique classroom, under the majestic red oaks, will be a pleasant and shady place to stop and chat with friends.

(Round-Trip Length: 0.65 mile)

(Difficulty Rating: Moderate)

South West Loop circles around a side draw of the east drainage. (See Section 2.3.3. Tandy Hills/Stratford Park Detailed Drainage Map) Beginning at the proposed building, the trail travels along elevation contours, through mid-succession and early succession woodland, until crossing the drainage where there are larger late succession trees. At this point the trail emerges onto an open prairie area

before circling back through the woods. The last portion of the loop is shared with Dog's Head Loop. The trail then doubles back along the same route to the building.

4.4.3.1. Existing Trails to Remove

There are no existing trails to be removed within this area.

4.4.4. Dog's Head Loop

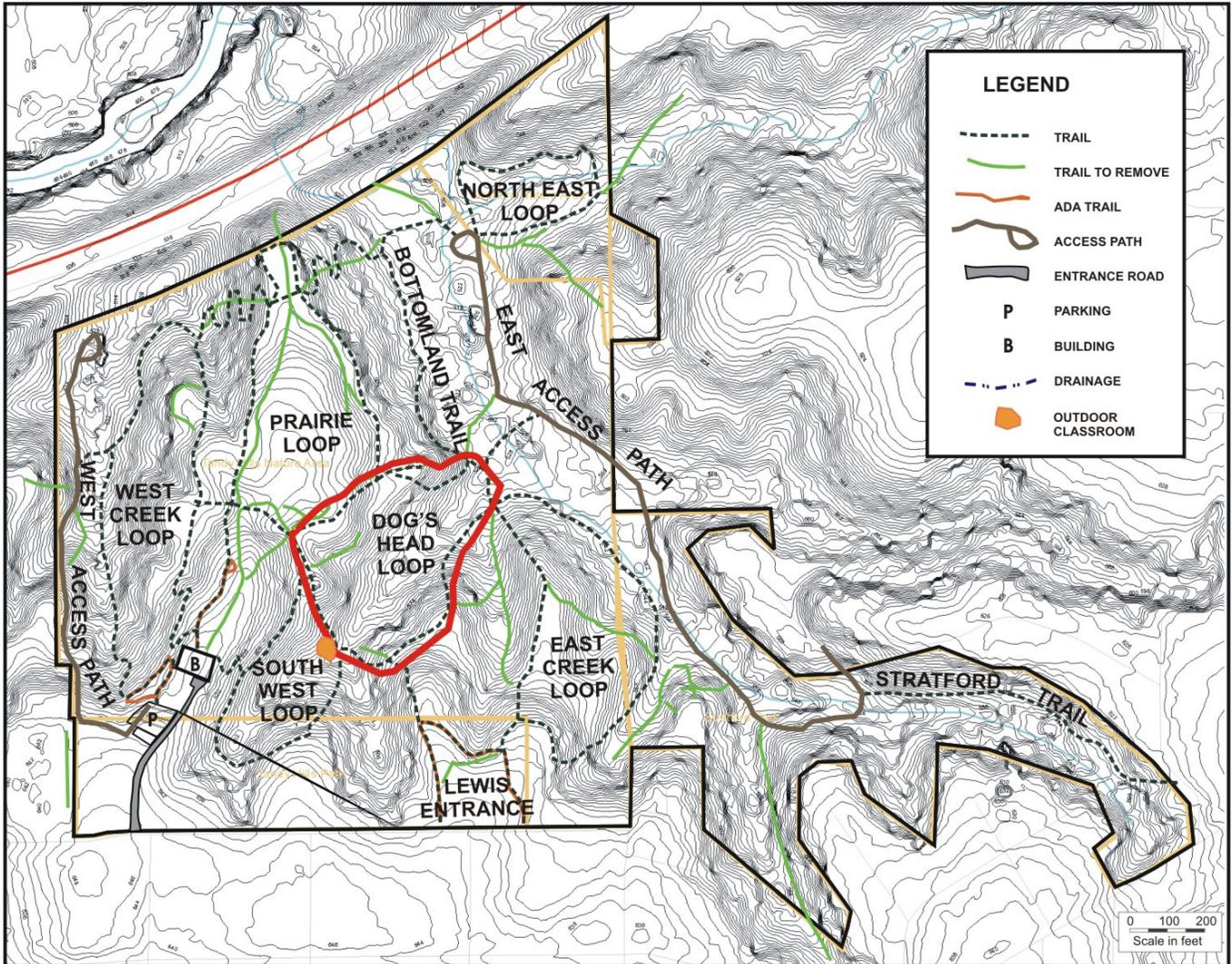


Figure 4-7. Dog's Head Loop Map

Dog's Head Loop is one of the more challenging trails in the park. There is hardly a flat spot except where it connects with Prairie Loop. It is a very secluded, scenic trail crossing rolling hills and a major drainage. The upper portions of Dog's Head Loop pass through open prairie areas with views of the surrounding hills and valleys. The lower elevation section is located in tall, shady woodlands of mostly late succession trees.

Many late succession meadows will present beautiful grasses and wildflowers through the seasons. There is a spur and proposed bench at its highest spot that offers multiple vantage points of the park's interior and the best overhead view of the riparian bottomland forest. Leaving the spur, the visitor can then hike down to the creek. Dog's Head Loop provides visitors the opportunity to explore the heart of the park.

(Round-Trip Length: 0.75 mile)

(Difficulty Rating: Moderate)

Dog's Head Loop shares portions of its trail with Prairie Loop and Southwest Loop.

4.4.4.1. Existing Trails to Remove

Approximately 0.1 mile of existing trails needs to be removed within the Dog's Head Loop area.

To access East Creek Loop from the proposed building, hikers will walk to the Prairie Loop and across the top of Dog's Head Loop. A second access to this trail is through the Lewis Entrance along View Street. Parking would be along View Street.

4.4.5.1. Existing Trails to Remove

Approximately 0.5 mile of existing trails needs to be removed from this area. Removal of existing trails in the western section of this area will maintain a sense of isolation. There is a network of trails behind the properties at the end of Arrowhead Court. It appears that some of the neighbors are encroaching on parkland with trails, clearings, and buildings. These trails and development need to be closed and restored.

4.4.6. Bottomland Trail

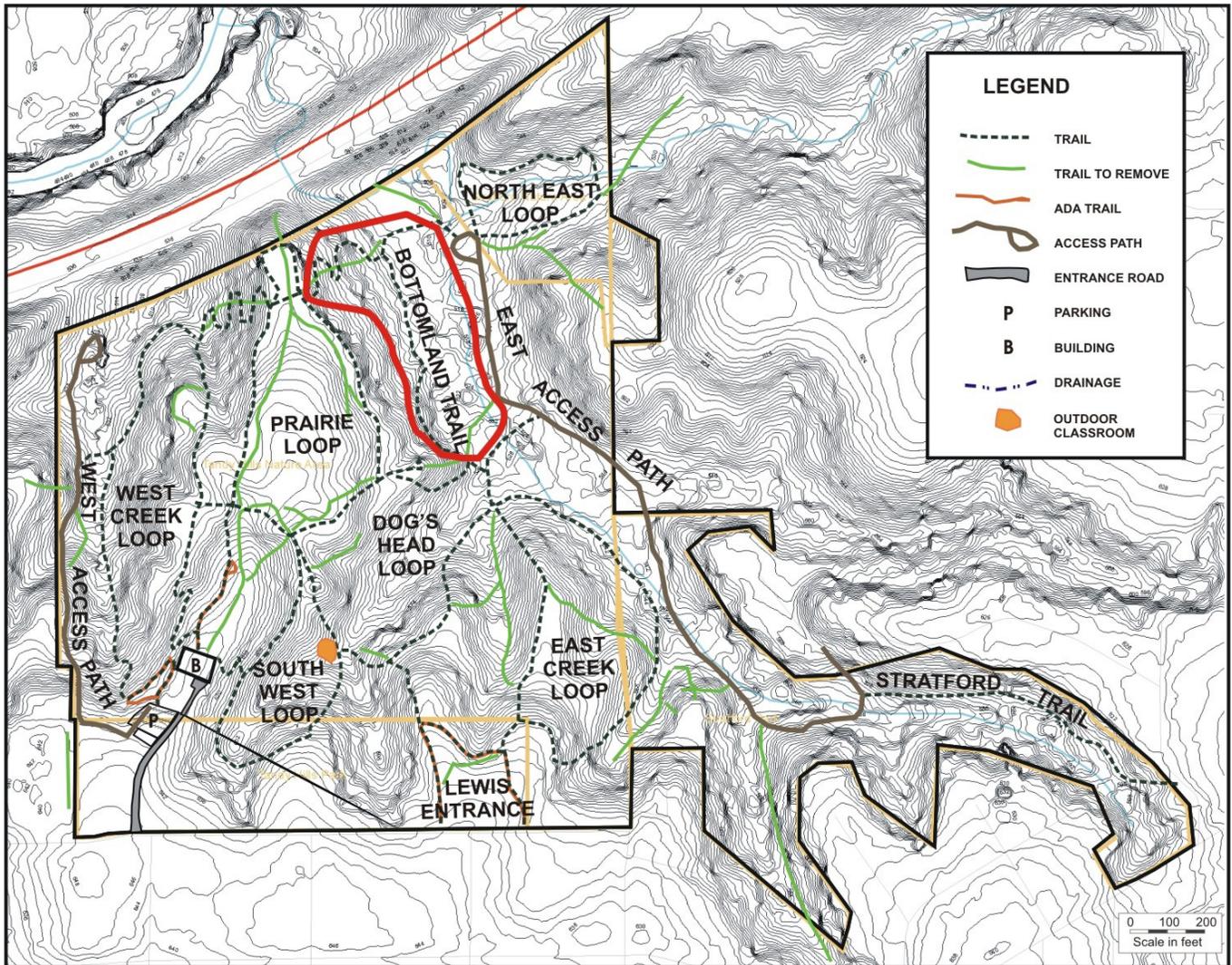


Figure 4-9. Bottomland Trail Map

The Bottomland Trail is a unique, shadowy place in the park where most visitors will feel diminutive. The towering trees are an example of dramatic old growth, with a sub-canopy of medium and small trees and shrubs. The creek is prone to flooding which creates a murky, swampy feel. Visitors will see understory species that are not found anywhere else in the park. The switchbacks that descend into the Bottomland Trail offer an opportunity to look at the woods before entering. Due to the unpredictable flooding along the creek, portions of this trail might be unusable during rainy seasons. There is potential for a boardwalk in this area.

(Round-Trip Length: 0.75 mile)

(Difficulty Rating: Moderate)

The Bottomland Trail runs along the downstream end of the main creek, just uphill from the major flood zone. The trail would climb up out of the drainage before connecting with Dog's Head Loop. At this point the hiker can cross over the creek to the East Access Path or continue back to the proposed building along Dog's Head Loop and Prairie Loop.

4.4.6.1. Existing Trails to Remove

There is approximately 0.2 mile of existing trails to be removed in this area. One of the trails to be removed is a section between Dog's Head Loop and the East Access Path. It is located in a place that is often submerged and would be extremely difficult and costly to remedy. The preferred cross-over trail indicated on the map would be easier to construct and more useable throughout the year.

The second stretch of trail to be removed runs straight down the steep slope between East Access Path and Prairie Loop. This needs to be replaced with a switch-back trail, as indicated on the map.

4.4.7. North East Loop

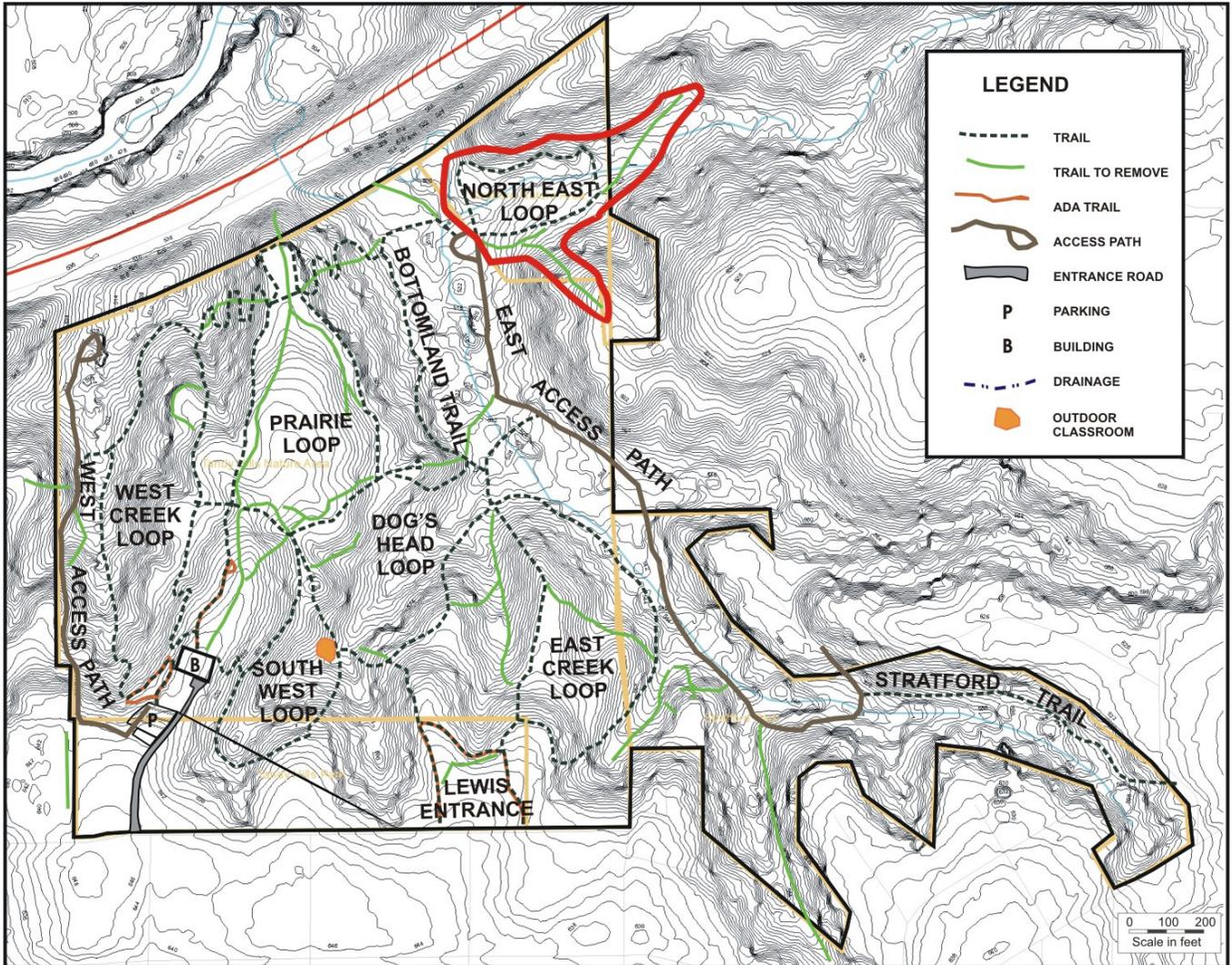


Figure 4-10. North East Loop Map

The North East Loop is a paradox. It is the closest trail to surrounding urban impact, including a television station, the future gas drilling operations, and the highway. It is an opportunity to see how urban development impacts a natural area. It does have some very large trees, somewhat similar to those in the Bottomland, and views of open grasslands, but it also has close-up views of the highway. It is not a top priority trail for construction.

(Round-Trip Length: 1.0 mile)

(Difficulty Rating: Moderate)

North East Loop is located along a tributary of the main creek in the northeast corner of the park. The majority of the trail passes through large late succession trees. The northern side of the loop borders on an open grassland hillside near the highway. Since this trail is a fair distance from the proposed building, it can be accessed by various routes, but the approximate round-trip distance is one mile.

4.4.7.1. Existing Trails to Remove

There is approximately 0.1 mile of existing trails that should be removed. One of the trails to be removed goes up an eroded slope. The proposed replacement trail would follow the shaded woodland closer to the drainage. The second existing trail to be removed extends into the neighboring property. It is recommended that this access to the park be closed. (See Section 4.5.2. Closures of Existing Entrances)

4.4.8. Stratford Trail

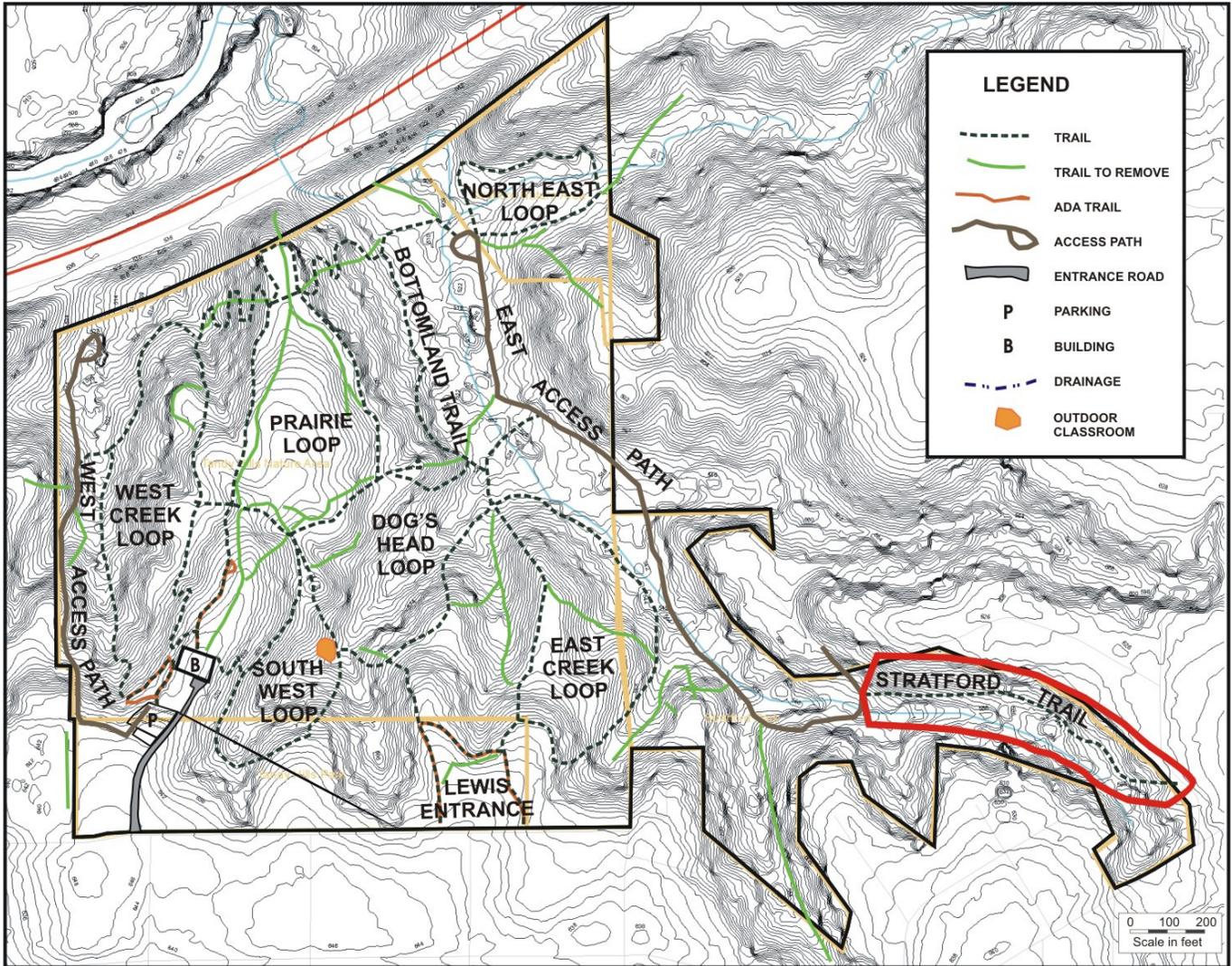


Figure 4-11. Stratford Trail Map

Stratford Trail is mostly an access route to the park from the east side of the property. It is a relatively level walk along a tributary of the park's main creek. The trail is between a forest of middle aged trees along the creek and open grassland behind neighboring houses. There is a sizable amount of trash along the creek and the forest's understory is choked with exotic species. The trail would be a pleasant walk if restored, cleaned up, and protected from future impact.

(Round-Trip Length: 0.25 mile)

(Difficulty Rating: Easy)

Stratford Trail is an access point to the park from Chelsea Road. It follows one of the forks of the main creek and ends at the junction with the East Access Path. This trail's main purpose is to allow access for neighbors on the east side of the park. The vegetation along this trail is mostly mid-succession woodland and some disturbed grassland.

4.4.8.1. Existing Trails to Remove

There are no existing trails to be removed within this area. The low-water crossing at the junction to the East Access Path needs to be repaired.

4.4.9. East Access Path

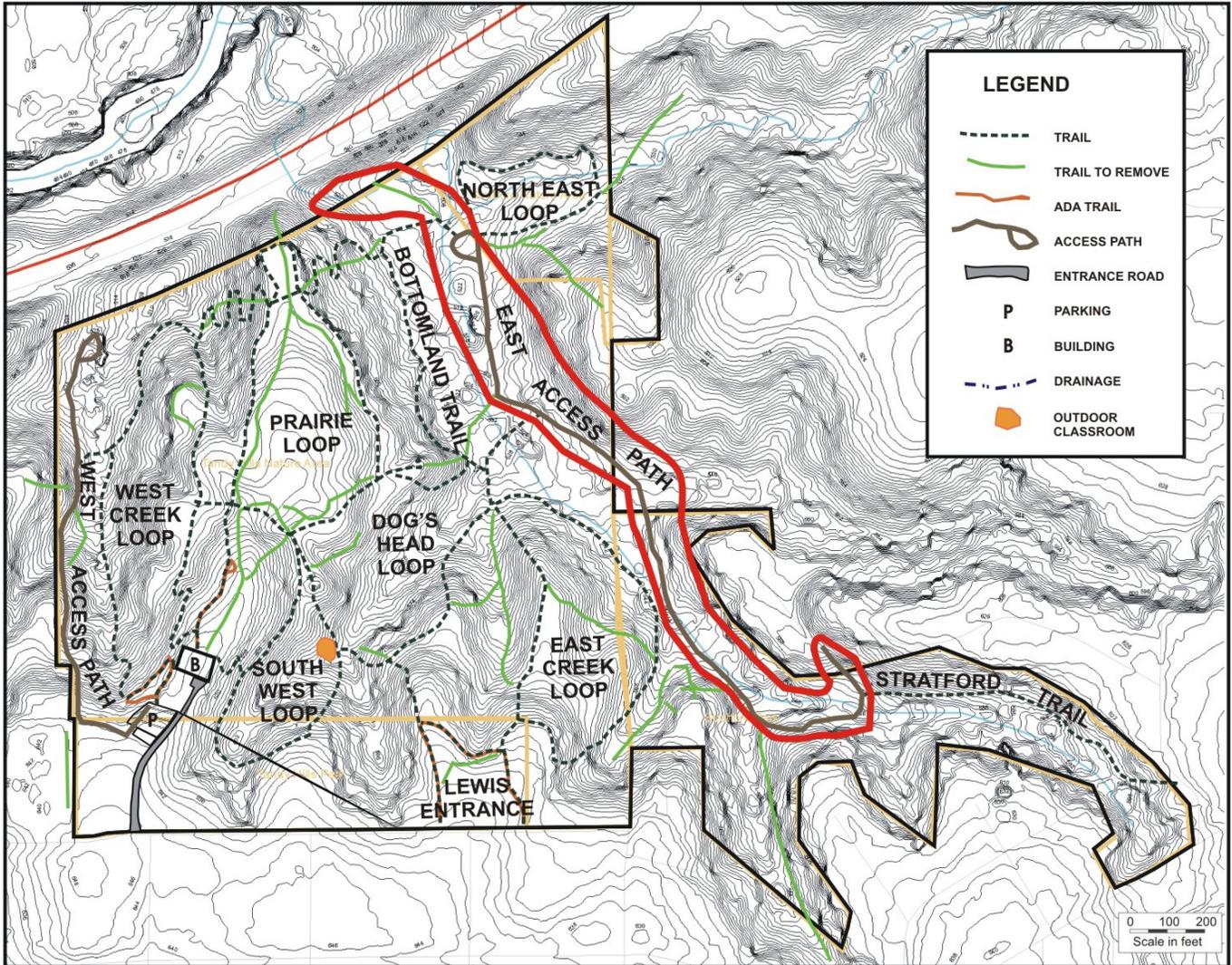


Figure 4-12. East Access Path Map

The East Access Path extends from the mid-succession forest of Stratford Park to the towering old growth trees of the Bottomland. There are several low-water crossings that will give visitors a chance to get a close view of the creek as it passes through the forest. There is, however, trash in the creek that washes down from the neighborhood.

(Round-Trip Length: 0.6 mile)

(Difficulty Rating: Easy)

The East Access Path is proposed to be a seven-foot wide drivable path for small maintenance vehicles and emergency park vehicles. It follows along an existing sewer line and has already been used as an access road. It would enter the park along Medford Road. There would have to be a turn-around before the path crosses the side creek.

4.4.9.1. Existing Trails to Remove

There are no existing trails to be removed within this area. However, there are several low-water crossings that need to be repaired.

4.4.10. West Access Path

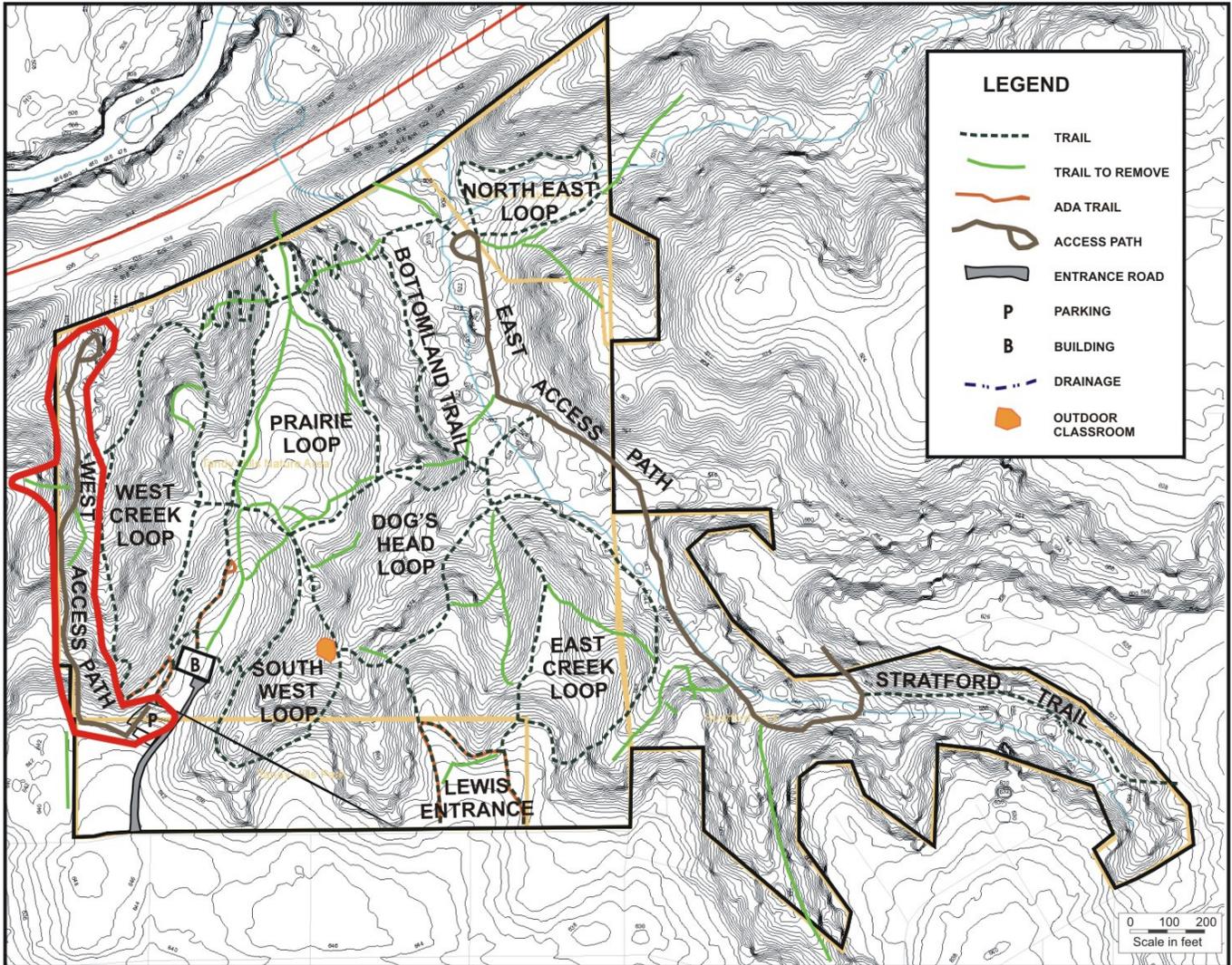


Figure 4-13. West Access Path Map

Installing the West Access Path is a suggestion. Further discussion and engineering studies need to be done before making a decision to include this path in the trail system. Its main function would be as a maintenance and emergency access to the west side of the park. The West Access Path area is similar to West Creek Loop, except that it does not have the proximity to the creek. It passes through hilly grassland openings and provides an overhead view into West Creek.

(Round-Trip Length: 0.3 mile)

(Difficulty Rating: Moderate)

The West Access Path, if constructed, is proposed to be a seven-foot wide drivable path for small maintenance vehicles and emergency vehicles. It follows along the western boundary of the park and ends at a turn-around at the northwest corner.

The vegetation along this path includes early, mid, and late succession woodland, as well as open grasslands. The topography is hilly and crosses several side draws. The path will follow contours

whenever possible to minimize erosion potential. In areas where the path crosses a slope, erosion-control construction methods would be necessary.

4.4.10.1. Existing Trails to Remove

There is approximately 0.1 mile of existing trails that should be removed. The first stretch to be removed is where the existing trail goes down a steep slope. The proposed replacement path would follow contours to minimize the slope of the path. The second stretch of existing trail to remove is where there is access from the neighboring property. It is recommended that this access to the park be removed. (See Section 4.5.2. Closures of Existing Entrances)

4.4.11. Lewis Entrance

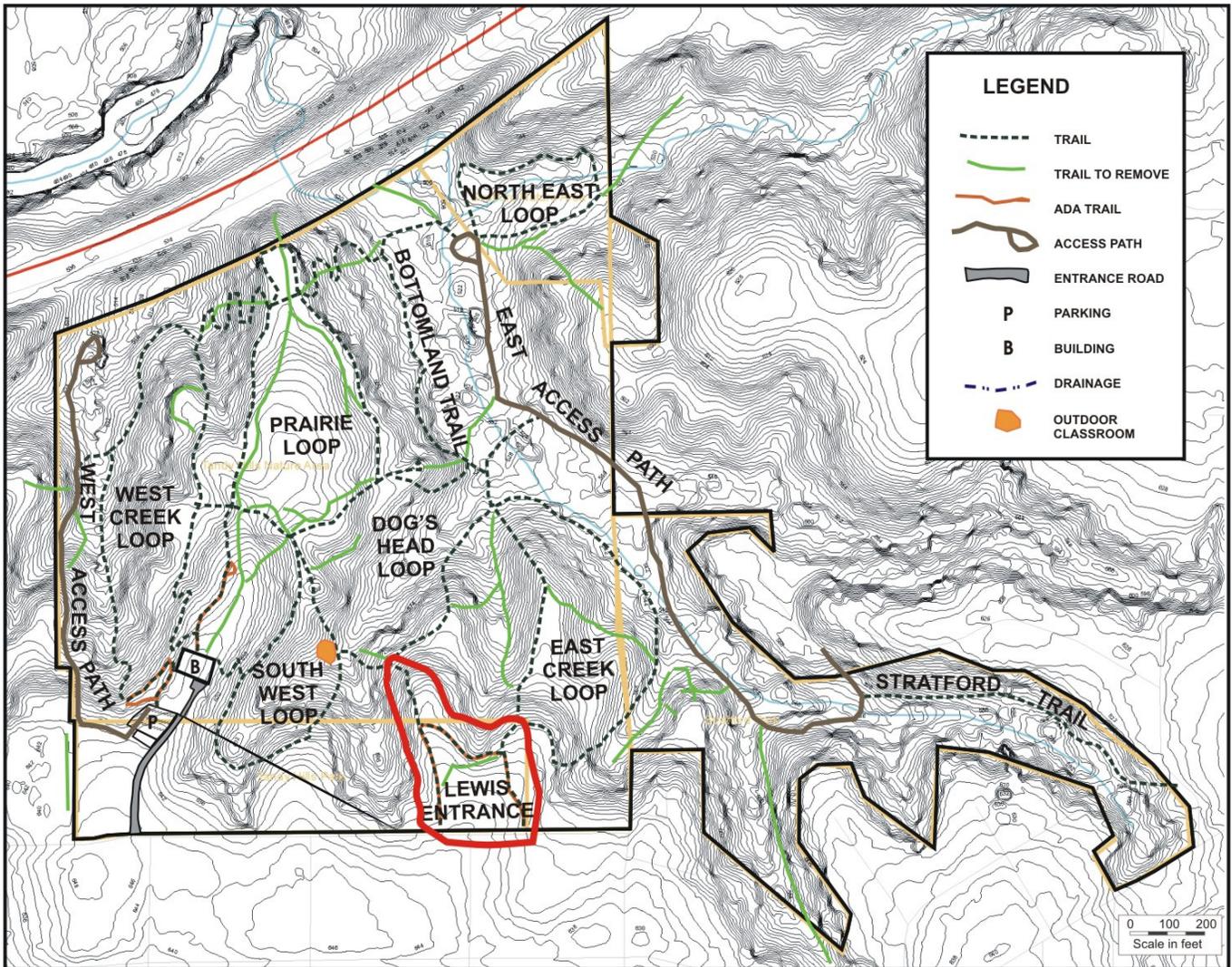


Figure 4-14. Lewis Entrance Map

Lewis Entrance is the only trail that specifically highlights early succession grassland. The visitors will leave their cars and in moments they will be in a natural setting, surrounded by spring wildflowers. This trail is a proposed handicap accessible route. There is enough of a drop in elevation, albeit gentle, that for the majority of the loop the user will only see the prairie and not the houses along View Street. Where the trail skirts the woodland, there are good views of the park's interior.

(Round-Trip Length: 0.1 mile)

(Difficulty Rating: Accessible)

This entrance trail is located near the intersection of View Street and Lewis Avenue. It is proposed to be an accessible ADA trail, which would need handicap parking signage at each of the two entrance locations.

There are two connecting trails off the Lewis Entrance Trail. One passes through to Dog's Head Loop. The other goes to the East Creek Loop.

4.4.11.1. Existing Trails to Remove

Proposed for removal is approximately 0.1 mile of existing trail that crosses the open prairie. Keeping the trail to the edges of the open area will increase the vista of wildflowers and grasses and enhance the illusion of solitude by keeping visitors on one side of the trail from seeing people on the other side.

4.5. Entrances and Closures of Existing Entrances

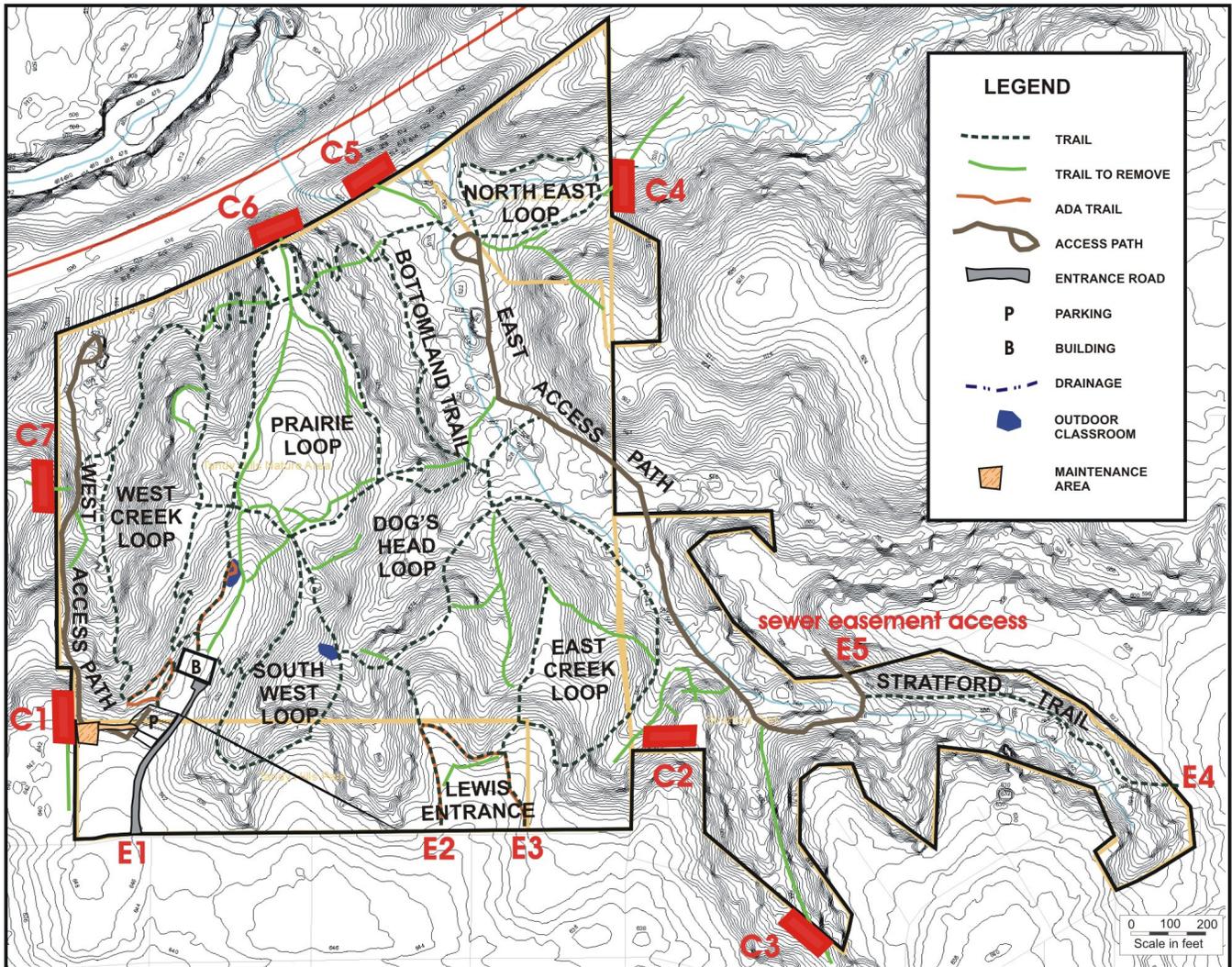


Figure 4-15. Entrances and Closures Map

4.5.1. Potential Entrances and Maintenance Access

There are four potential trail entrances and one maintenance access entrance, which are indicated on Figure 4-15. All existing entrances are also indicated on Figure 2-15 Tandy Hills Human Impacts.

E1: Entrance One

This is the main entrance to the park, which would lead to the proposed parking lot and building. The parking would be kept separate from the building and visitors would walk along a trail to get to the building. There would be a small road to the building for deliveries.

E2 & E3: Entrances Two and Three

These two entrances are for the Lewis Entrance ADA accessible trail. There would need to be handicap parking at each of these entrances.

E4: Entrance Four

This is the entrance to the Stratford Trail along Chelsea Road. There is currently a picnic area adjacent to this entrance. People park along the street.

E5: Entrance Five

This is the maintenance access entrance that would be kept gated and locked, to be used only by park personnel for maintenance and emergency use. It is also the access for any city maintenance of the existing permanent sanitary sewer easement.

4.5.2. Closures of Existing Entrances

There are seven existing entrances for which closure is recommended, as indicated on Figure 4-15. Visitors should be discouraged from creating any new entrances. Any unauthorized new entrances should be immediately closed and restored. Completely fencing the park is not recommended due to negative aesthetics and the prohibitive cost. Strategic gates and signage should be used to control public access.

C1: Closure One

There is currently a vague access trail at this location. With construction of the West Creek Path, there would need to be fencing and signage to prevent this from becoming an access.

C2: Closure Two

As stated in the description of the East Creek Loop, there is a network of trails behind the properties at the end of Arrowhead Court. It appears that some of the neighbors are encroaching on parkland with trails, clearings, and buildings. These trails need to be closed, the fugitive development removed, and the affected areas restored.

C3: Closure Three

It is recommended that this access point be closed off. The trail comes up too close between two residences and is not appropriate for an entrance to the park.

C4: Closure Four

This trail traverses quite a distance over the private property on Scenery Hill. It is not appropriate to have an entrance to the park that requires walking on private property. It is therefore recommended that this access point be closed.

C5 & C6: Closures Five and Six

Both of these access points are along the highway right-of-way and should be closed. It is not appropriate or safe to have people walking along the highway to access the park.

C7: Closure Seven

This access point is also located along private property and should be closed. It is not appropriate to have a park entrance where people have to walk across private property.

4.6. Recommended Trail Surfacing Materials

4.6.1. Accessible Trails

There are three proposed handicap accessible trails. These trails should meet guidelines required for an accessible recreation trail categorized as easy (urban/rural) as published in *Universal Access to Outdoor Recreation: A Design Guide* (USDA Forest Service, 1993). The surface should be of compacted crushed granite gravel. Requirements are for the trail to be five feet wide, with passing space intervals every 200 feet, and a resting area every 400 feet, with a sustained running slope at a maximum of five percent.

4.6.2. Hiking Trails

The majority of the trails in Tandy Hills / Stratford Park will be hiking trails. The recommended width for hiking trails is four to five feet wide, with no surface additions. Limiting path width will contain erosion and make maintenance easier. All trails should be cleared of overhead branches to a height of eight feet.

4.6.2.1. Site Preparation

Trail paths should be hand cut and cleared of stumps. Appropriate tools would include chainsaws, pickaxes, and weed eaters. Grassy areas should be closely mowed. Woody native material can be shredded and used on the surface of the trails. Invasive and exotic woody material should be removed from the site. Shredding any invasive or exotic woody material runs the risk of spreading seed, which would perpetuate current problems.

4.6.2.2. Trail Construction

In areas where trails ascend a slope, cedar log steps (waterbars) are to be installed at an approximate rate of two steps (waterbars) per one foot rise in elevation. When possible, trails should follow elevation contours and use switchbacks to ascend and descend steep slopes. Areas with cross slope will require cedar log sidebars. All trails should be constructed to remove sheeting water as quickly as possible to minimize erosion. Steps (waterbars) and sidebars are not necessary in areas where elevation change is gradual.

In places where water flows over a trail, cedar log sidebars and other drainage structures should be used for stabilization and to minimize erosion. When a trail crosses small drainages, stepping stones will be sufficient to stabilize the trail and make it easy for hikers to walk across. Crossing large drainages where flooding is common will require more substantial construction, including culverts, low-water crossings, and possibly stretches of boardwalk.

4.6.2.3. Trail Markers

Trail markers should be placed at the beginning and end at each intersection of all trails. Markers should also be placed every 500 to 1,000 feet to help define trails. Markers are especially necessary in places where hikers might walk off the intended path.

Carsonite[®] is a patented material that combines fiberglass and epoxy resins to make a strong but flexible substrate, and is recommended for all park trail markers. Used most often in a thin, vertical format, it is also employed for small routine signs. Its hard, impervious surface best serves as a substrate for decals, although silk screening is possible. It is very resistant to impact and weather. Initial and replacement costs are low.

4.6.2.4. Trail Maintenance

Trails in sunny areas will need to be mowed periodically, although over time, compaction from hiking use will inhibit growth of grasses and other herbaceous vegetation, thereby improving trail definition. Periodically, branches and other vegetative growth extending into the trails will need to be removed.

4.6.3. Sign Installation, Maintenance, and Vandalism Control

Signs should be installed with care. They will be potential targets of vandalism, weathering, and decay, and will need to be maintained and replaced when necessary. Setting sign posts in cement will deter most vandals. Metal posts should be unpainted galvanized metal. All hardware used to affix signs to either wood or metal posts should be either aluminum, galvanized, or stainless steel. See Section 5.6 for further discussion of signage material.

After a sign has been installed, snip off the ends of the bolts and upset or fracture the threads to prevent removal of the nuts by vandals or thieves.

Listed below are thoughts about vandalism in parks, taken from Vandalism Control Management for Parks and Recreation Areas, by Monty L. Christiansen. Venture Publishing, 1982.

1. Areas that usually experience the most damage from vandalism include parking areas and interpretive displays.
2. Immediate cleaning and repair prevents copy-cat destructive behavior.
3. Most littering happens in parking areas and along roads. Frequent litter clean-up reduces volume of litter and tends to discourage continued littering.
4. Neighborhood watch efforts can help reduce vandalism.

4.7 Goals for Locating a Visitor Center

While the heart of the park will always be its natural features, a visitor center will offer many opportunities to educate the public and promote the goals of the park. It is important to place the visitor center in a location that captures the essence of the environment and at the same time draws in the public. An entrance road and parking area will need to be provided to keep congestion in the neighborhood to a minimum. A parking area off the street will also reduce the number of people exiting cars along View Street.

With that in mind, choosing a location for a visitor center included the following goals:

1. Location with the least possible impact on the park.
2. Location level enough to be accessible to handicap visitors.
3. Location close enough to View Street to straddle the urban and natural environment.
4. Location far enough into the park to be surrounded by the natural area.
5. Location distant from the highway.

To satisfy all of these goals, there proved to be only one possible location for the visitor center, which is indicated on the map below. It includes part of the already developed and mowed playground park, but minimally impacts that existing use. There are two open meadows east of this area, but both are valuable prairie remnants and constructing any road, parking area, and building in those locations would have a negative impact on the park. Also, the two meadows are surrounded by fairly steep slopes and it would not be possible to locate a building out of sight of View Street that would also be accessible to handicap visitors.

4.7.1 Schematic Map of Park Infrastructure

The following schematic map outlines the location for the following infrastructure:

1. Entrance road.
2. Parking for cars and a school bus.
3. Utility road to the visitor center for deliveries.
4. Visitor center.

The diagrams are schematic only. Final road/parking layout and design will be determined based on site topography, accessibility and impact to the open space/event/venue area.

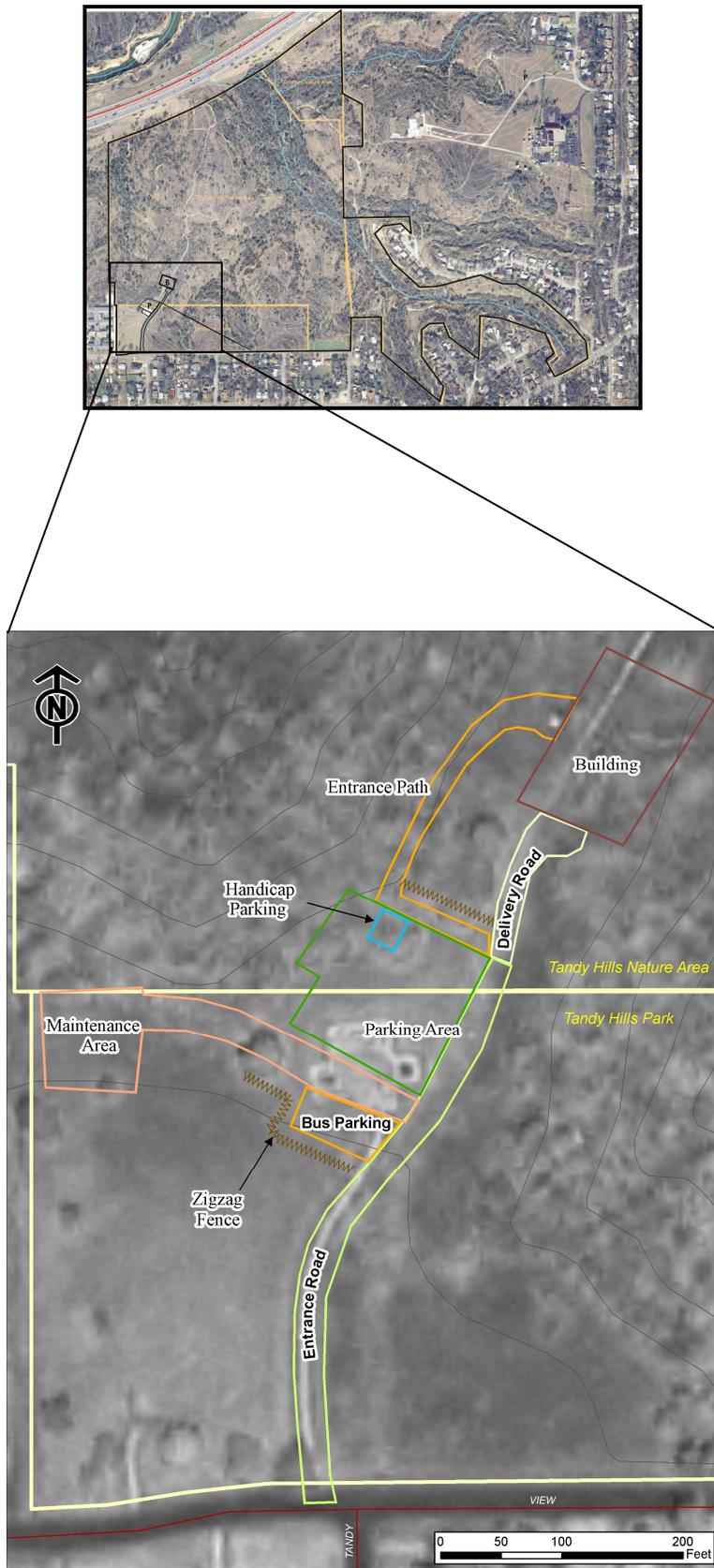


Figure 4-16. Schematic Map of Park Infrastructure

4.7.2. Entrance Road

An entrance road is proposed along the existing sidewalk. It would be approximately 200 feet long and 20 to 25 feet wide to accommodate two single lanes. It is recommended to design and build the entrance road with environmentally friendly green building materials, such as pervious concrete or turfstone.

4.7.3. Lighting

Ecologically-friendly lighting should be designed for the entrance road and parking area. The ecological consequences of artificial night lights is a problem that increases with urbanization and the growing number of night lights. Many species have evolved to require a certain amount of darkness. Urban lighting is a form of ecological disruption, which can be a problem for a natural area like TH/SP. Affected animals include migratory birds flying by night, nocturnal insectivores such as some salamanders and snakes, small nocturnal mammals such as mice, and most moths. Some researchers suggest using sodium high pressure vapor lights to improve the conservation of nocturnal insects. These lights are also potentially less expensive to operate than mercury vapor lamps. A recent book, *Ecological Consequences of Artificial Night Lighting* (Rich & Longcore, 2005), is a helpful resource guide to responsible night lighting. PACS will consider solar power sources for appropriate lighting.

4.7.4. Parking

The parking area should have enough space to provide parking for the majority of educational events and casual visitors. The proposed parking area is approximately 100 feet by 100 feet. It would be designed to provide spaces for approximately 30 cars, with the correct number of handicap parking slots that are determined by law. There would also be a side parking area for one school bus. To turn around, a school bus would have room to back out of its parking slot onto the entrance road to head out of the park. It is recommended that educational tours for this size park be limited to one school bus-full of students at a time, which would be approximately 60 students. For events that attract more than 30 cars, parking would be available along View Street. Large events should arrange a shuttle service with parking at an off site location to ease congestion in the neighborhood surrounding TH/SP.

Standard parking design should be employed. Construction should use the same environmentally sensitive techniques as is recommended for the entrance road.

4.7.4.1. Resources for Pervious Road Construction

The following websites contain information regarding environmentally sensitive construction method and materials:

- Stoney Creek Materials is a Texas-based company that specializes in environmentally sound construction and concrete solutions.
 - <http://www.stoneycreekmaterials.com>
- The National Ready Mixed Concrete Association has information regarding the use of pervious concrete as a Best Management Practice (BMP) recommended by the EPA.
 - <http://www.perviouspavement.org>

-
- ToolBase Services has technical information on building products, materials, and new technologies, including many options for permeable pavement materials.
 - <http://www.toolbase.org/Technology-Inventory/Sitework/permeable-pavement>
 - Two types of open-cell concrete paving are given below:
 - <http://hastingsarchitectural.com/checkerblock.htm>
 - <http://www.belgard.biz/shapes-turfstone.htm>

4.7.5. Delivery Road: From Parking Area to Visitor Center

There will need to be a smaller one-way road from the parking area to the visitor center for deliveries. This road could be a pervious, gravel-surfaced road. Signage, or perhaps a gate, should be placed at the entrance to this road to keep general visitors out. This road is proposed to be approximately 125 feet long and ten feet wide. There would need to be turn-around space at the building for delivery trucks.

4.7.6. Entrance Path: From Parking Area to Visitor Center

For all visitors, the entrance path would be the main access to the visitor center from the parking area. It would be approximately 100 feet long, handicap accessible, and surfaced with decomposed granite gravel. It would be designed and constructed according to ADA regulations. (See Section 4.6.1.)

4.7.6.1. Screening Strategies From View Street

To minimize the view of the parking area from View Street, screening can be accomplished with strategically placed fences and vegetation.

4.7.6.2. Fencing

An attractive zigzag cedar log split rail fence or a linear 3-rail fence with a granite gravel path along the north side of the parking area would guide visitors to the entrance path, which would then pass through an existing shaded wooded area to the visitor center. An additional zigzag fence or a linear 3-rail fence would be constructed along the south side of the parking area for decorative and screening purposes. An example of a zigzag split rail fence is shown on Figure 4-17.

Zigzag Split Rail Cedar Log



Photo by Judy Walther

Figure 4-17. Zigzag Split Rail Fence

4.7.6.3. Vegetative Screening

Native vines and other appropriate species could be planted along the fence to add vegetative screening. An example is shown in Figure 4-18.

Zigzag Fence with Vines



Photo by Judy Walther

Figure 4-18. Zigzag Split Rail Fence with Vegetation

4.7.7. Visitor Center

TH/SP represents the environmental heritage of the Fort Worth Prairie. In keeping with this sense of history, it is recommended that the visitor center also reflect the human history of the area. One of the common houses in historic North Central Texas was the dog-run house, an architectural style that melded German and American cultures of the mid-nineteenth century. The signature breezeway between two house sections allowed for natural circulation in the hot summer months. A dog-run style building lends itself well to a visitor center while reflecting cultural heritage.

4.7.7.1. Dog-run House

It is proposed that the visitor center be designed as a typical Texas one-and-a-half story dog-run house, approximately 100 feet long by 50 feet wide. The building would have two enclosed areas connected by

an open breezeway, with a front and back porch running the length of the building. Construction should consist of green building techniques.

The entrance trail would approach the building at the open breezeway, which would have interpretive bulletin boards with information about the park and its activities. There would be both a front and back porch, where visitors could relax in the shade before and after hiking through the park. Kiosks would be placed in open gravel areas outside each porch.

The south side of the building would be for offices. The north side would be an open multi-purpose room that could be used for classes, meetings and displays. It would be large enough for a group up to approximately 50 people. The second half-floor would be used for storage.

4.7.7.2. Cistern

A rainwater collection system is proposed, with the water stored in a cistern near the building. The water collected in the cistern can be used for landscape irrigation. Additionally, a stairway around the outside of the cistern could lead to a lookout platform on the top of the cistern for a view of the park. The cistern should be designed to reflect the historical integrity of the Fort Worth Prairie and match the dog-run house in architectural style.

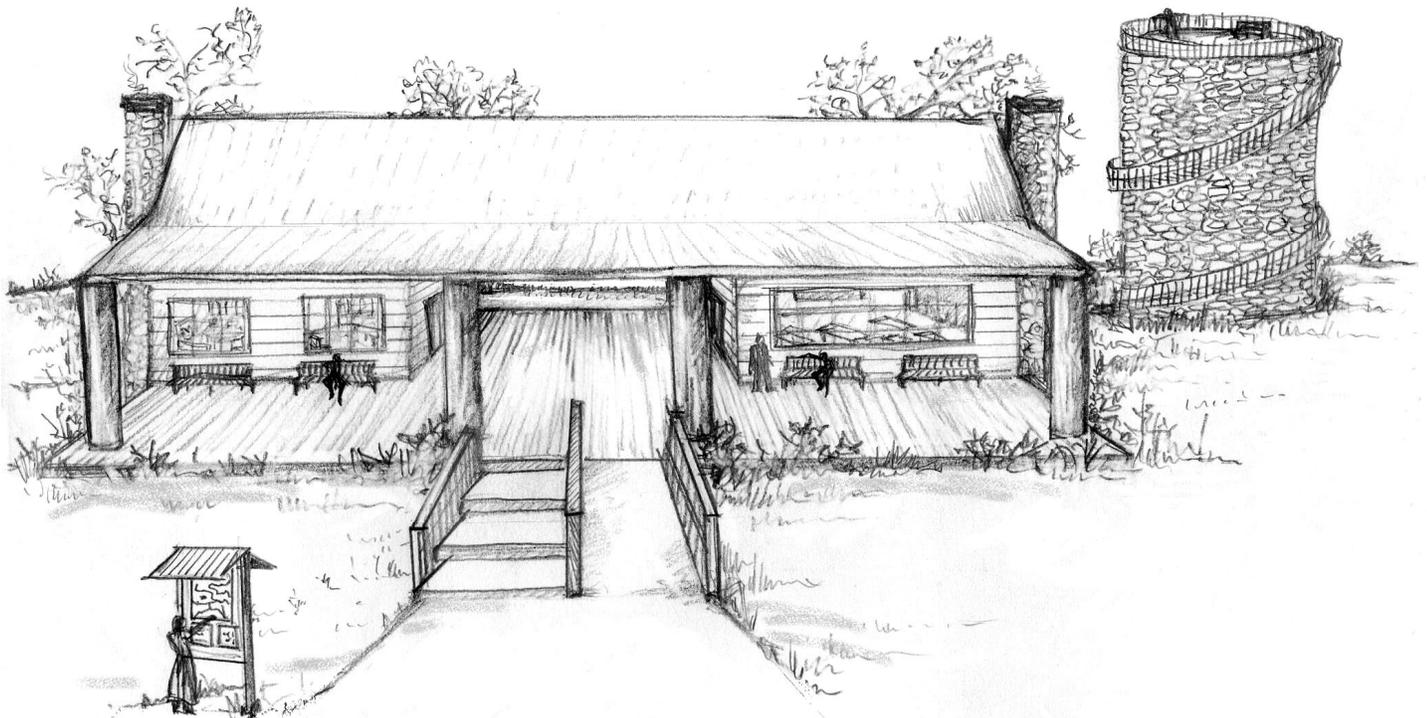


Figure 4-19. Visitor Center Drawing

4.7.7.3. Schematic Visitor Center Diagram

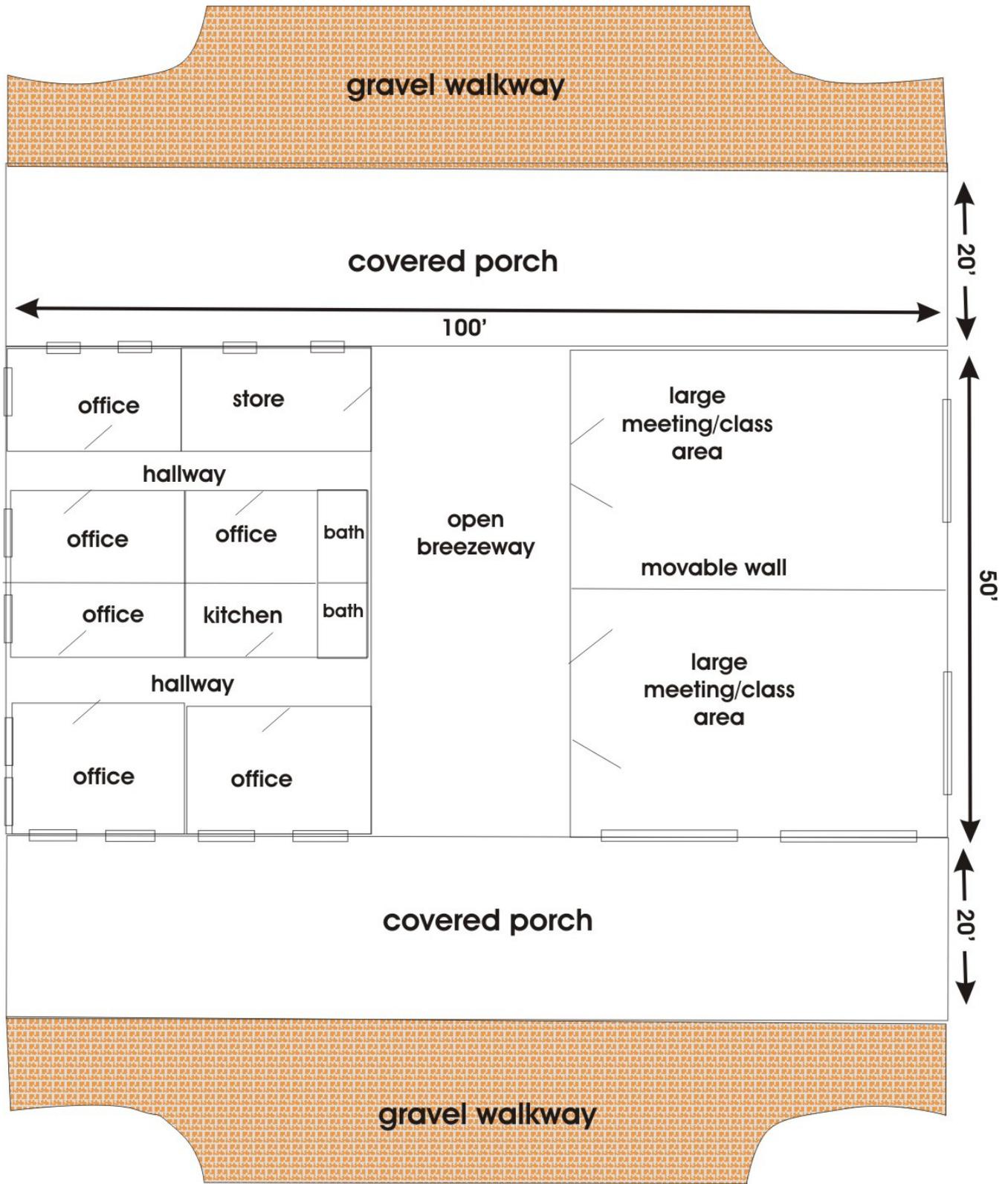


Figure 4-20. Schematic Visitor Center Diagram

5.0 PUBLIC OUTREACH

Tandy Hills / Stratford Park is important because it is a remnant piece of the vanishing Fort Worth Prairie. The prairies of North America are considered among our nation's most endangered ecosystems. Therefore, preserving this small natural area has a larger importance than just as a neighborhood park. Developing an interpretive program is an opportunity to educate a large number of people about the importance of this natural heritage and the importance of habitat preservation.

TH/SP can develop an interpretive program that plays an important role in the Fort Worth area. The Fort Worth Nature Center and Refuge is the only other natural area in Fort Worth that offers an environmental program. Having another program at TH/SP would widen the opportunities for citizens, students, and teachers to participate in environmental education.

The underlying premise for the interpretive program would be that people, no matter how young, can be learning and practicing skills that will encourage them to be environmentally responsible. The goals and objectives of this program include:

1. To provide interpretive activities, with an emphasis on monitoring the effects of human activities on terrestrial and freshwater habitats.
2. To provide environmental study materials for the North Central Texas region and specifically for TH/SP.
3. To provide a site where classes and groups can see and participate in environmental studies.

These goals can be accomplished by the following means:

1. Providing organized environmental education programs for children and adults.
2. Providing self-guided tours and interpretive exhibits in public trail areas.
3. Providing teacher training programs in environmental education.
4. Gathering and disseminating information.
5. Serving as a link between the scientific community and interested citizens.
6. Establishing an interpretive center with displays, collections, and a herbarium.

5.1. Existing Activities

TH/SP already has a sizable group of citizens who visit the park. This includes people hiking alone or with others, high schools groups studying the vegetation, university professors and their students doing research on flora and fauna, and large groups attending the yearly spring Prairie Fest. (See Section 5.1.1. Fort Worth Prairie Fest)

TH/SP has been recognized as an important prairie remnant by Texas scientists and environmental groups. The Botanical Research Institute of Texas (B.R.I.T.), an organization that conducts world-class botanical research, considered Tandy Hills important enough to compile a complete vegetation species list. The Texas Nature Conservancy has identified TH/SP as one of the important prairie remnants

remaining in Texas. (See Figure 1-6.) Both of these distinctions are only two examples of the special importance of the park and the extent of the opportunity the park offers to visitors who might want to learn about the Fort Worth Prairie.

5.1.1. Fort Worth Prairie Fest

Since 2006, local citizens have been organizing the “Fort Worth Prairie Fest,” an outdoor festival held at TH/SP. In 2007, more than 3,000 participants enjoyed this celebration. Over 45 sponsors, including local businesses, scout groups, and environmental organizations, have lent their support to the festival.

5.2. Interpretive Program Options

There are many options when developing an interpretive program for a natural area like TH/SP. Programs can be developed for adults and children, groups and individuals, weekdays and weekends. Activities can be held in the mornings, afternoons, and sometimes evenings. Some visitors will want to hike alone or with their family, while others will want to join a guided tour or class. A well-developed interpretive program will address all these different preferences.

The interpretive program will most likely begin before there is a visitor center. Many activities can be done without a building, although a more extensive program will be possible once a building is in place.

5.2.1. Develop a Sense of Stewardship

An interpretive program for a natural area must be done carefully. The first and foremost objective is to protect the park and develop a sense of stewardship. People will be attracted to TH/SP because of its beauty and its wilderness. With education, visitors will learn how they can help protect the very aspects of the parks that they value.

5.2.2. Create an Inviting Program

The park should be an inviting place, one that visitors will want to revisit throughout the changing seasons and over the years. To create a widely used interpretive program, develop options for all levels of interest, ability, and age. When constructing trails, place benches along the way for those who need to rest. Where possible, create accessible trails to include handicap visitors who want to participate. Create different volunteer programs that are either challenging or easy. An important objective is to present a program that is inclusive. When visitors feel included, it will foster their sense of ownership, pride, and stewardship.

5.2.3. First Project: Building the Trails

The first need will be to construct the trail system. This is a project that could use many volunteers. The park will most likely go through a transition period where some existing trails are kept open for use while other trails are closed for repair and/or construction. As new trails are ready, unwanted trails can be closed permanently. Signage should be used to explain the process of construction and restoration.

5.2.4. Guided Tours for Adults, Families, and Youth Groups

Guided tours can begin from the opening date of the park. Tours should avoid trails under construction, while still leaving enough open trails to have many tour options. Tours should last for a maximum of two hours. Groups should be limited in size to approximately ten people, with a maximum of twenty people only if necessary. With a group of ten, all participants can hear easily and will feel more included. A group of twenty is beginning to be unwieldy. People standing in the back often will not be able to hear and will lose interest.

There are many potential programming/interpretive tour topics. A few possibilities include the following:

1. General description of the park.
2. Seasonal vegetation topics:
 - a. Winter foliage.
 - b. Spring wildflowers.
 - c. Fall grasses.
3. Reading a topographic map of the park.
4. Geology of the park.
5. Bird watching.
6. Butterfly watching.

5.3. Volunteer Program

In order to have a successful interpretive program, the park staff will have to develop a volunteer program. There will need to be volunteers for the following:

1. Adult / family tours and programs.
2. School programs.
3. Trail construction and maintenance.
4. General park management.
5. Habitat restoration.
6. Visitor center duties.
7. Fund raising.
8. Newsletter organization.

There should be a description written for each volunteer position to help interested people decide how they might best help the park. This description should include a list of expected duties or tasks, as well as the position's commitment level and training requirements.

5.3.1. Advertising for Volunteers

The park will need to find volunteers for both a school program and an adult activities program. There are various approaches to this search, including those listed below.

- Online: Utilize the Fort Worth Park's Department website to list volunteer opportunities. The creation of TH/SP website would allow for a greater level of control and further options to post about volunteer positions and events. Additionally, list any TH/SP volunteer work days on community calendars or on community message boards.
- Newspaper articles: Before each semester try to have an article appear in the local newspapers, as either a news item or editorial piece, or by directly advertising for the volunteer program.
- Local radio shows: As with the newspapers, try to arrange to speak on local radio shows during a volunteer drive for the school or adult programs. The park can also run public service announcements (PSAs) regarding volunteer openings.
- Contact area schools: Stay in touch with all of the local schools to generate interest in visiting TH/SP. Develop a traveling program to advertise the park and its various educational opportunities.
- Previous volunteers to spread the word: Encourage past and present volunteers to spread the word about the park's volunteer needs.
- Bulletin boards in the park: Kiosks and bulletin boards in the park are an excellent way to advertise for volunteers.

5.4. Environmental Education School Program

Tandy Hills / Stratford Park is a living laboratory. Giving students the opportunity to relate the outdoor environment to their studies improves their powers of observation and critical thinking. Students respond well when they are included in a hands-on program. The goal of the TH/SP school program should be to present environmental science in a manner that is engaging and purposeful. If students are actively involved, they will feel a sense of ownership and will hopefully develop a sense of stewardship toward the park and the environment in general. It is recommended that tour guides use a wondering and questioning approach, by asking students to think, wonder, and predict. If the tour guide does most of the talking, it is not a successful session.

5.4.1. Divide Into Study Groups

The school program should last two to three hours per session, depending upon the age of the students. It should be designed to involve students in a hands-on experience. Large groups should be divided into small working groups of six to eight students. During their visit to the park students should become participants in a data gathering survey, giving each student a particular responsibility. Giving students scientific titles during the program is a way to encourage them to consider science as a future option. They will become a "Botanist" or a "Geologist" if only for two hours and on a level appropriate for their age. All students would have clipboards with their assigned worksheet.

Potential tasks could include the following assignments.

1. Botanist 1: This student would carry a small 8"x11" plant press that would be used at some point during the program.
2. Botanist 2: This student would carry an already pressed plant in an 8.5" x 11" plastic sleeve. This plant would be previously chosen by the park staff as one that should be looked for. It could be a currently blooming wildflower, or an exotic privet, or some other plant that would fit into the general topic of the day. This could include looking for species of seasonal note.
3. Zoologist: This student would fill out a worksheet on animal observations.
4. Cartographer: This student would carry a topographic map of the park and keep track of the route and all elevation changes the group hikes. Student could map specific species of note.
5. Geologist 1: This student would have a geology worksheet that makes observations about rocks and soil.
6. Geologist 2: This student would gather small soil samples from a dry, high elevation location and a moist, low elevation location.

5.4.2. Topical Worksheets for Study Groups

The students will be asked to complete various tasks during their visit to the park. Worksheets should be made that are usable for each topic. These worksheets should be created so they can be used for different age levels. For younger students, perhaps they will only make check marks as answers. For older students, they can write down more detailed answers. The group leaders will use worksheets as guides for directing the conversation.

Examples of two potential worksheets are included on this and the following page.

Evidence of Animals			
Zoologist Name:			Date:
1. Have you seen evidence that animals need plants?	How is it helpful?		How else do you think it is helpful?
	food	shelter	
Chewed leaves			
Holes in leaves			
Webs on plants			
Holes in trees			
Nests in trees			
List other evidence you observed:			
2. Have you seen evidence that plants need animals?			
Butterflies visiting flowers			
Bees visiting flowers			
Animal droppings on the ground			
List other evidence you observed:			

Table 5-2. Zoologist Worksheet 2

5.4.3. Outdoor Classrooms

While most of the school program will happen as the different small groups of students hike through the park, there are two proposed outdoor classrooms where a larger group can stop and discuss various topics. The outdoor classrooms could be used as staging areas before smaller groups set out to accomplish their tasks. They could also be the location where all groups meet to report back to the class and compare what they have learned. The outdoor classrooms are indicated on the trail map. (See Section 4.3. Proposed Trails)

5.4.4. Adapting the School Program to TEKS Requirements

School are under increasing pressure to prepare students for the TEKS (Texas Essential Knowledge and Skills) tests. In order to assure teachers that bringing their students to TH/SP will help in this process, it will be important to analyze how the park's school program will satisfy TEKS requirements.

The TH/SP education staff could develop a short introductory program that could be taken to local schools to inform teachers about the park's program and how it can be incorporated into the school's curriculum. In addition to the program at the park, materials could be developed for follow-up activities for students. These follow-up activities should use the data and observations students made during their visit to the park.

On the next three pages are five charts of potential TH/SP Program activities and the corresponding TEKS science concepts for first through eighth grade students. Each of the activities could be modified for multiple grade levels, by varying the discussions to reflect the age of the students. Clearly, more would be expected from a sixth grader than a first grader.

5.4.5. Charts of TEKS Concepts as Related to Park Activities

Potential Activity in Park	TEKS Concepts	Grade Level									
		K	1	2	3	4	5	6	7	8	
TOPIC: Animal / Plant Relationships 1. Observe and record a list of animals sighted in the park. 2. Observe and record the type of animals sighted: vertebrate or invertebrate. 3. Observe and record in which habitat each animal was sighted. 4. Observe the relationship between animals and plants.	Observe and identify basic needs of organisms.	X									
	Observe how parts within systems can interact.			X							
	Learn about adaptation and the unique niche of some organisms in an ecosystem.						X				
	Identify traits that are inherited in plants and animals.						X				
	Describe interactions within ecosystems.										X
	Describe and observe properties and patterns of organisms.	X									
	Sort objects and events to form patterns including identification and prediction.		X								

Table 5-3. Chart 1 of TEKS Concepts

Potential Activity in Park	TEKS Concepts	Grade Level									
		K	1	2	3	4	5	6	7	8	
TOPIC: Plant Communities 1. Compare and contrast the various vegetation habitats, such as grasslands and woodlands 2. Explore areas with exotic species and make predictions regarding native plant diversity. 3. Observe the number of species in one location along the study route to determine diversity.	Identify and describe complex systems and predict what happens when parts of a system are removed.					X					
	Investigate systems to understand how parts within these systems interact.		X								
	Describe equilibrium of systems and ecological succession.								X		
	Study systems and feedback mechanisms that maintain equilibrium of systems.									X	
	Observe and describe habitats and ecosystems and how environmental changes affect the objects and organisms within those ecosystems.				X						

Table 5-4. Chart 2 of TEKS Concepts

Potential Activity in Park	TEKS Concepts	Grade Level								
		K	1	2	3	4	5	6	7	8
TOPIC: Geology / Topography	Interpret how landforms are result of a combination of constructive and destructive forces.						X			
1. Keep track of study route on a topographic map and observe the drainage basin patterns. 2. Make calculations of the elevations changes of the study route. 3. Collect soil samples from two different locations to make comparisons: dry/high elevation and wet/low elevation. 4. Make observations regarding erosion problems and solutions along the study route. 5. Make observations regarding soil movement from flooding.	Learn about earth systems including rock cycle, surface and groundwater cycles, and watersheds.							X		
	Learn about earth science concepts including sources of water, rocks, and soil and how these are recycled.		X							

Table 5-5. Chart 3 of TEKS Concepts

Potential Activity in Park	TEKS Concepts	Grade Level								
		K	1	2	3	4	5	6	7	8
TOPIC: Web of Life	Study consumers, producers and decomposers to know there is a relationship between organisms and the environment.							X		
1. Look for animal / plant interaction: webs, chewed leaves, nests, etc. 2. Fill out a worksheet on the various types of relationships between animals and plants. 3. Make predictions regarding how animals use and need plants. 4. Make predictions regarding how plants use and need animals. 5. Fill in a web-of-life chart with information from the study route. 6. Observe body parts on animals sighted and make predictions regarding characteristic advantages.	Compare and give examples of ways living organisms depend on each other for basic needs.								X	
	Identify species and adaptations within species for survival and simple concepts related to reproduction.		X							
	Learn how adaptations may increase survival in past and present species.				X					
	Know how a system is a collection of processes that interact.					X				
	Explain / illustrate energy transformations including photosynthesis, food chains, and food webs.							X		

Table 5-6. Chart 4 of TEKS Concepts

Potential Activity in Park	TEKS Concepts	Grade Level								
		K	1	2	3	4	5	6	7	8
TOPIC: Plant Identification 1. Collect and press one plant for the park herbarium. 2. Collect and examine seed samples along the study route and observe seed differences. 3. Make predictions regarding seed dispersal, based on observations of seed types.	Make observations of simple systems and describe the role of various parts within the system such as germination of seeds.				X					
	Sort, record, identify and manipulate parts of systems such as plants, animals.	X								
	Classify and sequence organisms, objects and events to identify patterns.			X						

Table 5-7. Chart 5 of TEKS Concepts

5.5. Volunteers for the School Program

Volunteering for the school program is more of a time commitment than volunteering for the other park needs. Potential volunteers should be able to make a minimum of a semester-long commitment because schools will be making reservations and the park staff will need to know if there are enough volunteers to handle the program.

Ideally there should be trained volunteer guides so each school group can be divided up into smaller groups, to keep the attention of the students. Large groups will scatter and be hard to control. The optimum number for each volunteer should be six to eight students. For an average school bus of 60 students, this would mean having approximately seven to ten trained volunteers.

Developing a volunteer program for tour guide leaders will require establishing contacts with organizations, local universities, and the general public. In addition to advertising in the places listed in Section 5.3.1. Advertising for Volunteers, the following volunteer organizations should be approached.

5.5.1. Volunteer Organizations

Listed below are some organizations that help match volunteers with community projects.

- The Junior League has potential volunteers and funding.
 - <http://www.juniorleaguefw.org>
- VolunteerMatch lists volunteer opportunities in the Fort Worth-Arlington area.
 - <http://www.volunteermatch.org/bymsa/m2800/c/opp1.html>
- AmeriCorps maintains a group of young adults who are assigned community service jobs. This is a good option for supplying TH/SP with tour guides or park labor.
 - <http://www.americorps.org>

5.5.2. Local Universities and Colleges

The park should try to organize a college-level course as a way to enlist volunteers for the school program. The park will need the semester-long commitment and the college students would need to satisfy a semester's worth of class.

There are four local universities and colleges that have Schools of Education. Develop a relationship with each of these institutions to see if they would be interested in establishing a course based on outdoor education at TH/SP. Students would be given training in subject matter as well as learning how to lead tours for children. With guidance from the universities and colleges, credit could be given for a one semester, two days per week course. The course would consist of two weeks of training, then bi-weekly tours with follow-up discussions.

Students from other disciplines might be interested in such a class as an elective. In similar programs at other parks, having college-age tour guides has been very popular with students ranging from elementary to high school levels. If a university is not able to create a class, individual students could apply to internships at TH/SP for a semester or more of credit. This would allow TH/SP a bit more leeway in planning a university student's involvement at the park.

Some of the Universities and Colleges in the Fort Worth area are:

- Texas Christian University, School of Education
 - <http://www.coe.tcu.edu>
- Tarrant County College
 - <http://www.tccd.edu>
- Texas Wesleyan University, School of Education
 - <http://www.txwes.edu>
- University of Texas at Arlington, School of Education
 - <http://www.uta.edu>
- University of North Texas, College of Education
 - <http://www.unt.edu/>
- Tareyton State University, College of Education
 - <http://www.tarleton.edu/>

5.5.3. General Public Volunteers

There are often people from the general public who are looking for outdoor volunteer programs and can make a semester-long commitment. The TH/SP education program should be advertised through newspapers, radio, television, and the Internet before the beginning of each semester to alert the public that volunteer positions are available.

5.6. Interpretive Signage and Materials

Signs are an important educational and informational tool for park visitors. It is important to have well designed signs that are professional in appearance. This will give a subtle message to visitors that the staff is serious about their concern for the park. Signs are also an efficient way to present a consistent message to many people, which can be viewed at the visitor's convenience.

5.6.1. Types of Interpretive Signage

Signs can be large with a great deal of information, or small and specific to one topic. A typical size for an interpretive sign is 36"x 24."

5.6.1.1. Directional and Safety Signs

Directional signs help keep visitors oriented and safe, such as:

- a. Entrance sign.
- b. Parking signs.
- c. Rules and regulations.
- d. "You are here" signs along the trails.
- e. Trail and road closure signs.
- f. Temporary information signs. (Example: Areas being restored, Special event, Class in progress, etc.)

5.6.1.2. Interpretive Signs Along the Trails

Signs along the trails could have detailed information. Another choice is to have numbered posts spaced periodically with the numbers correlating to a self-guided brochure. The following map indicates options for signage at junctions and at each proposed outdoor classroom. Additional signage could potentially be added as park staff discovers additional areas of special note. It is also possible that temporary signs can be placed in locations that have particular seasonal interest. Number of signs should be decided dependent upon budget.

5.6.1.3. Kiosks at the Visitor Center

Signs at the visitor center could be attached to kiosks. Kiosks are usually double-sided or perhaps triangular. Double or triple-sided kiosks are a more efficient use of space. Kiosks offer the flexibility to change signs seasonally. Information on kiosks doesn't have to be as permanent as free-standing interpretive signs.

5.6.1.4. Exhibits

Exhibits are usually three-dimensional displays. They are often interactive and more complex than signs, and are usually found inside visitor centers.

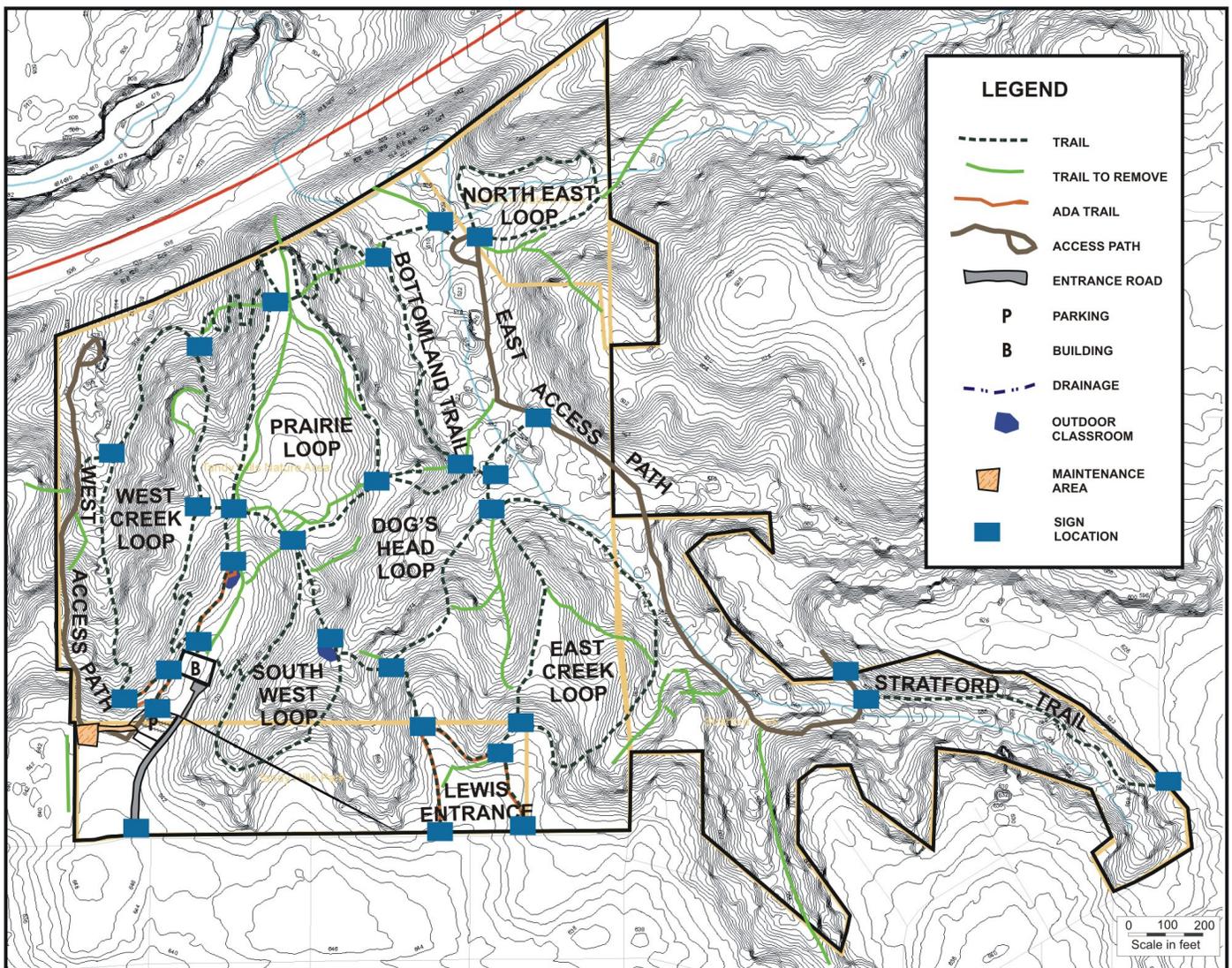


Figure 5-1. Map of Sign Locations

5.6.1.5. Brochures

Most parks have some sort of simple brochure that is given to each visitor. The brochure should have a trail map and a list of rules and regulations. It can also have information about how interested visitors can become more involved in the park.

5.6.1.6. Self-Guided Tour Guides

Self-guided tour pamphlets are more detailed and larger than a simple brochure. These guides can be produced simply from 8.5"x11" paper, folded and stapled, with a heavier card stock cover. They can be printed in black and white or color depending on the park's budget.

5.6.2. Estimated Cost of Interpretive Signage and Materials

The costs of fabricating interpretive signs depend upon mostly upon size and material. The following is a general estimate of various interpretive options. These estimates do not include text, layout and artwork, which can vary greatly depending on whether work is done internally or contracted out. (See Section 4.6.3 for discussion of vandalism control).

Directional signs along trails (on single post)	\$50 - \$100
24" x 36" permanent outdoor interpretive sign (various materials)	\$500 - \$1,000
24" x 36" temporary laminated sign (protected at kiosk)	\$100 - \$200
12" x 24" permanent outdoor sign (various materials)	\$300 - \$600
12" x 24" temporary laminated sign (protected at kiosk)	\$50 - \$100
Kiosks construction (dependent upon size, design, materials)	\$1,000 - \$4,000

5.6.3. Designing Interpretive Signage

When designing signs, consideration should be given to the following objectives:

1. Make the sign interesting to look at - colorful signs will draw attention.
2. Use large headings and subheadings in addition to text. A generally accepted rule is "3 -30 -3," which refers to "three seconds, thirty seconds, three minutes." Some people will only look at the headlines for three seconds, while others will spend thirty seconds. The most interested will stay and read for three minutes. People who visit often will have the chance to read more of the signs with each visit.
3. Use fonts and type sizes that are easy to read. Younger visitors in particular will need a larger font size.
4. Consider having some of the signs be bilingual.

5.6.3.1. Choose Appropriate Reading Levels

If a sign is meant for all ages, write the text at a standard sixth grade level using short sentences and paragraphs. Don't use scientific language that is too technical for the average visitor. Be sure to make the headlines understandable for younger readers.

5.6.3.2. Height and Angle of Signs

Install the signs so the angle and height makes it comfortable and accessible for all visitors.

5.6.4. Fabrication of Interpretive Signs

Signs will need to be as durable and vandal-proof as possible, although no sign is completely vandal-proof. A Texas-based company, iZone (<http://www.izoneimaging.com>), is a reputable nearby source of embedded phenolic resin signs. This is the sign material recommended for TH/SP. Other sign materials are listed below. This information has been taken from the U.S. Department of Interior Bureau of Reclamation's Sign Guidelines, October 2006.

5.6.4.1. Anodized Aluminum

Also known as Duratone, Dura-Etch, and Novalloy. This material is very expensive, but its long life and low maintenance costs make the product cost effective. It is very susceptible to scratching but impervious to weather. Finishes are available in gold, bronze, or silver tones. Recommended locations would be in high traffic use areas. It is also the material of choice for recognition plaques. Photos can be used in the production process at an extra cost.

5.6.4.2. Gator Foam

A Styrofoam board faced and backed with illustration board, creating a lightweight, durable, and attractive display. Image and text are screened onto the paper face after it has been prepared with a coat of paint. This product is for temporary interior displays, presentations, and master plans. If it is used outside, it should be enclosed in a moisture-proof case; however, other materials are better suited for exterior use. It will receive multiple colors, but no photos unless they are glued to the panels.

5.6.4.3. High Impact Styrene

An extremely durable and attractive material best suited for interior use. This material is similar in quality to fiberglass, except the image and copy are screened on the opaque materials. It can be used for high traffic areas, as this material will withstand considerable abuse; however, the surface of the image and copy can be scratched if one works at it. It is temperature and weather tolerant.

5.6.4.4. Embedded Fiberglass

Also known as Modulite and Fibrex, it is a process that produces a screen print substrate encapsulated into layers of fiberglass. Available in multiple colors. It is an attractive sign that is very resistant to shattering, weathering, fire, and graffiti and can be applied to virtually any surface. It comes in 1/16-inch and 1/8-inch thicknesses.

5.6.4.5. Masonite Silk Screen

This material comes in 1/4-inch Masonite that is silk screened in multicolor latex enamel. The materials are inexpensive but are limited in application. It is best for interior use in displays or cabinets. Any use outdoors requires a nonpermeable covering as well as a location out of direct sunlight.

5.6.4.6. Photometal

Photometal is an aluminum alloy that is electronically treated to produce a colored, corrosion-resistant surface. It is available in various shades of aluminum, bronze, and gold. Photometal has excellent longevity, is weather resistant, and relatively vandal-proof.

5.6.4.7. Plexiglas

Common Plexiglas with the screened image on the reverse side is fairly scratch resistant, but the material does become brittle with age and will shatter by point impact. It is best suited for interior use.

5.6.4.8. Polycarbonate

Also known as Lexan and Tuffak, polycarbonate is a clear material with impact strength about 250 times stronger than glass. It is ultraviolet stabilized and is available in a full range of colors. It comes in 10-, 50-, 75-, and 125-mil thicknesses. It is similar to Plexiglas but softer, and will not shatter on point impact. A matte velvet finish must be ordered because the gloss finish is very susceptible to scratching. This material is suitable for either interior or exterior use. The thinner Polycarbonate (10-23 mil) can be used on Masonite, metal, fiberglass, or other materials and is relatively inexpensive. Images are reverse silk screened. Resolution of the graphics and text suffers slightly in comparison with fiberglass-embedment process, but it is still considered a good product.

5.6.4.9. Polyethylene

“Poly-Print” comes in 1/16-inch and 1/8-inch thicknesses. The low cost of this material makes it attractive for large multiple orders. Polyethylene is durable and applicable to interior use, but does not do well outdoors and loses its image in direct sun.

5.6.4.10. Porcelain Enamel

Also known as Dura-enamel and Enameltec. The process is a fired-on, opaque, glassy coating on metal. Infinite colors are available, as well as gloss, semigloss, pebble, or mottled finishes. It has interior or exterior applications, especially in high visitation areas. It is very weather resistant and vandal-proof, except that it is easily shattered by excessive impact. Porcelain enamel is one of the most attractive sign materials on the market today. The cost is competitive with the rising prices of embedded fiberglass or metal signs. There is little or no maintenance.

5.6.4.11. Rigid Vinyl

This material comes in 10-mil, 20-mil, and 30-mil thicknesses. It is durable, but best used inside as exposure to the elements and ultraviolet rays tends to crack and warp it. Costs are low. Multiple colors can be used.

5.6.4.12. Screened Sign Board

Direct screen printing on medium density overlay (MDO) sign board. Sheet size is ½ inch by four feet by eight feet, which will make six 22”x32” signs per sheet at a very moderate cost. Signs need to be primed and finish-coated with exterior enamel, then sent to a screen printer along with camera-ready artwork. Once printed, the sign is ready to mount on uprights without having to attach it to a board.

5.6.5. Choosing Locations for Signs

Where signs are placed is almost as important as the information on the signs. Here are several suggestions regarding the placement of signs:

1. Place signs where people will be passing.
2. Don't place signs where in areas where foot traffic may become congested.
3. Place signs in the shade.
4. Overlooks and viewpoints are good locations. However, place the signs so as to minimize any viewing obstructions.

5.7. Options for Generating Income

There should be no admission charge at Tandy Hills / Stratford Park. During the first years of the interpretive program while the park is developing relationships with schools and other groups, all programs should be free as well. Perhaps after some years, the staff might decide to charge for certain events. In any case, charges should always be nominal.

Option	Potential Charge	Benefits and/or Events
Semi-annual Newsletter	\$10/year	Keeping public up-to-date on TH/SP news and events.
Building rental	Will vary	Events should be small and appropriate to the setting, including: <ul style="list-style-type: none"> • Meetings of other organizations • Wedding receptions • Small parties • Acoustical music concerts (not loud)
Store	Will vary	<ul style="list-style-type: none"> • Books • T-shirts • Hats • Nature gifts • Snack food and beverages

Table 5-8. Income Generation Options

6.0 BUDGET

Year One Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i> ^(See edited footnote)				
Park Manager	1	261	76,700	76,700
Education Director	1	261	42,900	42,900
Resource Manager ²	1	261	42,900	42,900
Maintenance Worker ³	3	783	93,600	93,600
<i>Contract</i>				
Road construction ⁴			100,000	200,000
Parking area construction ⁴			50,000	100,000
Lighting ⁵			10,000	20,000
Portable toilets ⁶			1,000	2,000
Security ⁷			6,000	8,000
Architectural design of visitor center ⁸			40,000	60,000
<i>Permanent equipment</i>				
Maintenance pre-fab building and set-up ⁹			35,000	45,000
Truck (with crew cab)			40,000	50,000
Tractor			15,000	20,000
Gator/mule			4,000	6,000
Trailer			4,000	6,000
<i>Equipment and tools</i>				
Office furniture			5,000	7,000
Computers (3)			3,000	5,000
Machinery and tools ¹⁰			20,000	30,000
<i>Office supplies, services and materials</i>				
Newsletter production (2 issues)			1,000	2,000
Trail map production (original)			1,000	1,400
Materials for volunteer management program			2,000	4,000
Public outreach events: coordination/promotion			500	1,000
General office expendables and reproduction			500	1,000
Materials for volunteer tour program			1,000	2,000
<i>Park exterior supplies and materials</i>				
Entrance closure signage			200	300
Entrance gate, fence rails and posts ¹¹			5,000	7,000
Prairie Loop trail materials			200	400
TOTAL EXPENDITURES			600,500	834,200

Table 6.1. Year One Expenditures

Year One Labor Allocation

Task	Labor (days)				
	Park Mgr	Edu Dir	Res Mgr	Maint	Vol. ¹²
<i>Park exterior development and maintenance</i>					
Close unwanted and most eroded trails			30	85	*
Close unwanted existing entrances (and install signage)			10	40	*
Remove existing garbage ¹³			40	250	*
Install entrance sign and zigzag rail fence			7	30	
Prairie Loop trail			30	64	*
<i>Park exterior management</i>					
Woody growth removal in early succession grasslands ¹⁴			25	45	*
Woody growth removal in late succession grasslands (1/3 of area)			65	200	*
<i>Operations and office</i>					
Set up offices and maintenance area	5	10	10	60	
Produce map of park trails (original)	5	2	6		
Website development	2	6	2		
Volunteer programs for management and tours ¹⁵	2	40	10		
Visitor Center building specifications ¹⁶	10	4	20		
Produce newsletter (2 issues)	14	20	2		*
Park promotion, presentations, meetings	60	40			
Fundraising and grantwriting	80	20			
Coordination of park events	2	40	2	6	
Develop education program		75			
Coordination with Parks Department	80				

Table 6.2. Year One Labor Allocation

Year Two Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i>				
Park Manager	1	261	76,700	76,700
Education Director	1	261	42,900	42,900
Resource Manager	1	261	42,900	42,900
Maintenance Worker	3	783	93,600	93,600
<i>Contract</i>				
Visitor Center construction ¹⁷			1,000,000	2,000,000
Construct water collection system with cistern/outlook			50,000	70,000
Construct kiosks and signage			5,000	10,000
Build and install interpretive exhibits (indoor)			5,000	10,000
Security			6,000	8,000
East Access Path: retrofit 4 low-water crossings trail materials ¹⁸			60,000	80,000
<i>Permanent equipment</i>				
Maintenance for rolling items (4) @ \$700 each per year			2,800	2,800
<i>Office supplies, services and materials</i>				
Utilities ¹⁹			500	1,000
Newsletter production (4 issues)			500	1,000
Trail map production (revision)			500	700
Education program materials			1,000	2,000
General office expendables and reproduction			500	1,000
Volunteer program for tours materials			500	1,000
Public outreach events: coordination/promotion			400	600
<i>Park exterior supplies and materials</i>				
West Creek Loop trail materials			16,000	20,000
East Creek Loop trail materials			12,000	15,000
East Access Path trail materials			5,000	6,000
Lewis Entrance trail materials			5,000	8,000
Stratford Trail trail materials			4,000	6,000
ADA Entrance / West Creek trail materials			4,000	6,000
Dog's Head Loop trail materials			11,000	15,000
Outdoor classroom materials			400	800
TOTAL EXPENDITURES			1,446,200	2,521,000

Table 6.3. Year Two Expenditures

Year Two Labor Allocation

Task	Labor (days)				
	Park Mgr	Edu Dir	Res Mgr	Maint	Vol.
<i>Park exterior development and maintenance</i>					
West Creek Loop			31	100	*
East Creek Loop			25	90	*
East Access Path			10	40	*
Lewis Entrance			30	110	*
Stratford Trail			8	30	*
ADA Entrance / West Creek			25	74	*
Dog's Head Loop			22	68	*
Outdoor Classroom			7	30	*
<i>Park exterior management</i>					
Woody growth removal in late succession grasslands (2nd 1/3 of area)			30	225	*
<i>Operations and office</i>					
Design kiosks and signage	5	10	15		
Produce map of park trails (revision)	5	2	6		
Website maintenance	2	6	2		
Volunteer programs for management and tours	2	40	10		
Design interpretive exhibits (indoor)	10	20	6		
Design signage for building and trails	5	5	10		
Continue education program	10	45			
Produce newsletter (4 issues)	6	30	5		*
Park promotion, presentations, meetings	60	40			
Fundraising and grantwriting	40	20			
Coordination of park events	14	40	6	10	
Develop program for controlled burns/management mowing ²⁰	20		10		
Coordination with Parks Department	80				

Table 6.4. Year Two Labor Allocation

Year Three Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i>				
Park Manager	1	261	78,234	78,234
Education Director	1	261	43,758	43,758
Resource Manager	1	261	43,758	43,758
Maintenance Worker	3	783	95,472	95,472
<i>Contract</i>				
Portable toilets (last year-moving into building)			1,000	2,000
Security			6,000	8,000
<i>Permanent equipment</i>				
Building furniture			20,000	30,000
Library			2,000	3,000
Maintenance for rolling items (4) @ \$700 each per year			2,800	2,800
<i>Office supplies, services and materials</i>				
Utilities			1,000	2,000
Newsletter production (2 issues)			1,000	2,000
Final trail map production			1,000	1,400
Volunteer program for manangement materials			2,000	4,000
Public outreach events: coordination/promotion			500	1,000
General office expendables and reproduction			500	1,000
Volunteer program for tours materials			1,000	2,000
<i>Park exterior supplies and materials</i>				
Prairie ADA trail materials			5,000	7,000
Southwest Loop trail materials			14,000	16,000
Bottomland Trail materials			6,800	8,000
Crossover Trail materials			6,000	8,000
Logs for North East Loop			3,000	5,000
Fabrication of Lewis/Stratford signs			5,500	6,500
Fabrication of trail markers			4,500	5,500
Fabrication of junction signs			1,000	200
Fabrication major entrance			1,000	200
Materials for controlled burn for early succession grassland			1,500	2,000
<i>OR</i>				
Shared costs for mowing as burn substitute for early grass			n800	n900
TOTAL EXPENDITURES			348,322	376,822

Table 6.5. Year Three Expenditures

Year Three Labor Allocation

Task	Labor (days)				
	Park Mgr	Edu Dir	Res Mgr	Maint	Vol.
<i>Park exterior development and maintenance</i>					
ADA Building to Prairie Loop			25	70	*
South West Loop			5	15	*
Bottomland Trail			2	6	*
Crossover Trail			3	9	*
North East Loop			6	18	*
Design trail signs and markers		15			
Install entrance, junction and trail marker signs			1	3	
General park/building maintenance			5	20	
<i>Park exterior management</i>					
Woody growth removal in late succession grasslands (last 1/3 of area)			70	175	*
Early succession grassland:					
	<i>Res mgr</i>	<i>Maint</i>	<i>Shared cost</i>		
Controlled burn prep	18	24		18	24
Controlled burn	60	150		60	150
<i>OR</i>					
Management mowing	28	80	60		
Haul off	10	30	30		
<i>Operations and office</i>					
Set up offices in new building	5	5	10	20	
Produce final map of park trails	5	5	6		
Website maintenance	1	10	2		
Volunteer programs for management and tours	10	40	10	10	
Visitor Center building specifications	10	4	20		
Produce newsletter (2 issues)	4	20	2		*
Park promotion, presentations, meetings	60	40	10		
Fundraising and grantwriting	60	20			
Coordination of park events	10	40	2	6	
Continue education program	10	60			
Coordination with Parks Department	80				

Table 6.6. Year Three Labor Allocation

Year Four Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i>				
Park Manager	1	261	79,799	79,799
Education Director	1	261	44,633	44,633
Resource Manager	1	261	44,633	44,633
Maintenance Worker	3	783	97,381	97,381
<i>Contract</i>				
Security			6,000	8,000
<i>Permanent equipment</i>				
Maintenance for rolling items (4) @ \$700 each per year			2,800	2,800
<i>Equipment and tools</i>				
Repair and replacement			500	1,000
Vehicle maintenance			200	500
Tractor maintenance			500	1,000
<i>Office supplies, services and materials</i>				
Building maintenance			5,000	10,000
Utilities			500	1,000
Newsletter production (4 issues)			500	1,000
Education program materials			1,000	2,000
General office expendables and reproduction			500	1,000
Volunteer program for tours materials			500	1,000
Public outreach events: coordination/promotion			400	600
<i>Park exterior supplies and materials</i>				
Trails maintenance and upkeep			3,000	5,000
Materials for controlled burn for late succession grassland (50%)			3,000	4,000
<i>OR</i>				
Shared costs for mowing as burn substitute for late grass (50%)			n1,600	n2,000
Materials for revegetation/erosion control (1st 50%)			20,000	25,000
TOTAL EXPENDITURES			310,146	328,846

Table 6.7. Year Four Expenditures

Year Four Labor Allocation

Task	Labor (days)				
	Park Mgr	Edu Dir	Res Mgr	Maint	Vol.
<i>Park exterior development and maintenance</i>					
General park/building maintenance			50	225	
<i>Park exterior management</i>					
Woody growth removal in early succession woodlands (1st 50% of area)			50	250	*
Disposal of cut material from grassland (100%) ²¹					
	<i>Res mgr</i>	<i>Maint</i>	<i>Shared cost</i>		
Burn brush piles	50	140		50	140
<i>OR</i>					
Haul off	38	114	30		
Late succession grassland 50%:					
Controlled burn prep	50	150		50	150
Controlled burn		200			*
<i>OR</i>					
Management mowing	226	676	60		
Haul off	30	83	80		
<i>Operations and office</i>					
Website maintenance	1	6	2		
Volunteer programs for management and tours	12	40	14		
Continue education program	20	80			
Produce newsletter (4 issues)	16	30	5		*
Park promotion, presentations, meetings	60	40	10		
Fundraising and grantwriting	40	20			
Coordination of park events	20	40	20	10	
Develop program for controlled burns/management mowing	10		10		
Coordination with Parks Department	80				

Table 6.8. Year Four Labor Allocation

Year Five Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i>				
Park Manager	1	261	81,395	81,395
Education Director	1	261	45,526	45,526
Resource Manager ²	1	261	45,526	45,526
Maintenance Worker ³	3	783	99,329	99,329
<i>Contract</i>				
Security			6,000	8,000
<i>Permanent equipment</i>				
Maintenance for rolling items (4) @ \$700 each per year			2,800	2,800
<i>Equipment and tools</i>				
Repair and replacement			500	1,000
Vehicle maintenance			200	500
Tractor maintenance			500	1,000
<i>Office supplies, services and materials</i>				
Building maintenance			5,000	10,000
Utilities			500	1,000
Newsletter production (4 issues)			500	1,000
Education program materials			1,000	2,000
General office expendables and reproduction			500	1,000
Volunteer program for tours materials			500	1,000
Public outreach events: coordination/promotion			400	600
<i>Park exterior supplies and materials</i>				
Trails maintenance and upkeep			3,000	5,000
Materials for revegetation/erosion control (2nd 50%)			20,000	25,000
Materials for controlled burn for late succession grassland (50%)			2,000	4,000
<i>OR</i>				
Shared costs for mowing as burn substitute for late grass (50%)			n400	n600
TOTAL EXPENDITURES			314,475	334,175

Table 6.9. Year Five Expenditures

Year Five Labor Allocation

Task		Labor (days)				
		Park Mgr	Edu Dir	Res Mgr	Maint	Vol.
<i>Park exterior development and maintenance</i>						
General park/building maintenance				35	100	
<i>Park exterior management</i>						
Woody growth removal in early succession woodlands (2nd 50% of area)				65	250	*
Disposal of cut material (1st 50% early woods)						
		<i>Res mgr</i>	<i>Maint</i>	<i>Shared cost</i>		
	Burn brush piles	30	193		30	193
	<i>OR</i>					
	Haul off	100	300	322		
Late succession grassland (2nd 50%):						
	Controlled burn prep	50	150		50	150
	Controlled burn			200		
	<i>OR</i>					*
	Management mowing	226	676	60		
	Haul off	30	83	80		
<i>Operations and office</i>						
General upkeep and maintenance				30	60	
Website maintenance		2	6	2		
Volunteer programs for management and tours		15	40	10		
Continue education program		20	80			
Produce newsletter (4 issues)		20	30	5		*
Park promotion, presentations, meetings		60	40	10		
Fundraising and grantwriting		40	20			
Coordination of park events		20	40	20	20	
Coordination with Parks Department		80				

Table 6.10. Year Five Labor Allocation

Year Six Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i>				
Park Manager	1	261	83,023	83,023
Education Director	1	261	46,436	46,436
Resource Manager ²	1	261	46,436	46,436
Maintenance Worker ³	3	783	101,316	101,316
<i>Contract</i>				
Security			6,000	8,000
<i>Permanent equipment</i>				
Maintenance for rolling items (4) @ \$700 each per year			2,800	2,800
<i>Equipment and tools</i>				
Repair and replacement			500	1,000
Vehicle maintenance			200	500
Tractor maintenance			500	1,000
<i>Office supplies, services and materials</i>				
Building maintenance			5,000	10,000
Utilities			500	1,000
Newsletter production (4 issues)			500	1,000
Education program materials			1,000	2,000
General office expendables and reproduction			500	1,000
Volunteer program for tours materials			500	1,000
Public outreach events: coordination/promotion			400	600
<i>Park exterior supplies and materials</i>				
Trails maintenance and upkeep			3,000	5,000
Materials for revegetation/erosion control (1st 3rd mid woods)			30,000	35,000
Materials for controlled burn for early succession grassland			1,500	2,000
<i>OR</i>				
Shared costs for mowing as burn substitute for early grass			n800	n900
TOTAL EXPENDITURES			329,411	347,611

Table 6.11. Year Six Expenditures

Year Six Labor Allocation

Task	Labor (days)				
	Park Mgr	Edu Dir	Res Mgr	Maint	Vol.
<i>Park exterior development and maintenance</i>					
General park/building maintenance			5	20	
<i>Park exterior management</i>					
Woody growth removal in mid succession woodlands (1st 1/3 of area)			125	390	*
Disposal of cut material (2nd 50% early wood)					
	<i>Res mgr</i>	<i>Maint</i>	<i>Shared cost</i>		
Burn brush piles	30	193		30	193
<i>OR</i>					
Haul off	100	300	322		
Early succession grassland:					
Controlled burn prep	18	24		18	24
Controlled burn	60	150		60	150
<i>OR</i>					
Management mowing	28	80	60		
Haul off	10	30	30		
<i>Operations and office</i>					
Website maintenance	2	6	2		
Volunteer programs for management & tours	15	40	10		
Continue education program	20	80			
Produce newsletter (4 issues)	16	30	5		*
Park promotion, presentations, meetings	65	40			
Fundraising and grantwriting	40	20			
Coordination of park events	20	40	6	6	
Coordination with Parks Department	80				

Table 6.12. Year Six Labor Allocation

Year Seven Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i>				
Park Manager	1	261	84,683	84,683
Education Director	1	261	47,365	47,365
Resource Manager ²	1	261	47,365	47,365
Maintenance Worker ³	3	783	103,342	103,342
<i>Contract</i>				
Security			6,000	8,000
<i>Permanent equipment</i>				
Maintenance for rolling items (4) @ \$700 each per year			2,800	2,800
<i>Equipment and tools</i>				
Repair and replacement			500	1,000
Vehicle maintenance			200	500
Tractor maintenance			500	1,000
<i>Office supplies, services and materials</i>				
Building maintenance			5,000	10,000
Utilities			500	1,000
Newsletter production (4 issues)			500	1,000
Education program materials			1,000	2,000
General office expendables and reproduction			500	1,000
Volunteer program for tours materials			500	1,000
Public outreach events: coordination/promotion			400	600
<i>Park exterior supplies and materials</i>				
Trails maintenance and upkeep			3,000	5,000
Materials for revegetation/erosion control (2nd 3rd mid woods)			30,000	35,000
Materials for controlled burn for late succession grassland (50%)			3,000	4,000
<i>OR</i>				
Shared costs for mowing as burn substitute for late grass (50%)			n1600	n2000
TOTAL EXPENDITURES			336,455	355,155

Table 6.13. Year Seven Expenditures

Year Seven Labor Allocation

Task	Labor (days)				
	Park Mgr	Edu Dir	Res Mgr	Maint	Vol.
<i>Park exterior development and maintenance</i>					
General park/building maintenance			5	75	
<i>Park exterior management</i>					
Woody growth removal in mid succession woodlands (2nd 1/3 of area)			140	435	*
Disposal of cut material (1st 3rd mid woods)					
	<i>Res mgr</i>	<i>Maint</i>	<i>Shared cost</i>		
Burn brush piles	37	111		37	111
OR					
Haul off	138	415	400		
Late succession grassland (1st 50%):					
Controlled burn prep	50	150		50	150
Controlled burn			200		*
OR					
Management mowing	226	676	60		
Haul off	30	83	80		
<i>Operations and office</i>					
Website maintenance	2	6	2		
Volunteer programs for management & tours	15	40	10		
Continue education program	20	80			
Produce newsletter (4 issues)	16	30	5		*
Park promotion, presentations, meetings	65	40			
Fundraising and grantwriting	40	20			
Coordination of park events	20	40	6	6	
Coordination with Parks Department	80				

Table 6.14. Year Seven Labor Allocation

Year Eight Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i>				
Park Manager	1	261	86,377	86,377
Education Director	1	261	48,312	48,312
Resource Manager ²	1	261	48,312	48,312
Maintenance Worker ³	3	783	105,409	105,409
<i>Contract</i>				
Security			6,000	8,000
<i>Permanent equipment</i>				
Maintenance for rolling items (4) @ \$700 each per year			2,800	2,800
<i>Equipment and tools</i>				
Repair and replacement			500	1,000
Vehicle maintenance			200	500
Tractor maintenance			500	1,000
<i>Office supplies, services and materials</i>				
Building maintenance			5,000	10,000
Utilities			500	1,000
Newsletter production (4 issues)			500	1,000
Education program materials			1,000	2,000
General office expendables and reproduction			500	1,000
Volunteer program for tours materials			500	1,000
Public outreach events: coordination/promotion			400	600
<i>Park exterior supplies and materials</i>				
Trails maintenance and upkeep			3,000	5,000
Materials for revegetation/erosion control (last 3rd mid woods)			30,000	35,000
Materials for controlled burn for late succession grassland (50%)			3,000	4,000
<i>OR</i>				
Shared costs for mowing as burn substitute for late grass (50%)			n1600	n2000
TOTAL EXPENDITURES			342,110	360,810

Table 6.15. Year Eight Expenditures

Year Eight Labor Allocation

Task	Labor (days)				
	Park Mgr	Edu Dir	Res Mgr	Maint	Vol.
<i>Park exterior development and maintenance</i>					
General park/building maintenance			15	85	
<i>Park exterior management</i>					
Woody growth removal in mid succession woodlands (last 1/3 of area)			135	430	*
Disposal of cut material (2nd 3rd mid woods)					
	<i>Res mgr</i>	<i>Maint</i>	<i>Shared cost</i>		
Burn brush piles	37	111		37	111
<i>OR</i>					
Haul off	138	415	400		
Late succession grassland (2nd 50%):					
Controlled burn prep	50	150		50	150
Controlled burn			200		*
<i>OR</i>					
Management mowing	226	676	60		
Haul off	30	83	80		
<i>Operations and office</i>					
Website maintenance	2	6	2		
Volunteer programs for management & tours	15	40	10		
Continue education program	20	80			
Produce newsletter (4 issues)	16	30	5		*
Park promotion, presentations, meetings	65	40			
Fundraising and grantwriting	40	20			
Coordination of park events	20	40	6	6	
Coordination with Parks Department	80				

Table 6.16. Year Eight Labor Allocation

Year Nine Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i>				
Park Manager	1	261	88,104	88,104
Education Director	1	261	49,279	49,279
Resource Manager ²	1	261	49,279	49,279
Maintenance Worker ³	3	783	107,517	107,517
<i>Contract</i>				
Security			6,000	8,000
<i>Permanent equipment</i>				
Maintenance for rolling items (4) @ \$700 each per year			2,800	2,800
<i>Equipment and tools</i>				
Repair and replacement			500	1,000
Vehicle maintenance			200	500
Tractor maintenance			500	1,000
<i>Office supplies, services and materials</i>				
Building maintenance			5,000	10,000
Utilities			500	1,000
Newsletter production (4 issues)			500	1,000
Education program materials			1,000	2,000
General office expendables and reproduction			500	1,000
Volunteer program for tours materials			500	1,000
Public outreach events: coordination/promotion			400	600
<i>Park exterior supplies and materials</i>				
Trails maintenance and upkeep			3,000	5,000
TOTAL EXPENDITURES			314,878	327,578

Table 6.17. Year Nine Expenditures

Year Nine Labor Allocation

Task					Labor (days)				
					Park Mgr	Edu Dir	Res Mgr	Maint	Vol.
<i>Park exterior development and maintenance</i>									
General park/building maintenance							25	140	
<i>Park exterior management</i>									
Woody growth removal in late succession woodlands (75% of area)							175	530	*
Disposal of cut material (last 3rd mid woods)									
		<i>Res mgr</i>	<i>Maint</i>	<i>Shared cost</i>					
	Burn brush piles	37	111				37	111	*
	<i>OR</i>								
	Haul off	138	415	400					
<i>Operations and office</i>									
Website maintenance					2	6	2		
Volunteer programs for management & tours					15	40	10		
Continue education program					20	80			
Produce newsletter (4 issues)					16	30	5		*
Park promotion, presentations, meetings					65	40			
Fundraising and grantwriting					40	20			
Coordination of park events					20	40	6	6	
Coordination with Parks Department					80				

Table 6.18. Year Nine Labor Allocation

Year Ten Expenditures

	number	days	cost range (burdened)	
<i>Labor: Permanent staff</i>				
Park Manager	1	261	89,866	89,866
Education Director	1	261	50,264	50,264
Resource Manager	1	261	50,264	50,264
Maintenance Worker	1	261	36,556	36,556
<i>Contract</i>				
Security			6,000	8,000
<i>Permanent equipment</i>				
Maintenance for rolling items (4) @ \$700 each per year			2,800	2,800
<i>Equipment and tools</i>				
Repair and replacement			500	1,000
Vehicle maintenance			200	500
Tractor maintenance			500	1,000
<i>Office supplies, services and materials</i>				
Building maintenance			2,000	3,000
Utilities			500	1,000
Newsletter production (4 issues)			500	1,000
Education program materials			1,000	2,000
General office expendables and reproduction			500	1,000
Volunteer program for tours materials			500	1,000
Public outreach events: coordination/promotion			400	600
<i>Park exterior supplies and materials</i>				
Trails maintenance and upkeep			3,000	5,000
Materials for controlled burn for early succession grassland			1,500	2,000
<i>OR</i>				
Shared costs for mowing as burn substitute for early grass			n800	n900
TOTAL EXPENDITURES			246,150	255,350

Table 6.19. Year Ten Expenditures

Year Ten Labor Allocation

Task	Labor (days)				
	Park Mgr	Edu Dir	Res Mgr	Maint	Vol.
<i>Park exterior development and maintenance</i>					
General park/building maintenance			20	30	
<i>Park exterior management</i>					
General upkeep and maintenance			20	20	
Woody growth removal as needed			60	80	*
Disposal of cut material (as needed)					
	<i>Res mgr</i>	<i>Maint</i>	<i>Shared cost</i>		
Burn brush piles	20	50		20	50
OR					
Haul off	100	300	300		
Grassland (appx 1/3 per event):					
Controlled burn prep	15	22		15	22
Controlled burn	50	50	300	50	50
OR					
Management mowing	28	80	30		
Haul off	30	83	80		
<i>Operations and office</i>					
Website maintenance	2	6	2		
Volunteer programs for management and tours	15	40	25		
Continue education program	20	80			
Produce newsletter (4 issues)	16	30	5		*
Park promotion, presentations, meetings	65	40	20		
Fundraising and grantwriting	40	20			
Coordination of park events	20	40	20	6	
Coordination with Parks Department	80				

Table 6.20. Year Ten Expenditures

6.1 Budget Footnotes

- ¹ Staff qualifications should include experience in habitat restoration. Beginning with Year Two, salaries are multiplied by 1.3% to reflect cost of living adjustments.
- ² It is expected that the resource manager will spend most of his/her time with the maintenance crew during the first ten years. If it turns out that this person needs to spend a greater porportion of time elsewhere, additional maintenance workers will need to be hired.
- ³ The timeline and budget included 3 Maintenance Workers for the first ten years. After that time, the staff could be adjusted to 1 Maintenance Worker.
- ⁴ An engineering firm experienced in green building design should be hired to design the entrance road, lighting and parking area.
- ⁵ Ecologically friendly lighting should be installed, as discussed in Section 4.7.3.
- ⁶ Portable toilets will be needed for the first two years until the nature center is built. The portable toilet will likely have to be secured due to potential vandalism.
- ⁷ It is recommended that a security service be hired to patrol the park 7 days per week, 4pm - 6am. In addition, local police officers should be asked to add TH/SP to their nightly rounds. Any security devices purchased and installed for the buildings should have direct lines to the police.
- ⁸ An architecture firm experienced in green building design should be hired to design the building, cistern and water collection system.
- ⁹ The maintenance area will consist of a large shed for tools, a small shed for temporary offices and a chainlink fence with angled top. Due to potential vandalism, it is recommended screening be applied to the chain link fence, to keep the maintenance area invisible to the general public.
- ¹⁰ Machinery and tools include chainsaws, pole pruners, weed eaters, gas auger, gas drill, blower, compressor, shovels, spades, rakes, wheelbarrows, sprayers, drip torchs, fire flappers, backpack water sprayers, walkie-talkies, and other miscellaneous tools.
- ¹¹ Fencing is meant as screening of the parking area from View Street. Zigzag fencing is described in Section 4.7.5.2. The gate is meant to keep cars from driving past the parking area to the nature center.
- ¹² This budget does not reflect any cost savings from using volunteer labor. Cost savings from volunteers can vary greatly and are not always reliable.
- ¹³ Garbage removal will necessitate driving vehicles on park property. It should therefore be done as soon as possible.
- ¹⁴ Cut woody material should be piled in approximately six piles per acre and left to be burned at a later appropriate date.
- ¹⁵ Tours can begin even though all trails are not completed. Topics of tours can include the process of fixing and restoring the park.

¹⁶ Park staff should be part of the building design process with the architecture firm.

¹⁷ The building, cistern and water collection system should be constructed by others, using green building techniques.

¹⁸ The low-water crossings should be designed by an engineer and constructed by others.

¹⁹ Utility costs could be lower than average if green building techniques are used.

²⁰ Decisions will need to be made whether to conduct controlled burns or to do management mowing as a substitute. Mowed material should be removed from the sight and not left in place. It is possible a combination of both these strategies can be used.

²¹ Decisions will need to be made whether to burn piles of cut woody material or haul material to nearby East District subcenter.

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APPENDIX 1

Proposed Improvements

The following graphics have been previously presented in the document but are combined in this Appendix to show at a glance those proposed improvements. The following figures are included in this Appendix:

- Figure 3.7 Potential Grassland Map
- Figure 3.8 Trails to be Restored
- Figure 4.2 Proposed Trails
- Figure 4.16 Map of Park Infrastructure
- Figure 5.1 Map Sign Locations

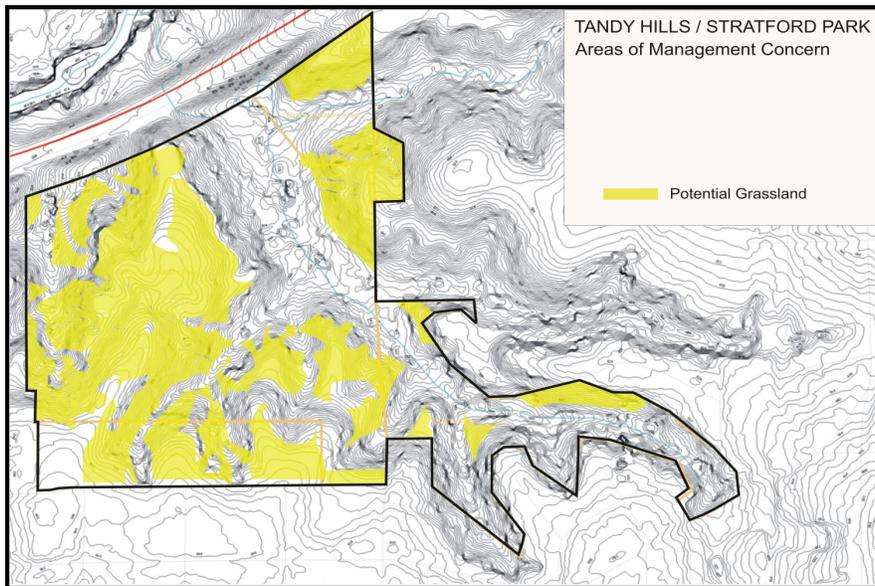


Figure 3-7. Potential Grassland Map of Tandy Hills / Stratford Park

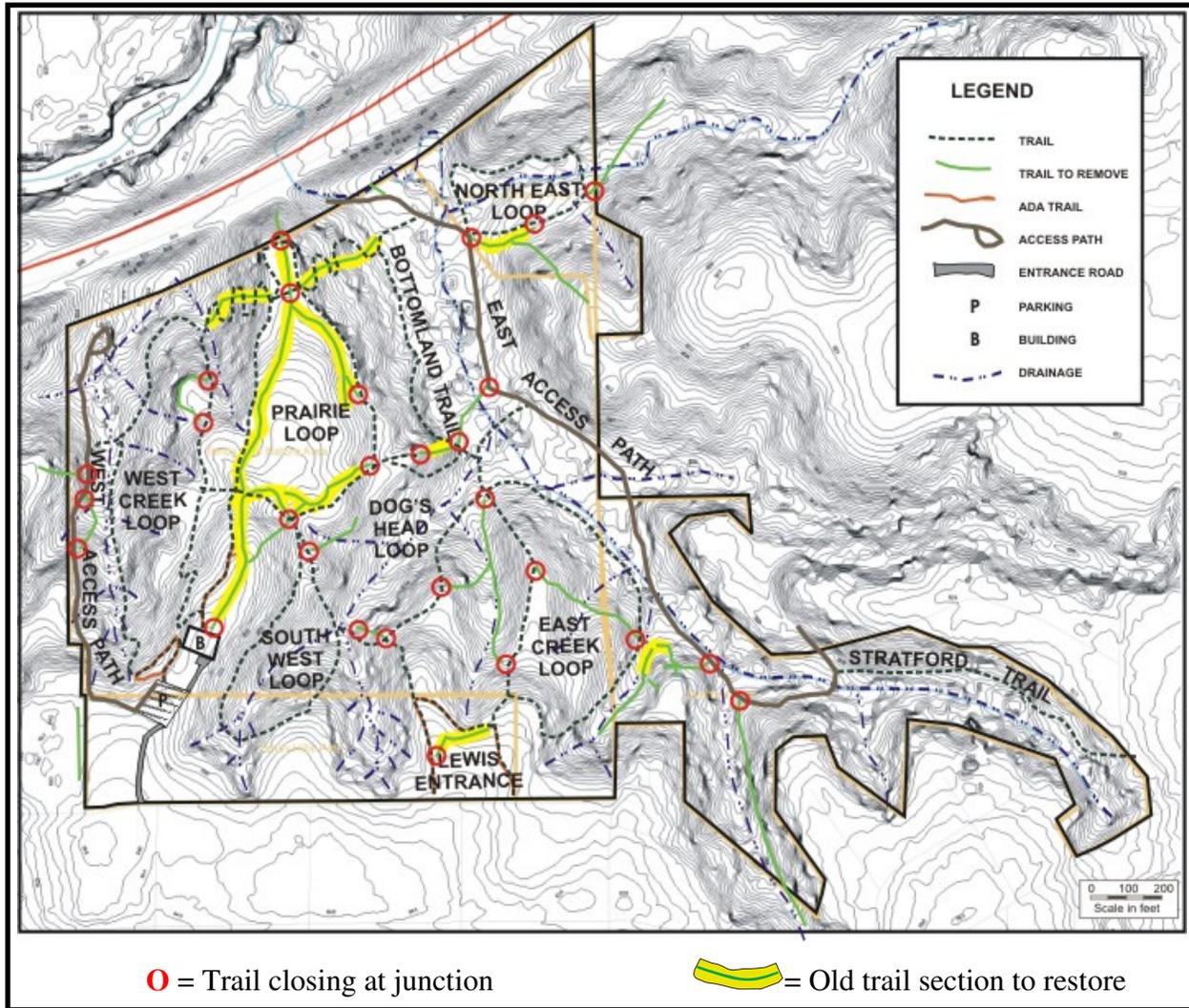


Figure 3-8. Map of Trails to Close and Restore

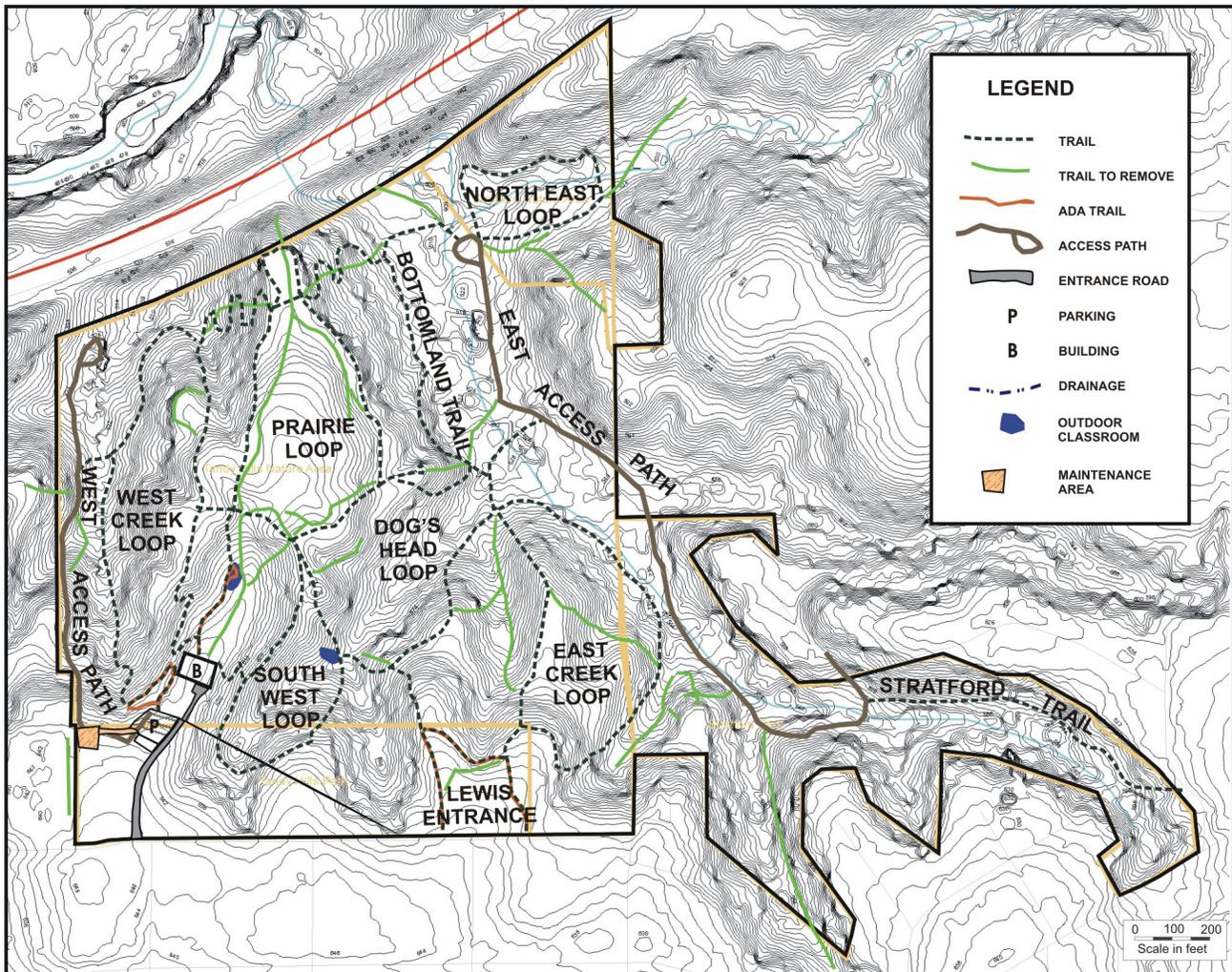


Figure 4-2. Proposed Trails

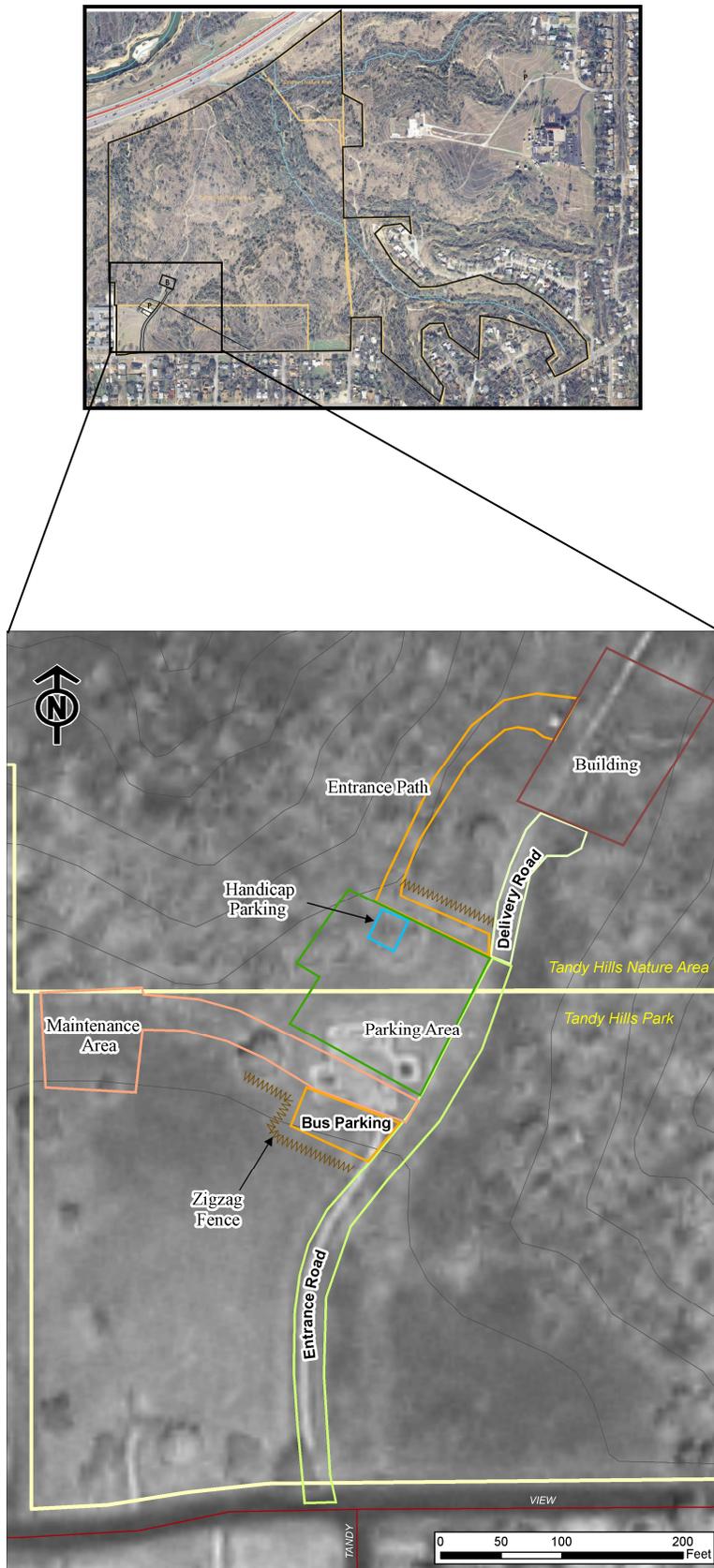


Figure 4-16. Schematic Map of Park Infrastructure

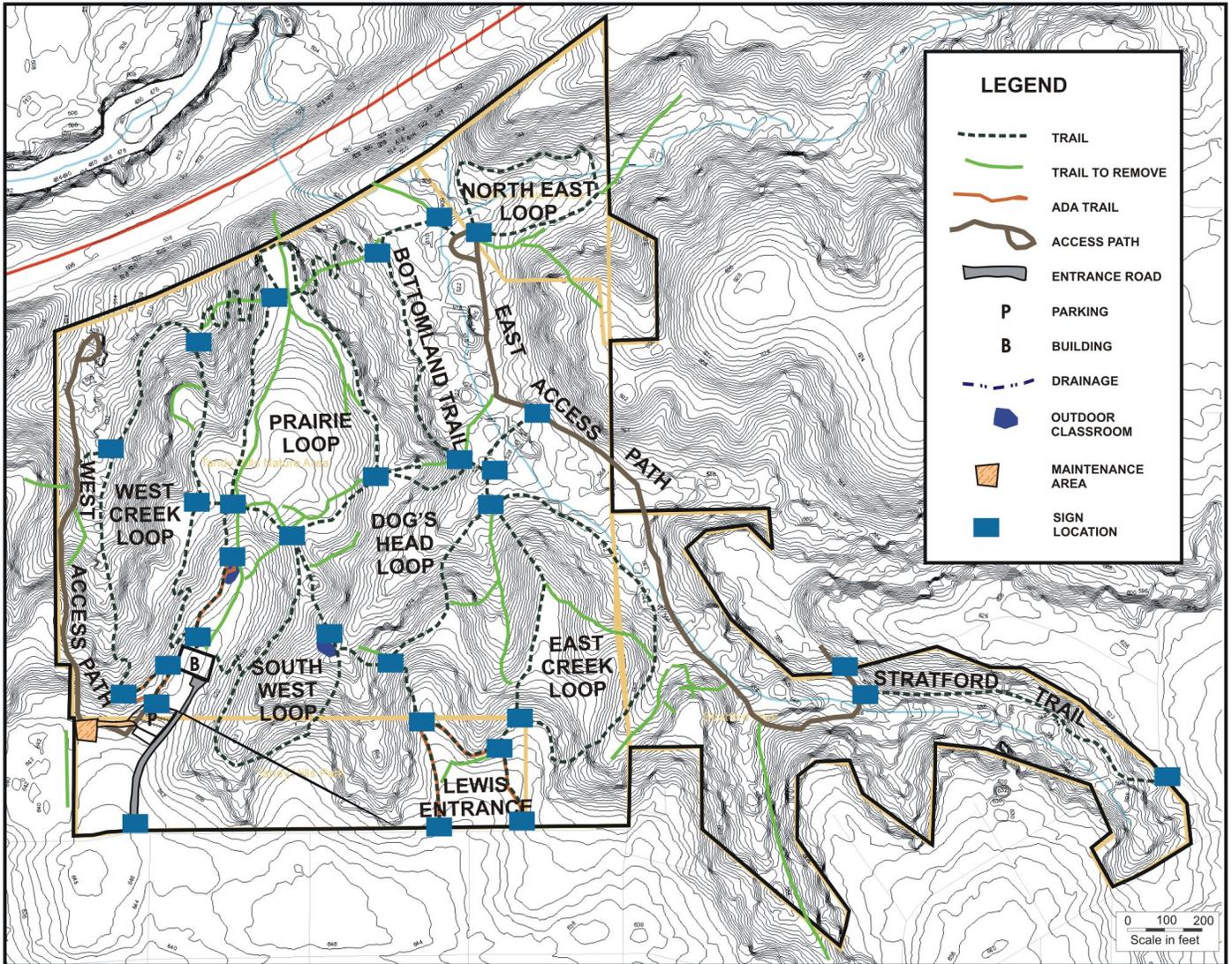


Figure 5-1. Map of Sign Locations

APPENDIX 2

Flora of Tandy Hills

FLORA OF TANDY HILLS

Bob O'Kennon - BRIT

Current as of 3 June 2006

Species Count: 540

Family	Genus species Tandy Hills 6/11/2006	Common
ACANTHACEAE	<i>Dicliptera brachiata</i>	False mint
ACANTHACEAE	<i>Dyschoriste linearis</i>	Narrowleaf Snakeherb
ACANTHACEAE	<i>Ruellia humilis</i> var. <i>humilis</i>	Low Ruellia
ACANTHACEAE	<i>R. nudiflora</i> var. <i>nudiflora</i>	Violet Ruellia
ACANTHACEAE	<i>R. strepens</i>	Limestone Ruellia
ACERACEAE	<i>Acer negundo</i> var. <i>negundo</i>	Boxelder
AGAVACEAE	<i>Yucca arkansana</i>	Arkansas yucca
AGAVACEAE	<i>Y. arkansana</i> x <i>pallida</i>	Yucca hybrid
AGAVACEAE	<i>Y. pallida</i>	Pallid yucca
AMARANTHACEAE	<i>Alternanthera caracasana</i> = <i>peploides</i> = <i>repens</i>	Mat chaff flower
AMARANTHACEAE	<i>Amaranthus albus</i> = <i>graecizans/pubescens</i>	Tumbleweed amaranth
AMARANTHACEAE	<i>A. rudis</i> = <i>Acnida tamariscina</i>	Tamarix amaranth
ANACARDIACEAE	<i>Rhus glabra</i>	Smooth sumac
ANACARDIACEAE	<i>R. lanceolata</i>	Prairie flame-leaf sumac
ANACARDIACEAE	<i>R. trilobata</i> = <i>aromatica</i> var. <i>flabelliformis</i>	Fragrant sumac
ANACARDIACEAE	<i>Toxicodendron pubescens</i> = <i>toxicarium</i>	Oakleaf poison oak
ANACARDIACEAE	<i>T. radicans</i>	Common poison ivy
APIACEAE	<i>Bifora americana</i>	Prairie bishop
APIACEAE	<i>Bowlesia incana</i>	Hoary bowlesia
APIACEAE	<i>Chaerophyllum tainturieri</i> var. <i>tainturieri</i>	Smooth chervil
APIACEAE	<i>Cymopterus macrorhizus</i>	Bigroot wavewing
APIACEAE	<i>Daucus pusillus</i>	Southwestern carrot
APIACEAE	<i>Eryngium leavenworthii</i>	Eryngo
APIACEAE	<i>Hydrocotyle verticillata</i> var. <i>verticillata</i>	Whorled pennywort
APIACEAE	<i>Polytaenia nuttallii</i> = <i>texana</i>	Prairie parsley
APIACEAE	<i>Sanicula canadensis</i> var. <i>canadensis</i>	Canada sanicle
APIACEAE	<i>Spermolepis echinata</i>	Bristly scaleseed
APIACEAE	<i>S. inermis</i>	Spreading scaleseed
APIACEAE	<i>Torilis arvensis</i>	Hedge-parsley
APIACEAE	<i>T. nodosa</i>	Knotted hedgeparsley
APOCYNACEAE	<i>Amsonia ciliata</i> var. <i>tenuifolia</i> = <i>filifolia</i>	Narrowleaf blue star
APOCYNACEAE	<i>A. ciliata</i> var. <i>texana</i>	Fringed blue star
APOCYNACEAE	<i>Vinca major</i>	Bigleaf periwinkle
AQUIFOLIACEAE	<i>Ilex decidua</i>	Possumhaw
AQUIFOLIACEAE	<i>I. vomitoria</i>	Yaupon holly
ARISTOLOCHIACEAE	<i>Aristolochia tomentosa</i>	Wooly dutchman's pipe
ASCLEPIADACEAE	<i>Asclepias asperula</i> ssp. <i>capricornu</i> = <i>decumbens</i>	Trailing antelopehorn
ASCLEPIADACEAE	<i>A. oenotheroides</i>	Primrose milkweed
ASCLEPIADACEAE	<i>A. tuberosa</i> ssp. <i>interior</i> = <i>terminalis</i>	Butterfly milkweed
ASCLEPIADACEAE	<i>A. tuberosa</i> ssp. <i>terminalis</i>	Butterfly milkweed
ASCLEPIADACEAE	<i>A. viridiflora</i> var. <i>viridiflora</i>	Greenflower milkweed
ASCLEPIADACEAE	<i>A. viridis</i>	Green milkweed
ASCLEPIADACEAE	<i>Cynanchum laeve</i>	Smooth swallow wort

Family	Genus species Tandy Hills 6/11/2006	Common
ASCLEPIADACEAE	<i>Matelea biflora</i>	Twoflower milkvine
ASTERACEAE	<i>Achillea millefolium</i> var. <i>occidentalis</i>	Yarrow
ASTERACEAE	<i>Ambrosia artemisiifolia</i>	Common ragweed
ASTERACEAE	<i>A. psilostachya</i> = <i>cumanensis</i>	Western ragweed
ASTERACEAE	<i>A. trifida</i> var. <i>texana</i>	Giant ragweed, Blood Ragweed
ASTERACEAE	<i>Amphiachyris dracunculoides</i> = <i>Xanthocephalum</i>	Annual broomweed
ASTERACEAE	<i>Arnoglossum plantagineum</i> = <i>Cacalia</i>	Groovestem Indian plantain
ASTERACEAE	<i>Artemisia ludoviciana</i> ssp. <i>ludoviciana</i>	Western-,Louisiana sagewort
ASTERACEAE	<i>Baccharis neglecta</i>	Roosevelt weed
ASTERACEAE	<i>B. texana</i>	Texas baccharis
ASTERACEAE	<i>Bidens frondosa</i>	Devil's beggar's ticks
ASTERACEAE	<i>Brickellia eupatorioides</i> var. <i>texana</i> = <i>Kuhnia</i>	Prairie kuhnia
ASTERACEAE	<i>Calyptocarpus vialis</i> = <i>Synedrella</i>	Prostrate lawnflower
ASTERACEAE	<i>Carduus nutans</i>	Nodding thistle
ASTERACEAE	<i>Centaurea americana</i>	American basketflower
ASTERACEAE	<i>Cirsium discolor</i> = <i>engelmannii</i> = <i>terranigrae</i>	Blackland thistle
ASTERACEAE	<i>C. texanum</i>	Texas thistle
ASTERACEAE	<i>C. undulatum</i>	Wavyleaf thistle
ASTERACEAE	<i>Conyza canadensis</i> var. <i>canadensis</i>	Horsetail conyza
ASTERACEAE	<i>C. canadensis</i> var. <i>glabrata</i>	Smooth horsetail
ASTERACEAE	<i>Dracopis amplexicaulis</i> = <i>Rudbeckia</i>	Claspingleaf coneflower
ASTERACEAE	<i>Dyssodiopsis tagetoides</i> = <i>Dyssodia</i>	Marigold dogweed
ASTERACEAE	<i>Echinacea angustifolia</i> var. <i>angustifolia</i>	Narrowleaf coneflower
ASTERACEAE	<i>Eclipta prostrata</i> = <i>alba</i>	Yerba de tago
ASTERACEAE	<i>Elephantopus carolinianus</i>	Leafy elephantfoot
ASTERACEAE	<i>Engelmannia peristenia</i> = <i>pinnatifida</i>	Engelmann daisy
ASTERACEAE	<i>Erigeron philadelphicus</i>	Philadelphia Fleabane
ASTERACEAE	<i>E. strigosus</i> var. <i>strigosus</i>	Prairie Fleabane
ASTERACEAE	<i>Eupatorium serotinum</i>	Late eupatorium
ASTERACEAE	<i>Evax prolifera</i>	Bighead evax
ASTERACEAE	<i>Gaillardia pulchella</i> var. <i>pulchella</i>	Indian blanket
ASTERACEAE	<i>Gamochoeta calviceps</i> = <i>falcata</i> = <i>Gnaphalium</i>	Sickleleaf cudweed
ASTERACEAE	<i>G. purpurea</i> = <i>Gnaphalium</i>	Purple cudweed
ASTERACEAE	<i>Grindelia lanceolata</i> var. <i>texana</i>	Texas Lanceleaf gumweed
ASTERACEAE	<i>G. nuda</i>	Rayless curlycup gumweed
ASTERACEAE	<i>G. papposa</i> = <i>Prionopsis ciliata</i>	Sawleaf daisy
ASTERACEAE	<i>Hedypnois cretica</i> Carswell	Cretanweed
ASTERACEAE	<i>Helenium amarum</i> var. <i>amarum</i>	Yellow Basin Sneezeweed
ASTERACEAE	<i>Helianthus annuus</i>	Annual sunflower
ASTERACEAE	<i>H. hirsutus</i>	Hairy sunflower
ASTERACEAE	<i>H. maximilliani</i>	Maximillian sunflower
ASTERACEAE	<i>Heterotheca subaxillaris</i> var. <i>latifolia</i>	Broadleaf camphorweed
ASTERACEAE	<i>Hymenopappus artemisiifolius</i>	Ragweed woollywhite
ASTERACEAE	<i>H. scabiosaes</i> var. <i>corymbosus</i>	Old plainsman
ASTERACEAE	<i>H tenuifolius</i>	Chalkhill woollywhite
ASTERACEAE	<i>Hymenoxys odorata</i>	Western bitterweed

Family	Genus species Tandy Hills 6/11/2006	Common
ASTERACEAE	<i>Iva angustifolia</i>	Rag marshelder
ASTERACEAE	<i>I. annua</i>	Marshelder
ASTERACEAE	<i>Krigia cespitosa = oppositifolia/gracilis</i>	Weedy dwarf dandelion
ASTERACEAE	<i>K. virginica = Hyoseris</i>	Virginia dwarf dandelion
ASTERACEAE	<i>Lactuca ludoviciana</i>	Louisiana lettuce
ASTERACEAE	<i>L. serriola = scariola</i>	Prickly lettuce
ASTERACEAE	<i>Liatris aestivalis</i>	Early gayfeather
ASTERACEAE	<i>L. intermedia/angustifolia</i>	
ASTERACEAE	<i>L. mucronata</i>	Sharp gayfeather
ASTERACEAE	<i>Lindheimera texana</i>	Texas star
ASTERACEAE	<i>Marshallia caespitosa var. caespitosa</i>	Seep barbara's buttons
ASTERACEAE	<i>Oligoneuron rigidum = Solidago</i>	Stiff goldenrod
ASTERACEAE	<i>Onopordum acanthium</i>	Scotch thistle
ASTERACEAE	<i>Packera obovata = Senecio</i>	Golden groundsel
ASTERACEAE	<i>P. plattensis = Senecio</i>	Prairie groundsel
ASTERACEAE	<i>Palafoxia callosa</i>	Calloused palafox
ASTERACEAE	<i>Parthenium hysterophorus</i>	False ragweed
ASTERACEAE	<i>Pluchea odorata = pupurascens</i>	Purple pluchea
ASTERACEAE	<i>Pyrrhopappus pauciflorus = multicaulis v. geiseri</i>	Manystem false dandelion
ASTERACEAE	<i>Ratibida columnifera = columnaris</i>	Prairie coneflower
ASTERACEAE	<i>Rudbeckia grandiflora var. alismifolia</i>	Rough coneflower
ASTERACEAE	<i>R. hirta var. pulcherrima</i>	Brown-eyed Susan
ASTERACEAE	<i>Senecio vulgaris</i>	Common groundsel
ASTERACEAE	<i>Silphium albiflorum</i>	White rosinweed
ASTERACEAE	<i>S. laciniatum</i>	Compassplant
ASTERACEAE	<i>Solidago altissima = canadensis var. scabra</i>	Scabrous goldenrod
ASTERACEAE	<i>S. nemoralis var. nemoralis</i>	Eastern Oldfield goldenrod
ASTERACEAE	<i>S. radula var. radula</i>	Rough goldenrod
ASTERACEAE	<i>Sonchus asper</i>	Prickly sowthistle
ASTERACEAE	<i>S. oleraceus</i>	Common sowthistle
ASTERACEAE	<i>Symphotrichum divaricatum = Aster subulatus var. ligulatus</i>	Hierba del Marrano
ASTERACEAE	<i>S. drummondii var. texanum</i>	Texas aster
ASTERACEAE	<i>S. ericoides</i>	Heath aster
ASTERACEAE	<i>S. patens</i>	Skydrop aster
ASTERACEAE	<i>Taraxacum laevigatum = erythrospermum</i>	Red seed dandelion
ASTERACEAE	<i>T. officinale</i>	Dandelion, Dent-de-lion
ASTERACEAE	<i>Tetaneuris linearifolia = Hymenoxys</i>	Slenderleaf four-nerve daisy
ASTERACEAE	<i>T. scaposa var. scaposa = Hymenoxys</i>	Slenderstem four-nerve daisy
ASTERACEAE	<i>Thelesperma filifolium var. filifolium = trifidum</i>	Common greenthread
ASTERACEAE	<i>Tragopogon dubius = major</i>	Yellow salsify, Goat's-beard
ASTERACEAE	<i>Verbesina virginica</i>	Frostweed
ASTERACEAE	<i>Vernonia baldwinii ssp. baldwinii</i>	Baldwin ironweed
ASTERACEAE	<i>V. lindheimeri</i>	Lindheimer ironweed
ASTERACEAE	<i>Xanthium strumarium var. canadense gland</i>	Cocklebur
ASTERACEAE	<i>Youngia japonica</i>	Japanese hawksbeard
BERBERIDACEAE	<i>Nandina domestica</i>	Nandina

Family	Genus species Tandy Hills 6/11/2006	Common
BIGNONIACEAE	<i>Campsis radicans</i>	Trumpet creeper
BIGNONIACEAE	<i>Catalpa speciosa</i>	Southern catalpa
BORAGINACEAE	<i>Buglossoides arvensis</i>	Buglossoides
BORAGINACEAE	<i>Heliotropium tenellum</i>	Pasture heliotrope
BORAGINACEAE	<i>Lithospermum incisum</i>	Puccoon, Gromwell
BORAGINACEAE	<i>Myosotis macrosperma</i>	Spring forget-me-not
BRASSICACEAE	<i>Capsella bursa-pastoris</i>	Shepherd's purse
BRASSICACEAE	<i>Cardamine pensylvanica</i>	Pennsylvania bittercress
BRASSICACEAE	<i>Descurainia pinnata ssp. pinnata</i>	Yellow tansymustard
BRASSICACEAE	<i>Draba cuneifolia var. cuneifolia</i>	Wedgeleaf draba
BRASSICACEAE	<i>Lepidium austrinum</i>	Southern peppergrass
BRASSICACEAE	<i>L. virginicum var. medium</i>	Virginia peppergrass
BRASSICACEAE	<i>L. virginicum var. virginicum</i>	Virginia peppergrass
BRASSICACEAE	<i>Lesquerella gracilis ssp. gracilis = Physaria</i>	White bladderpod
BRASSICACEAE	<i>L. recurvata = Physaria</i>	Slender bladderpod
BRASSICACEAE	<i>Rapistrum rugosum</i>	Bastard cabbage
BRASSICACEAE	<i>Sibaria virginica</i>	Virginia sibaria
CACTACEAE	<i>Echinocereus reichenbachii var. reichenbachii</i>	Lace cactus
CACTACEAE	<i>Escobaria missouriensis = Mammillaria similis</i>	Missouri nipple cactus
CACTACEAE	<i>Opuntia engelmannii var. lindheimeri</i>	Texas pricklypear
CACTACEAE	<i>O. humifusa = compressa</i>	Eastern pricklypear
CACTACEAE	<i>O. macrorhiza var. macrorhiza</i>	Plains pricklypear
CAMPANULACEAE	<i>Triodanis leptocarpa = Specularia</i>	Slimpod Venus lookingglass
CAMPANULACEAE	<i>T. perfoliata var. perfoliata = Specularia</i>	Clasping Venus lookingglass
CAPRIFOLIACEAE	<i>Lonicera albiflora</i>	Texas White honeysuckle
CAPRIFOLIACEAE	<i>L. japonica</i>	Japanese honeysuckle
CAPRIFOLIACEAE	<i>L. sempervirens var. sempervirens</i>	Coral honeysuckle
CAPRIFOLIACEAE	<i>Sambucus nigra ssp. canadensis</i>	American elderberry
CAPRIFOLIACEAE	<i>Symphoricarpus orbicularis</i>	Coralberry
CAPRIFOLIACEAE	<i>Viburnum rufidulum</i>	Rusty blackhaw
CARYOPHYLLACEAE	<i>Arenaria serpyllifolia</i>	Thymeleaf sandwort
CARYOPHYLLACEAE	<i>Cerastium brachypodum</i>	Shortstalk chickweed
CARYOPHYLLACEAE	<i>C. glomeratum</i>	Glomerate chickweed
CARYOPHYLLACEAE	<i>Paronychia virginica</i>	Virginia whitlow wort
CARYOPHYLLACEAE	<i>Silene antirrhina</i>	Sleepy catchfly
CARYOPHYLLACEAE	<i>Stellaria media</i>	Chickweed
CELASTRACEAE	<i>Euonymus atropurpurea</i>	Eastern Wahoo, Burning bush
CHENOPODIACEAE	<i>Chenopodium album</i>	Lambsquarters
CHENOPODIACEAE	<i>C. ambrosioides</i>	Wormseed
CHENOPODIACEAE	<i>C. berlandieri var. berlandieri</i>	Pitseed goosefoot
COMMELINACEAE	<i>Commelina erecta var. angustifolia</i>	Narrowleaf dayflower
COMMELINACEAE	<i>C. erecta var. erecta</i>	Erect dayflower
COMMELINACEAE	<i>Tradescantia occidentalis</i>	Western spiderwort
COMMELINACEAE	<i>T. ohioensis</i>	Ohio spiderwort
CONVOLVULACEAE	<i>Convolvulus equitans = hermannioides/incanus</i>	Texas bindweed
CONVOLVULACEAE	<i>Dichondra carolinensis</i>	Carolina ponyfoot

Family	Genus species Tandy Hills 6/11/2006	Common
CONVOLVULACEAE	<i>Evolvulus nuttallianus = pilosus</i>	Hairy evolvulus
CONVOLVULACEAE	<i>Ipomoea cordatotriloba = trichocarpa hairy</i>	Sharppod morningglory
CORNACEAE	<i>Cornus drummondii</i>	Roughleaf dogwood
CUCURBITACEAE	<i>Cucurbita foetidissima</i>	Fetid gourd
CUCURBITACEAE	<i>Melothria pendula var. pendula</i>	Drooping melonette
CUPRESSACEAE	<i>Juniperus ashei</i>	Ashe juniper
CUPRESSACEAE	<i>J. virginiana</i>	Virginia redcedar
CUSCUTACEAE	<i>Cuscuta indecora = longisepala</i>	Showy dodder
CYPERACEAE	<i>Carex amphibola var. amphibola</i>	Amphibious sedge
CYPERACEAE	<i>C. cherokeensis</i>	Cherokee sedge
CYPERACEAE	<i>C. microdonta</i>	Littletooth sedge
CYPERACEAE	<i>C. planostachys</i>	Cedar sedge
CYPERACEAE	<i>Cyperus acuminatus</i>	Taperleaf flatsedge
CYPERACEAE	<i>C. elegans</i>	Sticky flatsedge
CYPERACEAE	<i>C. erythrorhizos</i>	Redroot flatsedge
CYPERACEAE	<i>C. esculentus</i>	Yellow nutsedge
CYPERACEAE	<i>C. rotundus</i>	Nutsedge
CYPERACEAE	<i>C. squarrosus = aristatus</i>	Bearded flatsedge
CYPERACEAE	<i>Fimbristylis puberula var. interior</i>	Inland fimbry
CYPERACEAE	<i>Fuirena simplex var. simplex</i>	Western umbrellagrass
EUPHORBIACEAE	<i>Acalypha monococca</i>	Oneseed copperleaf
EUPHORBIACEAE	<i>A. ostryifolia</i>	Hornbeamleaf copperleaf
EUPHORBIACEAE	<i>A. virginica var. rhomboidea</i>	Rhomboid copperleaf
EUPHORBIACEAE	<i>A. virginica var. virginica</i>	Virginia copperleaf
EUPHORBIACEAE	<i>Argythamnia humilis var. humilis = Ditaxis</i>	Low wildmercury
EUPHORBIACEAE	<i>A. mercurialina var. mercurialina = Ditaxis</i>	Tall wildmercury
EUPHORBIACEAE	<i>Chamaesyce fendleri</i>	Fendler spurge
EUPHORBIACEAE	<i>C. fendleri var. chaetocalyx = triligulata</i>	Fendler spurge
EUPHORBIACEAE	<i>C. maculata</i>	Spotted spurge
EUPHORBIACEAE	<i>C. nutans</i>	Eyebane
EUPHORBIACEAE	<i>C. prostrata</i>	Prostrate spurge
EUPHORBIACEAE	<i>C. serpens</i>	Mat spurge
EUPHORBIACEAE	<i>C. stictospora</i>	Slimseed spurge
EUPHORBIACEAE	<i>Croton monanthogynus</i>	Oneseed croton
EUPHORBIACEAE	<i>Euphorbia bicolor = Agaloma</i>	Snow-on-the-prairie
EUPHORBIACEAE	<i>E. dentata = Poinsettia</i>	Toothed spurge
EUPHORBIACEAE	<i>E. spathulata = Tithymalus</i>	Warty euphorbia
EUPHORBIACEAE	<i>Phyllanthus polygonoides</i>	Knotweed leafflower
EUPHORBIACEAE	<i>Stillingia sylvatica</i>	Queen's delight
EUPHORBIACEAE	<i>S. texana</i>	Queen's delight
EUPHORBIACEAE	<i>Tragia brevispica</i>	Shortspike noseburn
EUPHORBIACEAE	<i>T. ramosa</i>	Catnip noseburn
FABACEAE	<i>Acacia angustissima var. hirta</i>	Fern acacia
FABACEAE	<i>Albizia julibrissin</i>	Silktree mimosa
FABACEAE	<i>Amorpha fruticosa</i>	Indigobush amorpha
FABACEAE	<i>Astragalus crassicaarpus var. crassicaarpus</i>	Groundplum milkvetch

Family	Genus species Tandy Hills 6/11/2006	Common
FABACEAE	<i>A. lotiflorus</i>	Low milkvetch
FABACEAE	<i>A. nuttallianus</i> var. <i>nuttallianus</i>	Turkey-pea, Nuttall milkvetch
FABACEAE	<i>A. plattensis</i>	Platte milkvetch-sweet scent
FABACEAE	<i>Cercis canadensis</i> var. <i>canadensis</i>	Eastern redbud
FABACEAE	<i>C. canadensis</i> var. <i>texensis</i>	Texas redbud
FABACEAE	<i>Dalea aurea</i>	Golden Dalea
FABACEAE	<i>D. compacta</i> var. <i>compacta</i> = <i>Petalostemon</i>	Showy Dalea
FABACEAE	<i>D. enneandra</i> var. <i>enneandra</i>	Bigtop Dalea
FABACEAE	<i>D. frutescens</i>	Black Dalea
FABACEAE	<i>D. multiflora</i> = <i>Petalostemon</i>	Roundhead Dalea
FABACEAE	<i>D. tenuis</i> = <i>tenuis</i> = <i>Petalostemon</i>	Slender Dalea
FABACEAE	<i>Desmanthus illinoensis</i>	Illinois bundleflower
FABACEAE	<i>D. velutinus</i>	Velvet bundleflower
FABACEAE	<i>Desmodium paniculatum</i> = <i>dichromum</i>	Panicled tickclover
FABACEAE	<i>Galactia volubilis</i> = <i>regularis</i> / <i>glabella</i>	Downy milkpea
FABACEAE	<i>Gleditsia triacanthos</i>	Honey locust
FABACEAE	<i>Indigofera miniata</i> var. <i>leptosepala</i>	Western scarlet pea
FABACEAE	<i>Lupinus texensis</i>	Texas bluebonnet
FABACEAE	<i>Medicago lupulina</i>	Black medic
FABACEAE	<i>M. minima</i>	Burclover
FABACEAE	<i>Melilotus albus</i>	White sweetclover
FABACEAE	<i>M. officinalis</i>	Yellow sweetclover
FABACEAE	<i>Mimosa latidens</i> = <i>Schrankia microphylla</i>	Catclaw sensitivebriar
FABACEAE	<i>M. roemeriana</i> = <i>Schrankia roemeriana</i>	Roemer sensitivebriar
FABACEAE	<i>Neptunia lutea</i>	Yellow neptunia
FABACEAE	<i>Oxytropis lambertii</i>	Locoweed
FABACEAE	<i>Pedimelum cuspidatum</i>	Tallbread scurfpea
FABACEAE	<i>P. cyphocalyx</i>	Wand scurfpea
FABACEAE	<i>P. hypogaeum</i> var. <i>scaposum</i>	Edible scurfpea
FABACEAE	<i>P. linearifolium</i>	Slimleaf scurfpea
FABACEAE	<i>P. rhombifolium</i>	Roundleaf scurfpea
FABACEAE	<i>Prosopis glandulosa</i> var. <i>glandulosa</i>	Honey mesquite
FABACEAE	<i>Senna roemeriana</i> = <i>Cassia</i>	Two-leaf senna
FABACEAE	<i>Sophora affinis</i>	Eve's necklace
FABACEAE	<i>Strophostyles helvula</i>	Trailing wildbean
FABACEAE	<i>Trifolium repens</i>	White clover
FABACEAE	<i>Vicia angustifolia</i> = <i>sativa</i> ssp. <i>nigra</i>	Narrowleaf vetch
FABACEAE	<i>V. ludoviciana</i> var. <i>ludoviciana</i>	Louisiana vetch
FABACEAE	<i>V. ludoviciana</i> var. <i>occidentalis</i> = <i>leavenworthii</i>	Leavenworth vetch
FABACEAE	<i>V. sativa</i> ssp. <i>sativa</i>	Common vetch
FABACEAE	<i>Wisteria sinensis</i>	Chinese wisteria
FAGACEAE	<i>Quercus fusiformis</i>	Plateau live oak, Roble, Encino
FAGACEAE	<i>Q. macrocarpa</i> var. <i>macrocarpa</i>	Bur oak
FAGACEAE	<i>Q. shumardii</i> var. <i>shumardii</i>	Shumard red oak
FAGACEAE	<i>Q. stellata</i>	Post oak
FUMARIACEAE	<i>Corydalis curvisiliqua</i> ssp. <i>curvisiliqua</i>	Curvepod corydalis

Family	Genus species Tandy Hills 6/11/2006	Common
FUMARIACEAE	<i>C. curvisiliqua ssp. grandibracteata</i>	Curvepod corydalis
GENTIANACEAE	<i>Centaurium beyrichii var. beyrichii</i>	Rock centaury
GENTIANACEAE	<i>C. texense</i>	Texas centaury
GENTIANACEAE	<i>Eustoma grandiflorum = russellianum</i>	Showy prairie gentian
GERANIACEAE	<i>Erodium cicutarium</i>	Cranesbill, Filaree
GERANIACEAE	<i>E. texanum</i>	Storksbill
GERANIACEAE	<i>Geranium carolinianum</i>	Carolina geranium
GERANIACEAE	<i>G. texanum</i>	Texas geranium
IRIDACEAE	<i>Iris germanica</i>	Garden, German Iris
IRIDACEAE	<i>Nemastylis geminiflora</i>	Celestial
IRIDACEAE	<i>Sisyrinchium ensigerum = scabrum/chilense</i>	Swordleaf blue-eyed grass
JUGLANDACEAE	<i>Carya illinoensis</i>	Pecan
JUNCACEAE	<i>Juncus interior</i>	Inland rush
JUNCACEAE	<i>J. tenuis</i>	Slender rush
KRAMERIACEAE	<i>Krameria lanceolata</i>	Trailing ratany
LAMIACEAE	<i>Hedeoma acinoides</i>	Slender Mock Pennyroyal
LAMIACEAE	<i>H. drummondii</i>	Drummond Mock Pennyroyal pep
LAMIACEAE	<i>H. reverchonii var. reverchonii</i>	Reverchon Mock Pennyroyal lem
LAMIACEAE	<i>Lamium amplexicaule</i>	Henbit
LAMIACEAE	<i>L. purpureum</i>	Purple deadnettle
LAMIACEAE	<i>Marrubium vulgare</i>	Horehound
LAMIACEAE	<i>Monarda citriodora var. citriodora</i>	Lemon beebalm
LAMIACEAE	<i>Salvia azurea var. grandiflora = Salvia pitcheri</i>	Azure, pitcher sage
LAMIACEAE	<i>S. engelmannii</i>	Engelmann's sage
LAMIACEAE	<i>S. texana</i>	Texas sage
LAMIACEAE	<i>Scutellaria drummondii var. edwardsiana</i>	Drummond scullcap
LAMIACEAE	<i>S. resinosa</i>	Resindot scullcap
LAMIACEAE	<i>Teucrium canadense</i>	Wood sage
LAMIACEAE	<i>Warnockia scutellarioides = Brazoria</i>	Prairie brazoria
LILIACEAE	<i>Allium canadense var. canadense = acetabulum</i>	Wild onion
LILIACEAE	<i>A. canadense var. fraseri</i>	Fraser onion
LILIACEAE	<i>A. canadense var. hyacinthoides</i>	Hyacinth onion
LILIACEAE	<i>A. drummondii = nuttallii</i>	Drummond onion
LILIACEAE	<i>Androstephium coeruleum</i>	Blue funnel lily
LILIACEAE	<i>Asparagus officinalis</i>	Asparagus
LILIACEAE	<i>Camassia scilloides</i>	Wild hyacinth
LILIACEAE	<i>Cooperia drummondii</i>	Drummond rainlily
LILIACEAE	<i>Crinum bulbispermum</i>	Milk & wine lily
LILIACEAE	<i>Erythronium albidum</i>	White trout lily
LILIACEAE	<i>E. mesochoreum</i>	Nodding trout lily
LILIACEAE	<i>Hypoxis hirsuta = rigida</i>	Yellow Stargrass, Clubpod
LILIACEAE	<i>Muscari neglectum = racemosum</i>	Grape hyacinth
LILIACEAE	<i>Narcissus pseudonarcissus</i>	Daffodil
LILIACEAE	<i>Nothoscordum bivalve = striatum</i>	False garlic
LILIACEAE	<i>Ornithogalum umbellatum</i>	Star of Bethlehem
LINACEAE	<i>Linum berlandieri var. berlandieri</i>	Berlandier flax

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LINACEAE	<i>L. pratense</i>	Meadow flax
LINACEAE	<i>L. rigidum</i>	Stiffstem flax
LINACEAE	<i>L. rupestre</i>	Rock flax
LYTHRACEAE	<i>Ammannia coccinea</i>	Purple ammannia
LYTHRACEAE	<i>Lythrum californicum</i>	California loosestrife
MALVACEAE	<i>Abutilon fruticosum = texense</i>	Pelotazo, Indian mallow
MALVACEAE	<i>Callirhoe pedata = digitata var. stipulata</i>	Finger winecup
MALVACEAE	<i>Modiola caroliniana</i>	Carolina modiola
MALVACEAE	<i>Sida abutifolia = filicaulis</i>	Spreading sida
MELIACEAE	<i>Melia azedarach</i>	Chinaberry
MENISPERMACEAE	<i>Cocculus carolinus</i>	Moonseed
MOLLUGINACEAE	<i>Mollugo verticillata</i>	Green carpetweed
MORACEAE	<i>Maclura pomifera</i>	Bois d'arc, Osage orange
MORACEAE	<i>Morus alba</i>	White mulberry
MORACEAE	<i>M. rubra</i>	Red mulberry
NYCTAGINACEAE	<i>Boerhavia coccinea</i>	Scarlet spiderling
NYCTAGINACEAE	<i>B. diffusa = coccinea</i>	Spreading spiderling
NYCTAGINACEAE	<i>B. erecta</i>	Erect spiderling
NYCTAGINACEAE	<i>Mirabilis nyctaginea = collina</i>	Wild four o'clock
OLEACEAE	<i>Forestiera pubescens var. glabrifolia</i>	Smooth elbowbush
OLEACEAE	<i>F. pubescens var. pubescens</i>	Hairy elbowbush
OLEACEAE	<i>Fraxinus pennsylvanica</i>	Pennsylvania ash
OLEACEAE	<i>F. texensis</i>	Texas ash, Fresno
OLEACEAE	<i>Ligustrum lucidum</i>	Glossy ligustrum
OLEACEAE	<i>L. quihoui</i>	Thinleaf privet
OLEACEAE	<i>L. sinense</i>	Chinese privet
ONAGRACEAE	<i>Calylophus berlandieri ssp. pinifolius = drum. s. drum.</i>	Blackthroat sundrops
ONAGRACEAE	<i>C. serrulatus</i>	Yellow sundrops
ONAGRACEAE	<i>Gaura coccinea</i>	Scarlet gaura
ONAGRACEAE	<i>G. parviflora</i>	Lizardtail gaura
ONAGRACEAE	<i>G. suffulta ssp. suffulta</i>	Roadside gaura
ONAGRACEAE	<i>Oenothera laciniata</i>	Cutleaf evening primrose
ONAGRACEAE	<i>O. macrocarpa ssp. macrocarpa = missouriensis</i>	Fluttermill
ONAGRACEAE	<i>O. speciosa</i>	Showy primrose
ONAGRACEAE	<i>O. triloba</i>	Stemless primrose
ONAGRACEAE	<i>Stenosiphon linifolius = Gaura</i>	False gaura
OPHIOGLOSSACEAE	<i>Ophioglossum engelmannii</i>	Limestone adder's tongue
ORCHIDACEAE	<i>Spiranthes cernua</i>	Nodding ladies' tresses
OXALIDACEAE	<i>Oxalis dillenii</i>	Dillen's oxalis, Sheep-showers
PAPAVERACEAE	<i>Argemone albiflora ssp. texana</i>	White pricklypoppy
PASSIFLORACEAE	<i>Passiflora lutea</i>	Yellow passionflower
PEDALIACEAE	<i>Proboscidea louisianica ssp. louisianica</i>	Common devil's claw
PHYTOLACCACEAE	<i>Phytolacca americana var. americana</i>	Pokeberry
PHYTOLACCACEAE	<i>Rivina humilis</i>	Pigeonberry
PLANTAGINACEAE	<i>Plantago helleri</i>	Cedar plantain
PLANTAGINACEAE	<i>P. patagonica = purshii</i>	Bristlebract plantain

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PLANTAGINACEAE	<i>P. rhodosperma</i>	Redseed plantain
PLANTAGINACEAE	<i>P. virginica</i>	Paleseed plantain
PLANTAGINACEAE	<i>P. wrightiana</i>	Wright plantain
POACEAE	<i>Aegilops cylindrica = Triticum</i>	Jointed goatgrass
POACEAE	<i>Andropogon gerardii var. gerardii = furcatus</i>	Big bluestem
POACEAE	<i>A. glomeratus NIT?</i>	Bushy bluestem
POACEAE	<i>Aristida desmantha = palustris</i>	Curly threeawn
POACEAE	<i>A. longespica var. geniculata</i>	Kearney threeawn
POACEAE	<i>A. oligantha</i>	Oldfield threeawn
POACEAE	<i>A. purpurea var. purpurea = roemeriana</i>	Purple threeawn
POACEAE	<i>A. purpurea var. wrightii</i>	Wright's threeawn
POACEAE	<i>Arundo donax</i>	Giant reed
POACEAE	<i>Avena sativa</i>	Oats
POACEAE	<i>Bothriochloa ischaemum var. songarica</i>	King Ranch bluestem
POACEAE	<i>B. laguroides ssp. torreyana</i>	Silver bluestem
POACEAE	<i>Bouteloua curtipendula var. caespitosa</i>	Clump sideoats grama
POACEAE	<i>B. curtipendula var. curtipendula</i>	Sideoats grama
POACEAE	<i>B. hirsuta</i>	Hairy grama
POACEAE	<i>B. pectinata</i>	Tall grama
POACEAE	<i>B. rigidiseta</i>	Texas grama
POACEAE	<i>Bromus catharticus = unioloides</i>	Rescuegrass
POACEAE	<i>B. japonicus</i>	Japanese brome
POACEAE	<i>B. pubescens</i>	Hairy brome
POACEAE	<i>B. tectorum var. tectorum</i>	Cheatgrass
POACEAE	<i>Buchloe dactyloides</i>	Buffalograss
POACEAE	<i>Cenchrus spinifex = carolinianus = incertus/pauciflorus</i>	Common sandbur
POACEAE	<i>Chasmanthium latifolium</i>	Inland Seaoats
POACEAE	<i>Chloris verticillata</i>	Tumble windmillgrass
POACEAE	<i>C. virgata</i>	Showy chloris
POACEAE	<i>Coelorachis cylindrica = Mnesithea = Manisuris</i>	Carolina jointtail
POACEAE	<i>Cynodon dactylon</i>	Bermudagrass
POACEAE	<i>Dichanthelium acuminatum var. acuminatum</i>	Wooly rosettegrass
POACEAE	<i>D. oligosanthes var. oligosanthes</i>	Fewflowered rosettegrass
POACEAE	<i>D. oligosanthes var. scribnerianum</i>	Scribner's rosettegrass
POACEAE	<i>D. sphaerocarpon var. sphaerocarpon</i>	Roundseed rosettegrass
POACEAE	<i>Digitaria ciliaris = sanguinalis dupe</i>	Hairy crabgrass
POACEAE	<i>D. filiformis</i>	Slender crabgrass
POACEAE	<i>Echinochloa colona</i>	Junglerice
POACEAE	<i>E. crus-galli var. crus-galli</i>	Barnyardgrass
POACEAE	<i>Eleusine indica</i>	Goosegrass
POACEAE	<i>Elymus canadensis var. canadensis</i>	Canada wildrye
POACEAE	<i>E. virginicus var. virginicus</i>	Virginia wildrye
POACEAE	<i>Eragrostis barrelieri</i>	Mediterranean lovegrass
POACEAE	<i>E. cilianensis = megastachya</i>	Stinkgrass
POACEAE	<i>E. intermedia</i>	Plains lovegrass
POACEAE	<i>Eriochloa sericea</i>	Texas cupgrass

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POACEAE	<i>Erioneuron pilosum</i> = <i>Tridens</i>	Hairy tridens
POACEAE	<i>Hordeum murinum</i> ssp. <i>leporinum</i> = <i>Critesion</i>	Hare barley
POACEAE	<i>H. pusillum</i> = <i>Critesion</i>	Little barley
POACEAE	<i>Leptochloa dubia</i>	Green sprangletop
POACEAE	<i>L. fusca</i> ssp. <i>fascicularis</i>	Bearded sprangletop
POACEAE	<i>L. panicea</i> ssp. <i>brachiata</i> = <i>filiformis</i>	Red sprangletop
POACEAE	<i>Limnodea arkansana</i>	Ozarkgrass
POACEAE	<i>Lolium arundinaceum</i> = <i>Festuca</i>	Tall fescue
POACEAE	<i>L. perenne</i> ssp. <i>multiflorum</i> = <i>italicum</i>	Perennial ryegrass
POACEAE	<i>L. perenne</i> ssp. <i>perenne</i>	Perennial ryegrass
POACEAE	<i>Muhlenbergia reverchonii</i>	Seep muhly
POACEAE	<i>Nassella leucotricha</i> = <i>Stipa</i>	Texas wintergrass
POACEAE	<i>Panicum capillare</i> = <i>hillmanii</i>	Witchgrass
POACEAE	<i>P. hallii</i> var. <i>hallii</i>	Hall's panic
POACEAE	<i>P. virgatum</i> var. <i>virgatum</i>	Switchgrass
POACEAE	<i>Paspalum dilatatum</i>	Dallisgrass
POACEAE	<i>P. pubiflorum</i> var. <i>pubiflorum</i>	Hairyseed paspalum
POACEAE	<i>P. setaceum</i>	Fringeleaf paspalum
POACEAE	<i>Phalaris caroliniana</i>	Carolina canarygrass
POACEAE	<i>Poa annua</i>	Annual bluegrass
POACEAE	<i>P. arachnifera</i>	Texas bluegrass
POACEAE	<i>Schedonnardus paniculatus</i>	Tumblegrass
POACEAE	<i>Schizachyrium scoparium</i> ssp. <i>scoparium</i>	Little bluestem
POACEAE	<i>Setaria parviflora</i> = <i>geniculata</i>	Knotroot bristlegrass
POACEAE	<i>Sorghastrum nutans</i> = <i>avenaceum</i>	Yellow Indiangrass
POACEAE	<i>Sorghum halepense</i>	Johnsongrass
POACEAE	<i>Sphenopholis obtusata</i> var. <i>obtusata</i>	Prairie wedgescale
POACEAE	<i>Sporobolus compositus</i> var. <i>clandestinus</i> = <i>asper</i>	Meadow dropseed
POACEAE	<i>S. compositus</i> var. <i>compositus</i>	Tall dropseed
POACEAE	<i>S. cryptandrus</i>	Sand dropseed
POACEAE	<i>S. neglectus</i>	Puffshead dropseed
POACEAE	<i>S. vaginiflorus</i>	Poverty dropseed
POACEAE	<i>Tridens albescens</i>	White tridens
POACEAE	<i>T. flavus</i>	Purpletop
POACEAE	<i>T. muticus</i> var. <i>muticus</i>	Slim tridens
POACEAE	<i>T. strictus</i>	Longspike tridens
POACEAE	<i>Trisetum interruptum</i> = <i>Sphenopholis</i>	Prairie trisetum
POACEAE	<i>Vulpia octoflora</i> var. <i>glauca</i>	Sixweeksgrass
POACEAE	<i>V. octoflora</i> var. <i>hirtella</i>	Hair sixweeksgrass
POACEAE	<i>V. octoflora</i> var. <i>octoflora</i>	Common sixweeksgrass
POLEMONIACEAE	<i>Ipomopsis rubra</i>	Standing cypress
POLEMONIACEAE	<i>Phlox pilosa</i> ssp. <i>pilosa</i>	Downy phlox
POLYGALACEAE	<i>Polygala alba</i>	White milkwort
POLYGONACEAE	<i>Eriogonum longifolium</i> var. <i>longifolium</i>	Longleaf wild buckwheat
POLYGONACEAE	<i>Polygonum aviculare</i>	Prostrate knotweed
POLYGONACEAE	<i>Rumex crispus</i>	Curly dock

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POLYGONACEAE	<i>R. hymenosepalus</i>	Canaigre
PORTULACACEAE	<i>Claytonia virginica</i>	Spring beauty
PORTULACACEAE	<i>Portulaca oleracea = retusa</i>	Roughseed purslane
PTERIDACEAE	<i>Pellaea atropurpurea</i>	Purple cliffbrake
RANUNCULACEAE	<i>Anemone berlandieri = heterophylla/decapetala</i>	Ten-petal anemone
RANUNCULACEAE	<i>Clematis drummondii</i>	Texas virginsbower
RANUNCULACEAE	<i>C. pitcheri var. pitcheri</i>	Purple leatherflower
RANUNCULACEAE	<i>Delphinium carolinianum ssp. virescens</i>	White Carolina larkspur
RHAMNACEAE	<i>Berchemia scandens</i>	Supplejack, Rattanvine
RHAMNACEAE	<i>Ceanothus herbaceus = ovatus</i>	Inland ceanothus
RHAMNACEAE	<i>Rhamnus caroliniana = Frangula</i>	Carolina false buckthorn
ROSACEAE	<i>Crataegus crus-galli = bushii, cherokeensis</i>	Cock spur hawthorn
ROSACEAE	<i>C. glabriuscula</i>	Centex hawthorn
ROSACEAE	<i>C. reverchonii</i>	Reverchon hawthorn
ROSACEAE	<i>Geum canadense var texanum</i>	White avens
ROSACEAE	<i>Photinia serratifolia = serrulata</i>	Chinese photinia
ROSACEAE	<i>Prunus angustifolia</i>	Chickasaw plum
ROSACEAE	<i>P. caroliniana</i>	Cherry laurel
ROSACEAE	<i>P. mexicana</i>	Mexican plum
ROSACEAE	<i>P. rivularis</i>	Creek plum
ROSACEAE	<i>Rosa foliolosa</i>	White prairie rose
ROSACEAE	<i>Rubus oklahomus</i>	Oklahoma dewberry
ROSACEAE	<i>R. trivialis</i>	Southern dewberry
RUBIACEAE	<i>Galium aparine</i>	Cleavers
RUBIACEAE	<i>G. circaezens</i>	Woods bedstraw
RUBIACEAE	<i>G. virgatum</i>	Southwest bedstraw
RUBIACEAE	<i>Hedyotis nigricans var. nigricans</i>	Prairie bluets
RUBIACEAE	<i>Houstonia pusilla = Hedyotis crassifolia</i>	Tiny bluets
RUBIACEAE	<i>Sherardia arvensis</i>	Spurwort
RUTACEAE	<i>Zanthoxylum clava-herculis</i>	Hercules club
SALICACEAE	<i>Populus deltoides ssp. deltoides</i>	Eastern cottonwood, Alamo
SALICACEAE	<i>Salix nigra</i>	Black willow
SAPINDACEAE	<i>Cardiospermum halicacabum</i>	Balloonvine
SAPINDACEAE	<i>Sapindus saponaria var. drummondii</i>	Western soapberry
SAPINDACEAE	<i>Ungnadia speciosa</i>	Mexican buckeye
SAPOTACEAE	<i>Sideroxylon lanuginosa ssp. oblongifolia = Bumelia</i>	Wooly bumelia, Chittamwood
SCROPHULARIACEAE	<i>Agalinis densiflora = Tomanthera</i>	Fineleaf gerardia
SCROPHULARIACEAE	<i>A. heterophylla</i>	Prairie gerardia
SCROPHULARIACEAE	<i>Castilleja indivisa</i>	Texas paintbrush
SCROPHULARIACEAE	<i>C. purpurea var. purpurea</i>	Purple paintbrush
SCROPHULARIACEAE	<i>Leucospora multifida = Conobea</i>	Narrowleaf conobea
SCROPHULARIACEAE	<i>Linaria canadensis = Nuttallanthus</i>	Canadian toadflax
SCROPHULARIACEAE	<i>Lindernia dubia var. anagallidea</i>	Clasping false pimpernel
SCROPHULARIACEAE	<i>Penstemon australis ssp. laxiflorus</i>	Looseflower penstemon
SCROPHULARIACEAE	<i>P. cobaea</i>	False foxglove
SCROPHULARIACEAE	<i>Verbascum thaspus</i>	Flannel mullein

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SCROPHULARIACEAE	<i>Veronica arvensis</i>	Common speedwell
SCROPHULARIACEAE	<i>V. peregrina ssp. peregrina</i>	Purslane speedwell
SCROPHULARIACEAE	<i>V. peregrina ssp. xalapensis</i>	Xalapa speedwell
SCROPHULARIACEAE	<i>V. persica var. persica</i>	Persian speedwell
SMILACACEAE	<i>Smilax bona-nox</i>	Greenbrier
SOLANACEAE	<i>Capsicum annuum var. glabriusculum</i>	Chillipiquin
SOLANACEAE	<i>Physalis cinerascens var. cinerascens</i>	Beach groundcherry
SOLANACEAE	<i>Solanum dimidiatum</i>	Horsenettle
SOLANACEAE	<i>S. elaeagnifolium</i>	Silverleaf nightshade
SOLANACEAE	<i>S. ptycanthum = americanum</i>	Black nightshade
SOLANACEAE	<i>S. rostratum</i>	Buffalobur
ULMACEAE	<i>Celtis laevigata var. laevigata</i>	Sugar hackberry
ULMACEAE	<i>C. reticulata</i>	Netleaf hackberry
ULMACEAE	<i>Ulmus americana</i>	American elm
ULMACEAE	<i>U. crassifolia</i>	Cedar elm
URTICACEAE	<i>Parietaria pensylvanica var. pensylvanica</i>	Pennsylvania pellitory
VALERIANACEAE	<i>Valerianella amarella</i>	Hairy cornsalad
VALERIANACEAE	<i>V. radiata</i>	Beaked cornsalad
VALERIANACEAE	<i>V. stenocarpa</i>	Narrowfruit cornsalad
VERBENACEAE	<i>Glandularia bipinnatifida = Verbena</i>	Prairie verbena
VERBENACEAE	<i>G. pumila</i>	Pink verbena
VERBENACEAE	<i>Lantana camara</i>	Westindian lantana
VERBENACEAE	<i>Phyla nodiflora = incisa = Lippia</i>	Sawtooth frogfruit
VERBENACEAE	<i>Verbena halei</i>	Slender verbena
VERBENACEAE	<i>Vitex agnus-castus var. agnus-castus</i>	Common chaste tree
VIOLACEAE	<i>Hybanthus verticillatus = linearis</i>	Green violet
VIOLACEAE	<i>Viola bicolor = rafinesquei/kitaibeliana</i>	Field pansy
VIOLACEAE	<i>V. sororia var. missouriensis</i>	Missouri violet
VISCACEAE	<i>Phoradendron tomentosum = pubescens</i>	Mistletoe
VITACEAE	<i>Ampelopsis cordata</i>	Heartleaf peppervine
VITACEAE	<i>Cissus incisa</i>	Treebine
VITACEAE	<i>Parthenocissus quinquefolia</i>	Virginia creeper
VITACEAE	<i>Vitis cinerea var. cinerea = aestivalis v. cin./canesens</i>	Sweet grape
VITACEAE	<i>V. mustangensis = candicans</i>	Mustang grape
VITACEAE	<i>V. vulpina = cordifolia</i>	Fox grape
ZYGOPHYLLACEAE	<i>Tribulus terrestris</i>	Goathead

APPENDIX 3

Tandy Hills / Stratford Park Community Interest Survey Analysis

“I think the park should be returned to prairie. This last and historic prairie is an important part of our history, and I believe it should be preserved.”

Introduction

A natural park like Tandy Hills / Stratford Park (TH/SP) will only be successful if there is strong support in the community. Interested citizens will become active advocates if they feel their concerns and thoughts are important. During the Master Plan process, many people expressed concern and worry about what might happen to their cherished park. Finding the pulse of this potential user base played an important role in the development of the park’s trail system and interpretive programs. To this end, a Community Interest Survey was created. A total of 401 citizens responded over two months. Considering the short time of the survey, this indicates a wide interest in the park.

The Survey

The purpose of the survey was to receive community input and to allow concerned citizens a place to share their opinions and reactions to the TH/SP development project.

“I run five days a week in [Tandy Hills]. It was one of the major reasons I bought my house. I would like to see the park kept up (trash, overgrown invasive plants/trees) a bit more. I don’t want to see [Tandy Hills] turn into a ‘city park,’ [it] just needs to be a little more user friendly.”

Design, Implementation, and Disbursement

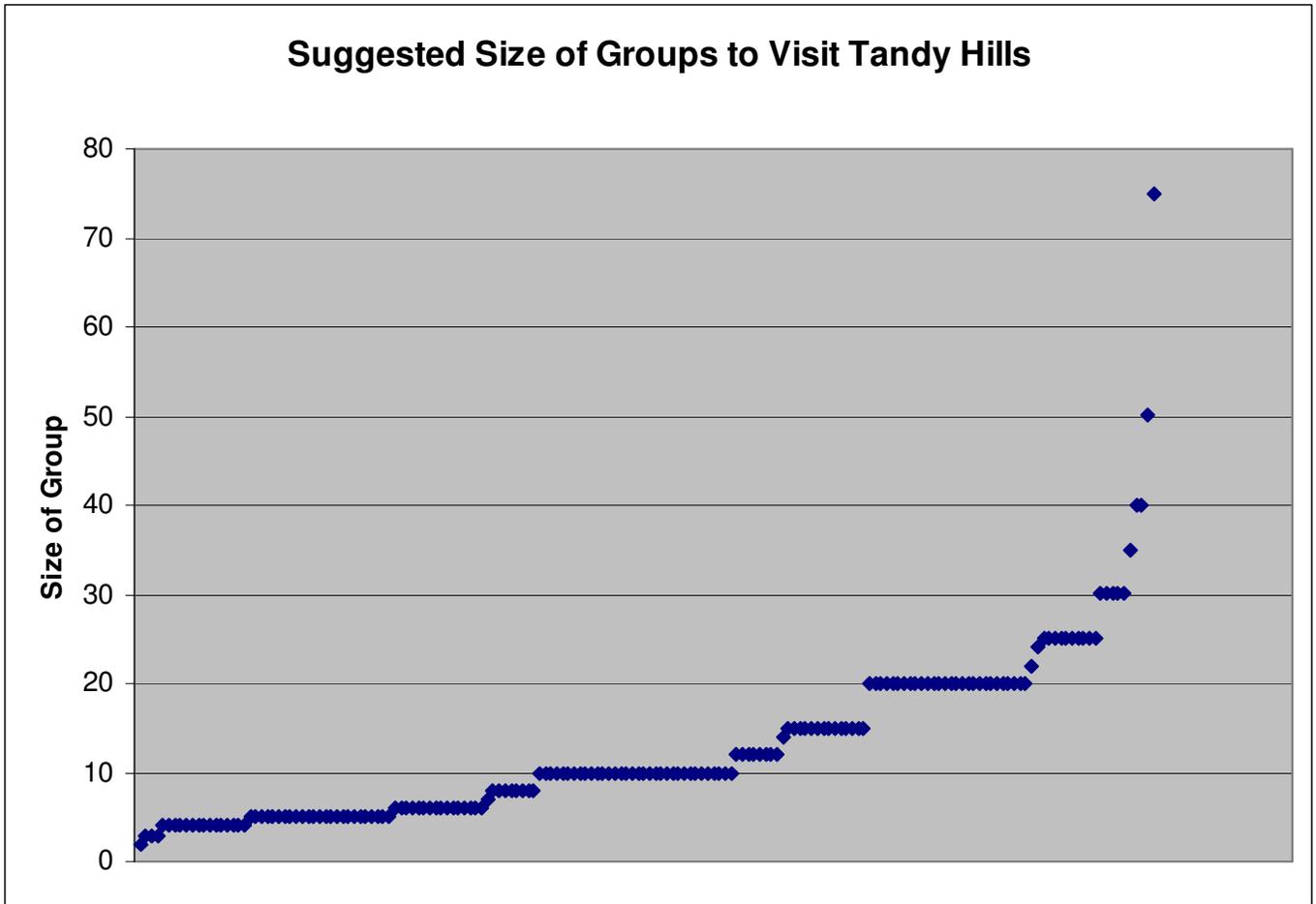
The survey was originally designed to be distributed in paper form at community meetings and through the mail. After further consideration, the survey was also placed on the Internet so that it could be taken by a greater number of constituents. (See Supplement 1 and Supplement 2 for survey examples.) Surveys that had previously been taken on paper were then added to the database of online responses. The total number of survey respondents was 401 (n=401).

The survey results will be discussed in the order of the survey questions for ease of comparison.

Visitation

Respondents indicated that the majority of them rarely visited TH/SP more than a few times a year, if at all. (Figure 1) This may be due, in part, to the current state of the park and its level of disrepair. Respondents were then asked how often they would visit the park after it was developed. The survey data shows a strong trend to indicate that constituents would increase their use of the park after it has been developed. The number of respondents who said they would visit TH/SP ‘rarely or never’ decreased from 41.9% to only 12.2%. (Figure 2)

TH/SP visitors indicated they would most likely visit the park with their family (62.8%), followed by visiting alone (38.4%) and with an adult group (32.7%). (Figure 3) Fifty five percent of respondents said they would bring groups to visit the park with them. (Figure 4) Of the 401 total respondents, 176 gave a sample group size, which ranged from small groups of two up to groups of 75 people. The following chart provides a visual representation of these answers, as well as basic statistical data. One anomalous data point was excluded from this chart to provide a more accurate view of survey responses.



n=176, Low=2, Median=10, High=75, Average=12.89

Astronomy Gazing

Approximately 70% of the survey respondents indicated that they were interested in astronomy gazing at TH/SP. (Figure 5) A few comments were made expressing concern over the ambient city light interfering with viewing the stars, but the majority of the comments regarding astronomy gazing were positive.

Parking

Demonstrating a definite need for general parking, a vast majority of survey respondents said they would need parking to utilize the TH/SP area. (Figure 6)

However, 90.7% of the respondents said they would not need to use school bus parking. (Figure 7) This may be due, in part, to the demographics of the people responding to the survey. There appear to be a larger number of older respondents who have grown children, or other people who do not have small children at home. (See the discussion regarding Programs in the section on the Nature Center.) If TH/SP had a designated Education Director, a greater number of school and camp groups would be able to utilize the park, then necessitating the need and support for bus parking.

Trails

Accessibility

The survey design allowed respondents to choose multiple options regarding the type of trails they would like to use at TH/SP. Moderate hiking trails were the most popular (66.2%), with easy hiking trails as a strong second (56.6%). (Figure 8) Commenters noted that at least some of the trails should be built to accommodate the elderly and mobility impaired.

Exploration

Respondents indicated they would prefer self-guided exploration (52.3%) followed by a combination of guided tours and self-guided exploration (46.7%). (Figure 9) This may demonstrate the need for trail guides at peak visitation times, while allowing individual exploration as an option for visitors.

Park Access

Fence

Approximately half of all respondents indicated they did not want TH/SP to be fenced. (Figure 10) A few commenters noted concerns about fencing interfering with wildlife movement and plant growth, as well as the aesthetic issues of installing a fence.

Entrances

Survey respondents were evenly divided on the issue of park entrances. The most popular option was to have two entrances to TH/SP. (Figure 11)

Control

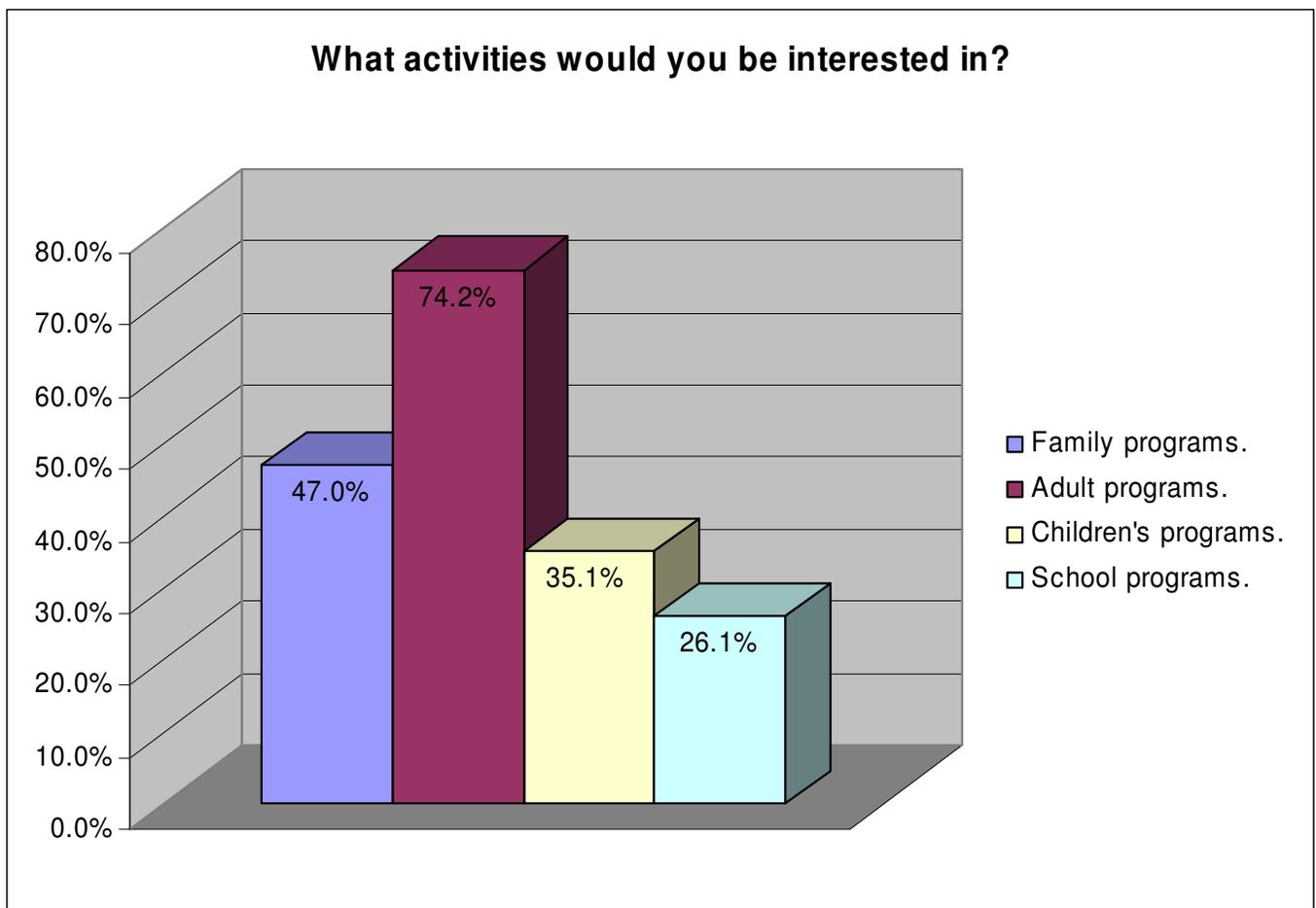
The survey's concept of 'control' was a bit ambiguous and was interpreted differently by many of the respondents. The survey group was closely divided on whether the park should be controlled, with 54.5% of respondents feeling it should be controlled. (Figure 12) Commenters noted they would feel safer if there were a guard or regular police scan of the park, while others expressed concern about making sure that vehicles were kept out of the park. Another group of respondents felt that TH/SP would be vandalized, particularly if a nature center were installed.

Nature Center

Survey respondents were strongly in favor of installing a nature center at TH/SP. (Figure 13) Only 3.6% of the respondents said they would visit the nature center at least once a week, but 23.6% indicated that they would use it at least once a month, and 52.7% indicated that they would visit the nature center a few times a year. (Figure 14) This should not be used as an indicator of overall use of TH/SP, as many people indicated they would continue to use the park, without necessarily using the nature center at each visit.

Programs

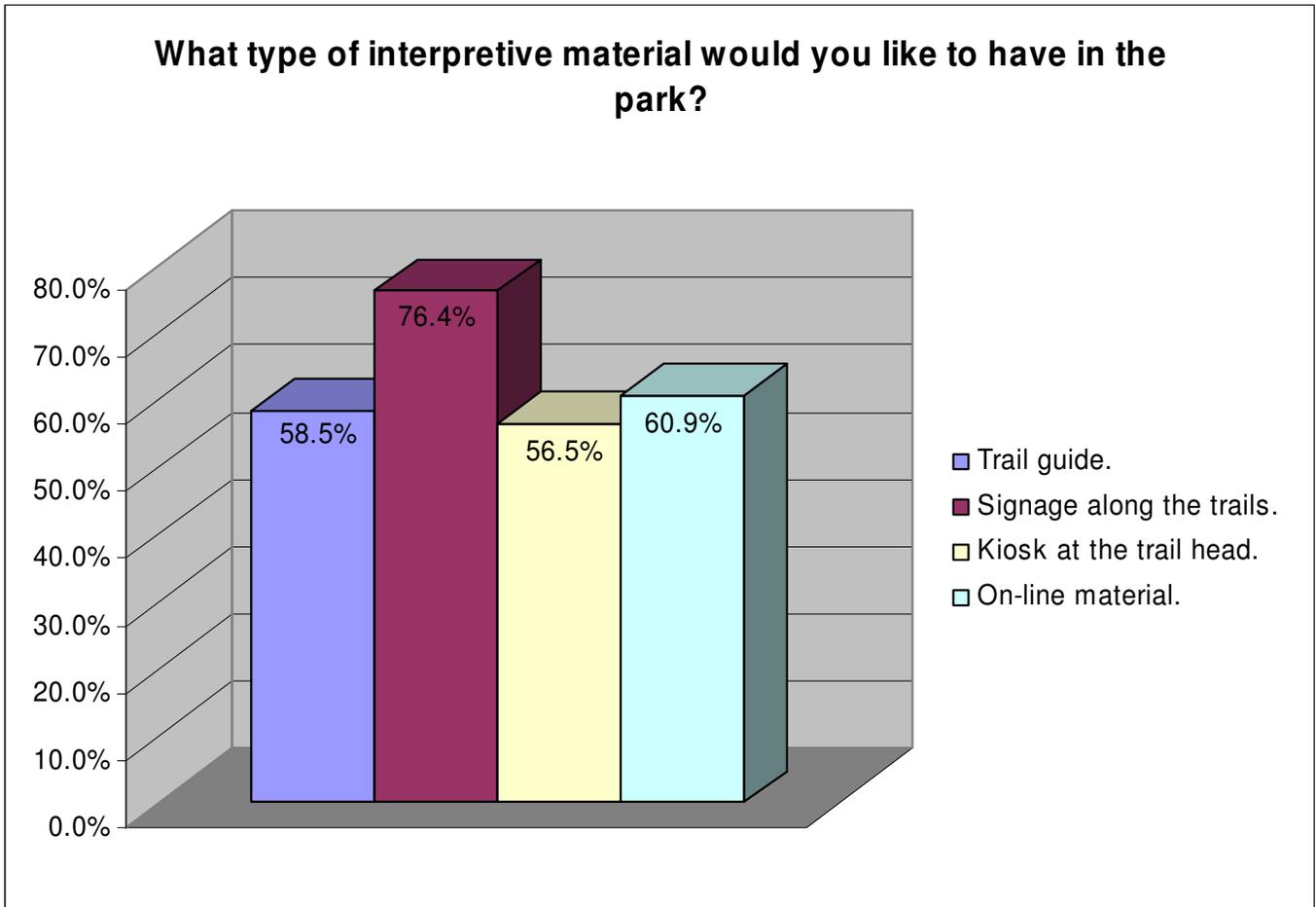
Adult programs were the most popular choice for the nature center (74.2%), followed by family programs (47.0%). Children's programs and school programs ranked at 35.1% and 26.1%, respectively, but this may be due in part to the demographics of the respondents and the number of small children in the homes of the survey takers.



Respondents also noted that weekends were the best time to hold official classes at the nature center, with 78.2% of respondents choosing weekend mornings as the best time for them or their family. (Figure 15)

Interpretive Material

Respondents expressed a strong interest in having a variety of interpretive materials available to them for their visits to TH/SP. People indicated they would like to have a trail guide either printed on renewable resources or provided only as an online document for visitors to print at home as necessary. Some commenters noted that any signage should be as innocuous as possible so as not to detract from the natural environment.



Volunteering

Volunteering at the Nature Center

By asking survey respondents to indicate their interest in volunteering at TH/SP, we are able to gauge the level of support the nature center and restoration projects will have within the community. There was a strong preference by respondents to volunteer in a nature center (69.1%) as compared to leading tours or training as guides. (Figure 16) This may be a reflection on the commitment level and amount of personal training required to perform these positions.

Some respondents suggested that TH/SP partner with the local Audubon Society or Sierra Club chapters to help operate the nature center. These organizations could provide a group of motivated citizens to help get the nature center on its feet in the first few months of operation.

Volunteering for Maintenance

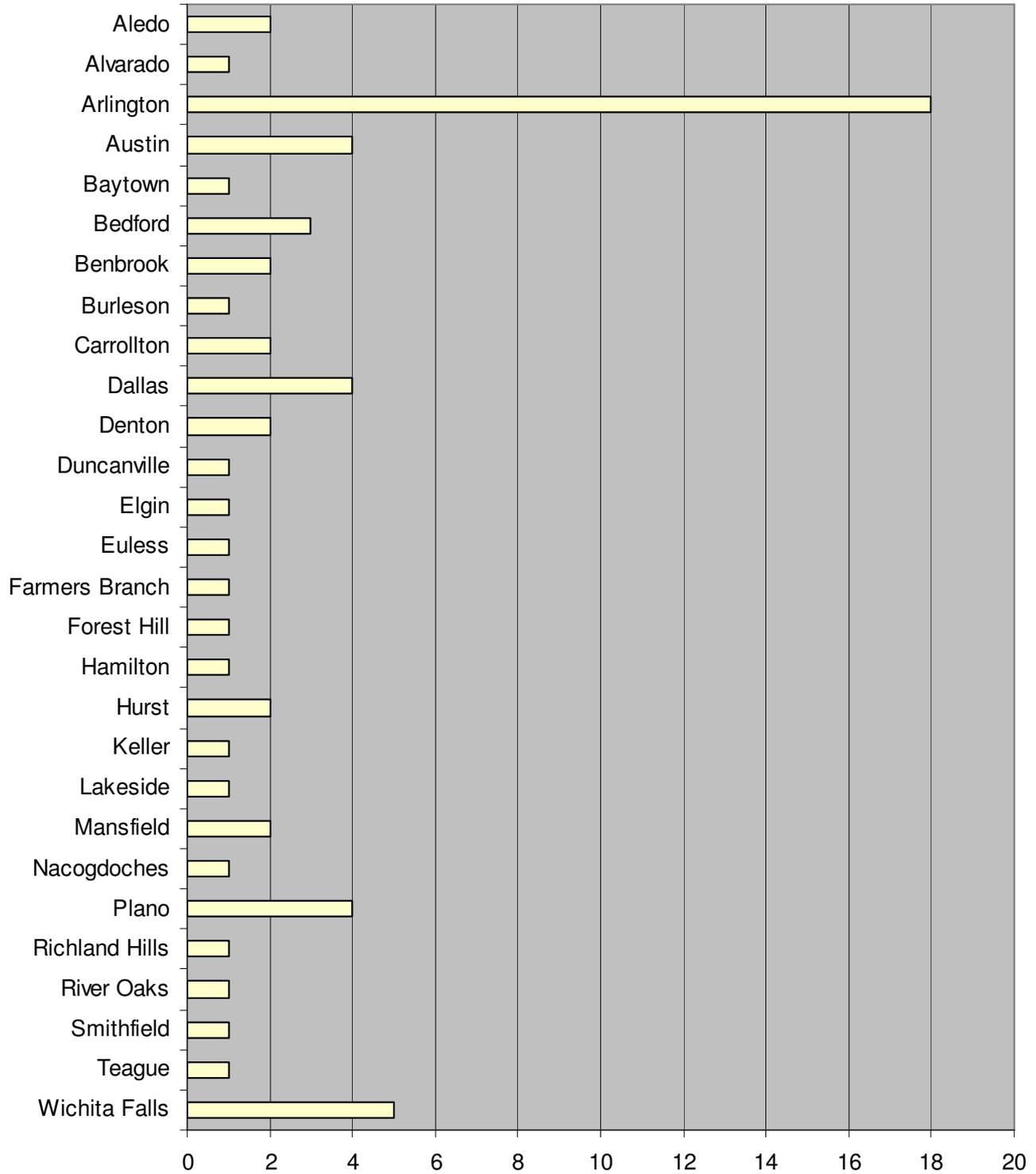
Of the respondents interested in providing maintenance support, the majority were interested in helping with planting and seeding (78.1%). The other maintenance activities received about the same amount of interest, approximately 45%. (Figure 17) Commenters suggested partnering with the Cross Timbers Chapter of the Texas Master Naturalists to help with land maintenance projects. This may also provide a training or hands-on opportunity for people who are working towards their Master Naturalist certification, which may supply TH/SP with ongoing maintenance support.

Respondent's Location

By analyzing the mailing list information, we are able to extrapolate the range of the survey and determine how far interest in TH/SP has spread. A total of 69 different zip codes were represented in this data set. (Figure 18) The majority of the respondents who provided their mailing information were from Fort Worth (148), but nearly one third of the respondents were from other locations across Texas. (Figure 19) It should be noted that not all survey respondents provided their mailing information, and the following data are an incomplete representation of respondent locations.

The following chart provides a list of cities, excluding the Fort Worth respondents, to demonstrate the wide spread interest in TH/SP.

Respondent's Location Excluding Fort Worth, Texas



Mailing List

The contact information collected in this survey will provide the new park director and education director with a list of citizens who are interested in being on a mailing list and/or willing to volunteer. This will provide TH/SP a strong base of community support during the development of the park.

Notable Respondent Comments

“Over many years, I’ve seen trees and shrubs expand across Tandy Hills. Only fairly recently I’ve been fortunate to experience what an amazingly diverse special grassland it [is, was, and can be.] The Tandy Hills area is a real treasure, part of Fort Worth’s prairie heritage and is highly visible to thousands of people driving by on I-30 each day. I’ve got great hopes that the management plan being considered will restore Tandy Hills and allow it to be recognized for the great natural resource that it is.

“I strongly support maintaining the area(s) as a prairie remnant. I realize that not everyone appreciates the value of this site designation, and I am a recent native plant apprentice myself; nevertheless, undisturbed land like Tandy Hills/Stratford is an important educational feature for our Tarrant and Texas heritage. If it is ignored or lapses, then this land feature cannot be easily reclaimed.”

“[Tandy Hills] needs to be preserved in a natural, native state as much as possible. Invasives need to be removed and kept out, erosion controlled. Citizens need to know why [the park] has been preserved and what they can learn from it – and how to enjoy it.”

Final Conclusion

The survey results show a strong citizen interest in Tandy Hills / Stratford Park and its place in Fort Worth as a natural area park, as well as a remnant prairie. The widespread community support of TH/SP indicates that any development and improvements made to the park will be well received.

Notes

- The survey results in their raw form will be on file with the Fort Worth Planning and Community Services Department on a compact disc.
- The quotes supplied in this document were taken from survey responses and were used anonymously.

Supplement 1
Print Survey

Tandy Hills / Stratford Natural Area

Community Interest Questionnaire

The Fort Worth Parks Department is in the process of developing a Master Plan for the Tandy Hills / Stratford Natural Areas, an approximately 180 acre park located in the Meadowbrook area of Fort Worth. Please take a few minutes to fill out this questionnaire, which will help the Master Plan team during the design phase. Your input is important.

Send your completed questionnaire to:

Tandy Hills / Stratford Master Plan Project
 Parks and Community Services Department
 4200 South Freeway, Suite 2200
 Fort Worth, Texas 76115
 Attn: Karen Wright

VISITING THE PARK

1. How often have you visited Tandy Hills Park within the last year?

- At least one a week At least once per month
 A few times a year Rarely or never

2. How often would you visit the park after it's developed?

- At least one a week At least once per month
 A few times a year Rarely or never

3. How would you want to visit the park?

- Alone With family
 With a youth group With an adult group

4. Would you be interested in Astronomy Gazing?

- Yes No

5. Would you need parking to visit the park?

- Yes No

6. Would you bring groups to the park?

- Yes No

How large a group? _____

7. Would you need parking for buses?

- Yes No

TRAILS

8. What types of trails would you like to have at the park?

- Accessible/surfaced Easy hiking
 Moderate hiking Challenging hiking

9. How would you most likely use the trails?

- Guided tours Self-guided exploration
 Both guided tours and self-guided exploration

ACCESS TO THE PARK

10. Do you think the park should be fenced?

- Completely Partially
 Not at all

11. How many entrances do you think the park should have?

- One Two
 More than two Open everywhere

12. Do you think access to the park should be controlled?

- Yes No
 Other (Use back if needed.)

INTERPRETIVE PROGRAMS

13. Would you be interested in having a nature center at the park?

- Yes No

14. How often do you think you would participate in activities at a nature center in the park?

- At least one a week At least once per month
 A few times a year Rarely or never

15. What activities would you be interested in?

- Family programs Adult programs
 Children's programs School programs

16. When would be the best time to offer classes or activities?

- After school Weekday evenings
 Weekend (__ a.m. __ p.m.)
 Other (Use back if needed.)

17. What types of interpretive material would you like to have in the park?

- Trail guide Signage along trails
 Kiosk at trail head On-line material
 Other (Use back if needed.)

VOLUNTEERING

18. Would you be interested in volunteering at a nature center in the park?

- At the nature center Leading adult tours
 Leading children's tours Training guides
 Other (Use back if needed.)

19. Would you be interested in volunteering for management/maintenance activities?

- Removal of invasive trees
 Planting and/or seeding
 Trail construction and/or repair
 Erosion control/restoration of closed trails/roads
 Other (Use back if needed.)

CONTACT

20. Would you like to be on a mailing list for the Tandy Hills/Stratford Natural Area Park?

- Yes No

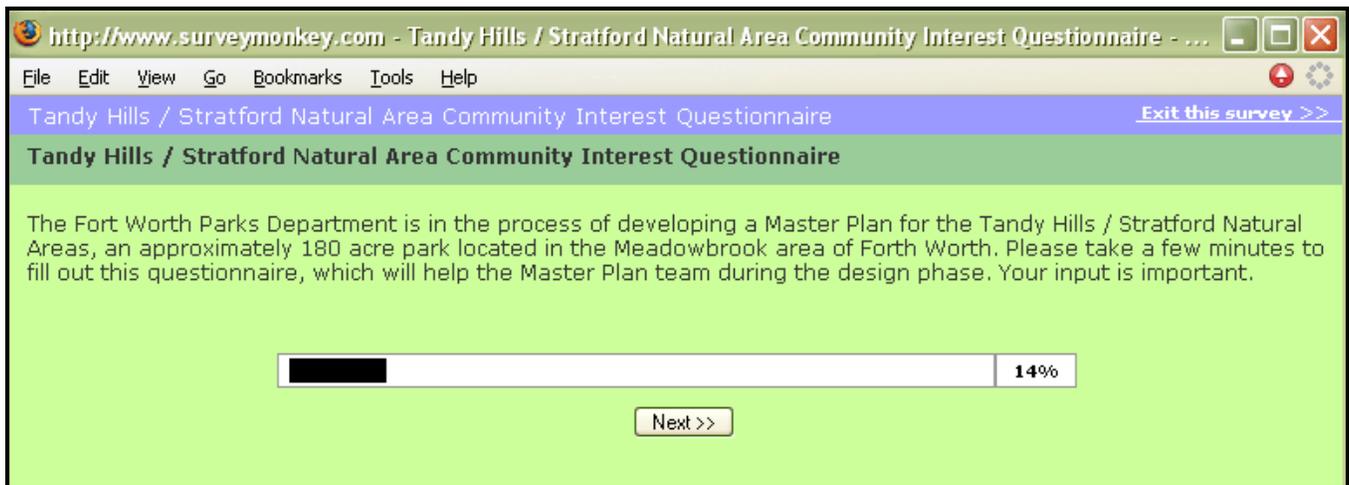
Your name, address and email:

Do you have any other thoughts or concerns about the development of the Tandy Hills/Stratford Natural Area? (Use back if needed.)

* This survey was originally designed to be printed on Legal paper. It has been reproduced to show the approximate layout of the distributed survey.

Supplement 2
Online Survey

Tandy Hills / Stratford Natural Area Survey Page One



Tandy Hills / Stratford Natural Area Survey
Page Two

http://www.surveymonkey.com - Tandy Hills / Stratford Natural Area Community Interest Questionnaire - ...

File Edit View Go Bookmarks Tools Help

Tandy Hills / Stratford Natural Area Community Interest Questionnaire [Exit this survey >>](#)

Visiting the Park

1. How often have you visited Tandy Hills Park within the last year?

At least once a week.

At least once a month.

A few times a year.

Rarely or never.

2. How often would you visit the park after it is developed?

At least once a week.

At least once a month.

A few times a year.

Rarely or never.

3. How would you want to visit the park?

Alone.

With family.

With a youth group.

With an adult group.

4. Would you be interested in Astronomy Gazing?

Yes.

No.

5. Would you need parking to visit the park?

Yes.

No.

6. Would you bring groups to the park?

Yes.

No.

How large a group?

7. Would you need parking for school buses?

Yes.

No.

Tandy Hills / Stratford Natural Area Survey
Page Three

The screenshot shows a web browser window with the URL <http://www.surveymonkey.com> and the page title "Tandy Hills / Stratford Natural Area Community Interest Questionnaire". The browser's address bar and menu bar are visible. The page content is on a light green background and is titled "Trails".

1. What types of trails would you like to have at the park?

- Accessible and/or surfaced.
- Easy hiking.
- Moderate hiking.
- Challenging hiking.

2. How would you most likely use the trails?

- Guided tours.
- Self-guided exploration.
- Both guided tours and self-guided exploration.

At the bottom of the form, there is a progress bar that is mostly black, with a white segment on the right labeled "43%". Below the progress bar are two buttons: "<< Prev" and "Next >>".

Tandy Hills / Stratford Natural Area Survey
Page Four

http://www.surveymonkey.com - Tandy Hills / Stratford Natural Area Community Interest Questionnaire - ...

File Edit View Go Bookmarks Tools Help

Tandy Hills / Stratford Natural Area Community Interest Questionnaire [Exit this survey >>](#)

Access to the Park

1. Do you think the park should be fenced?

Completely.

Partially.

Not at all.

2. How many entrances do you think the park should have?

One.

Two.

More than two.

Open everywhere.

3. Do you think access to the park should be controlled?

Yes.

No.

Other (please specify)

 57%

Tandy Hills / Stratford Natural Area Survey
Page Five, Part One

The screenshot shows a web browser window with the URL <http://www.surveymonkey.com> and the page title "Tandy Hills / Stratford Natural Area Community Interest Questionnaire". The browser's menu bar includes "File", "Edit", "View", "Go", "Bookmarks", "Tools", and "Help". The page content is titled "Interpretive Programs" and contains four questions:

1. Would you be interested in having a nature center at the park?

- Yes.
- No.

2. How often do you think you would participate in activities at a nature center in the park?

- At least once a week.
- At least once per month.
- A few times a year.
- Rarely or never.

3. What activities would you be interested in?

- Family programs.
- Adult programs.
- Children's programs.
- School programs.

4. When would be the best time to offer classes or activities?

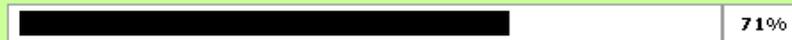
- After school.
- Weekday evenings.
- Weekend (a.m.)
- Weekend (p.m.)

Other (please specify)

5. What type of interpretive material would you like to have in the park?

- Trail guide.
- Signage along the trails.
- Kiosk at the trail head.
- On-line material.

Other (please specify)



[<< Prev](#) [Next >>](#)

Tandy Hills / Stratford Natural Area Survey
Page Six

http://www.surveymonkey.com - Tandy Hills / Stratford Natural Area Community Interest Questionnaire - ...

File Edit View Go Bookmarks Tools Help

Tandy Hills / Stratford Natural Area Community Interest Questionnaire [Exit this survey >>](#)

Volunteering

1. Would you be interested in volunteering at a nature center in the park?

- At the nature center.
- Leading adult tours.
- Leading children's tours.
- Training guides.

Other (please specify)

2. Would you be interested in volunteering for management or maintenance activities?

- Removal of invasive trees.
- Planting and/or seeding.
- Trail construction and/or repair.
- Erosion control or restoration of closed trails and roads.

Other (please specify)

86%

[<< Prev](#) [Next >>](#)

Tandy Hills / Stratford Natural Area Survey
Page Seven

The screenshot shows a web browser window with the following elements:

- Browser Title Bar:** `http://www.surveymonkey.com - Tandy Hills / Stratford Natural Area Community Interest Questionnaire - ...`
- Browser Menu Bar:** File, Edit, View, Go, Bookmarks, Tools, Help
- Page Header:** Tandy Hills / Stratford Natural Area Community Interest Questionnaire [Exit this survey >>](#)
- Section Header:** Contact
- Question 1:** 1. Would you like to be on a mailing list for the Tandy Hills / Stratford Natural Area Park? If so, please provide the following information.
 - Name:**
 - Address:**
 - City/Town:**
 - State/Province:** -- select state --
 - ZIP/Postal Code:**
 - E-mail:**
- Question 2:** 2. Do you have any other thoughts or concerns about the development of the Tandy Hills / Stratford Natural Area?
 -
- Progress Bar:** A black progress bar is shown at 100%.
- Navigation Buttons:** << Prev and Done >>

Figure 1

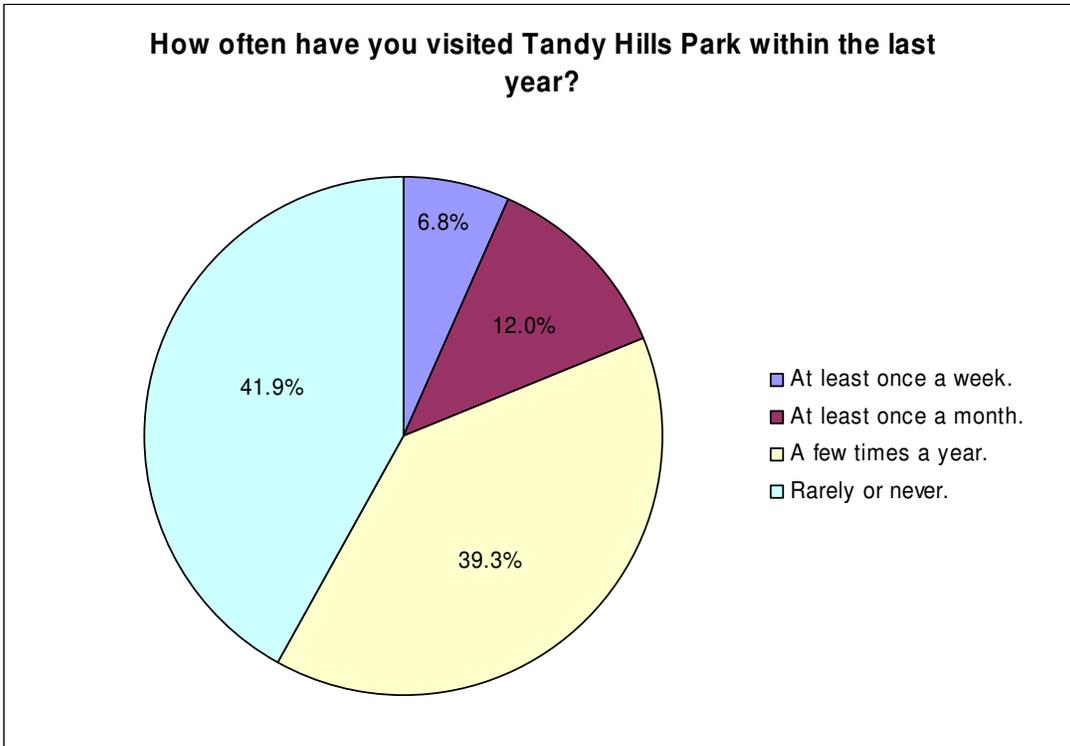


Figure 2

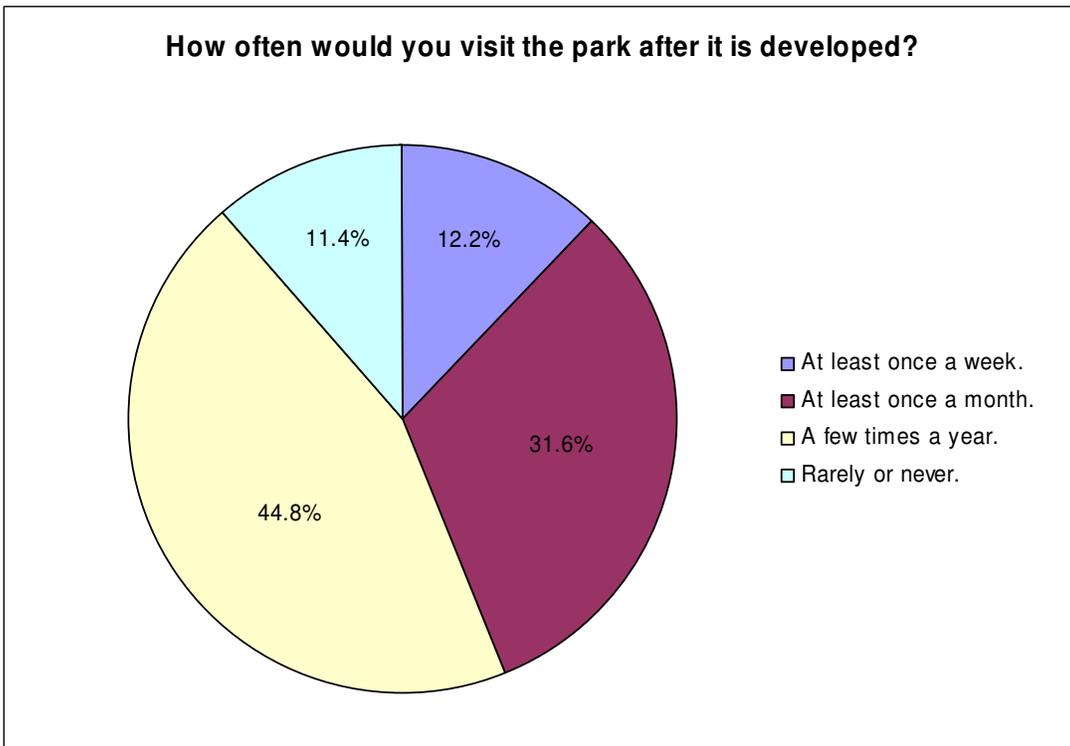


Figure 3

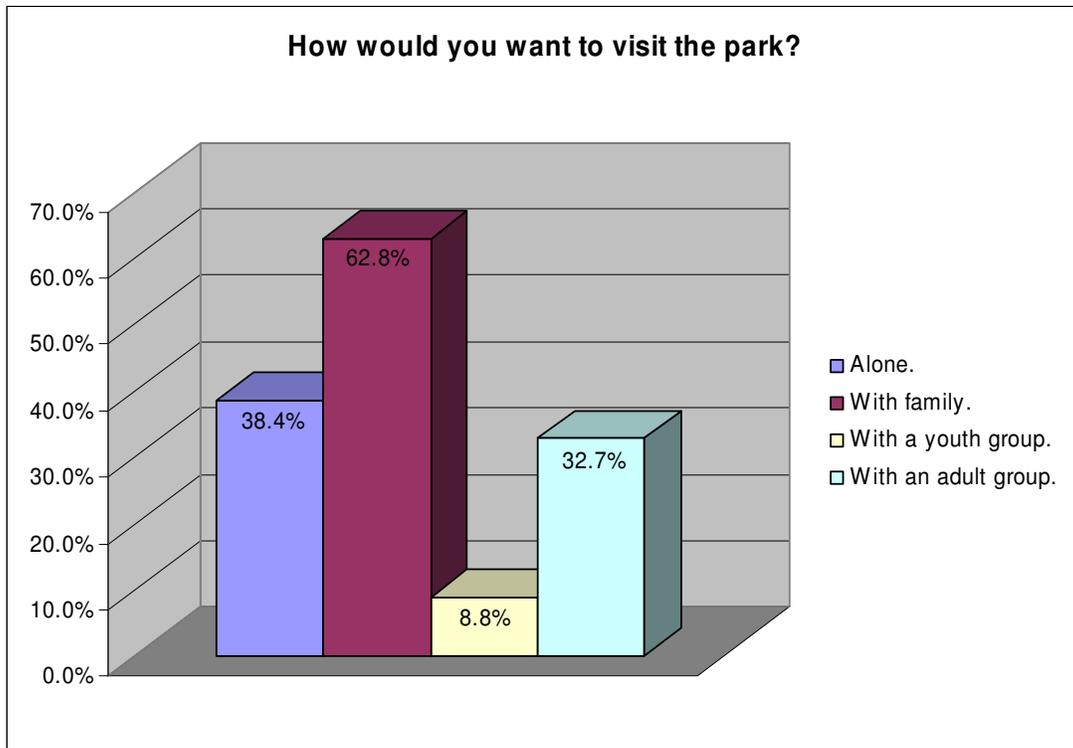


Figure 4

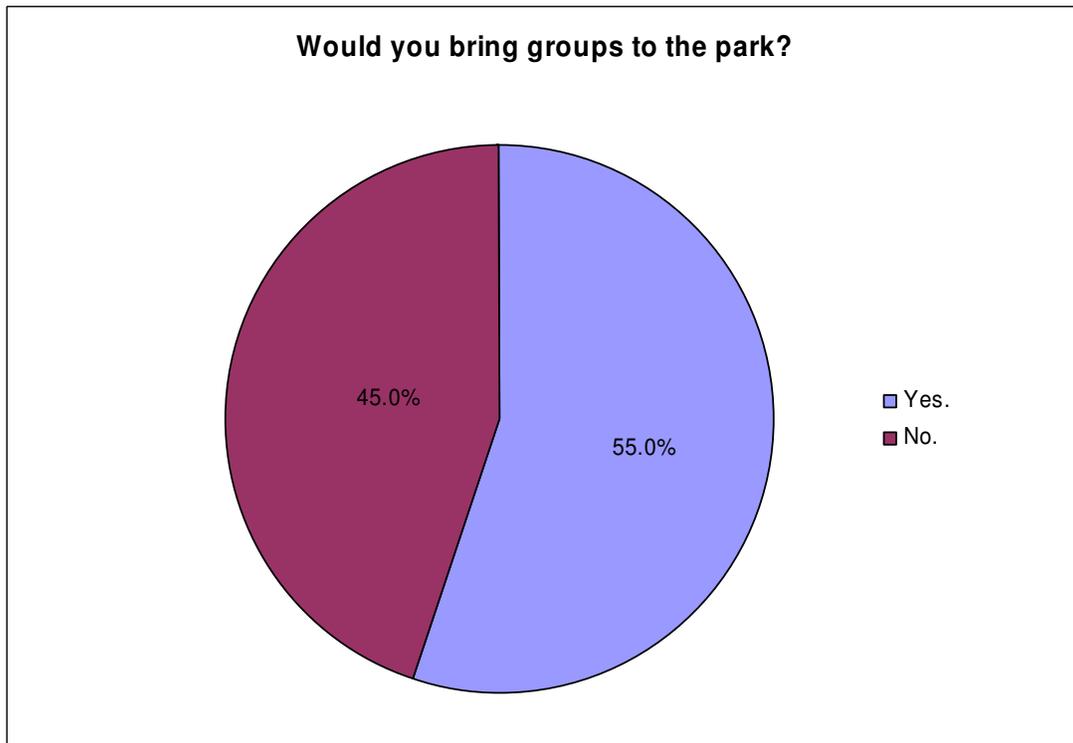


Figure 5

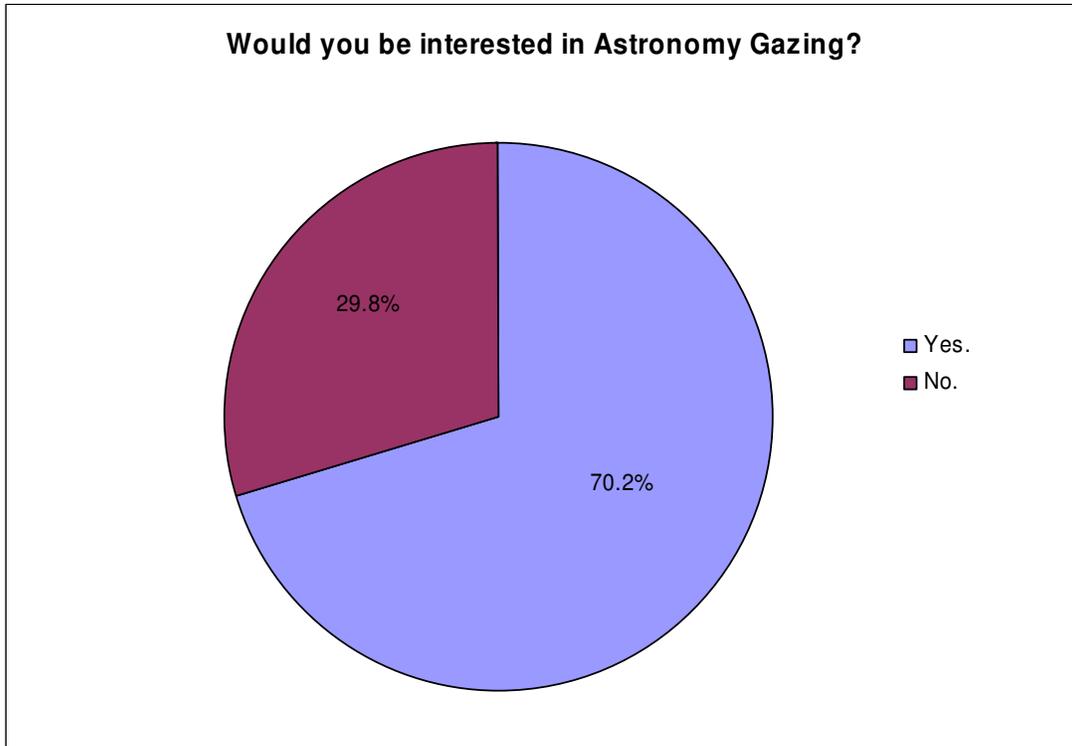


Figure 6

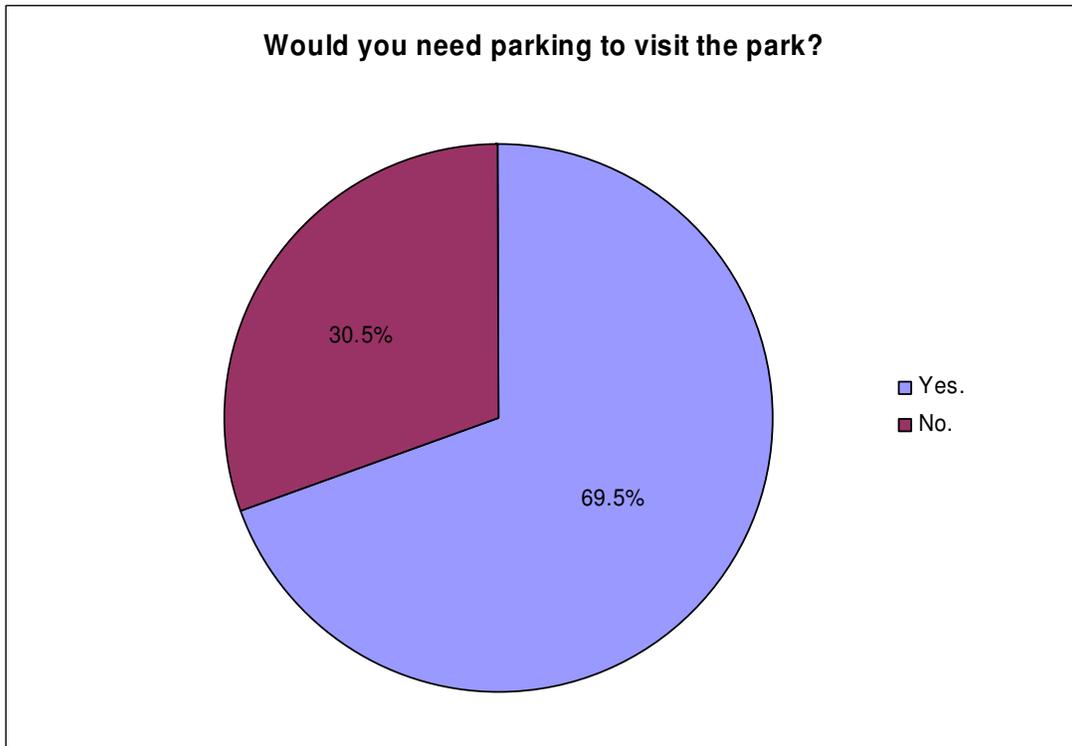


Figure 7

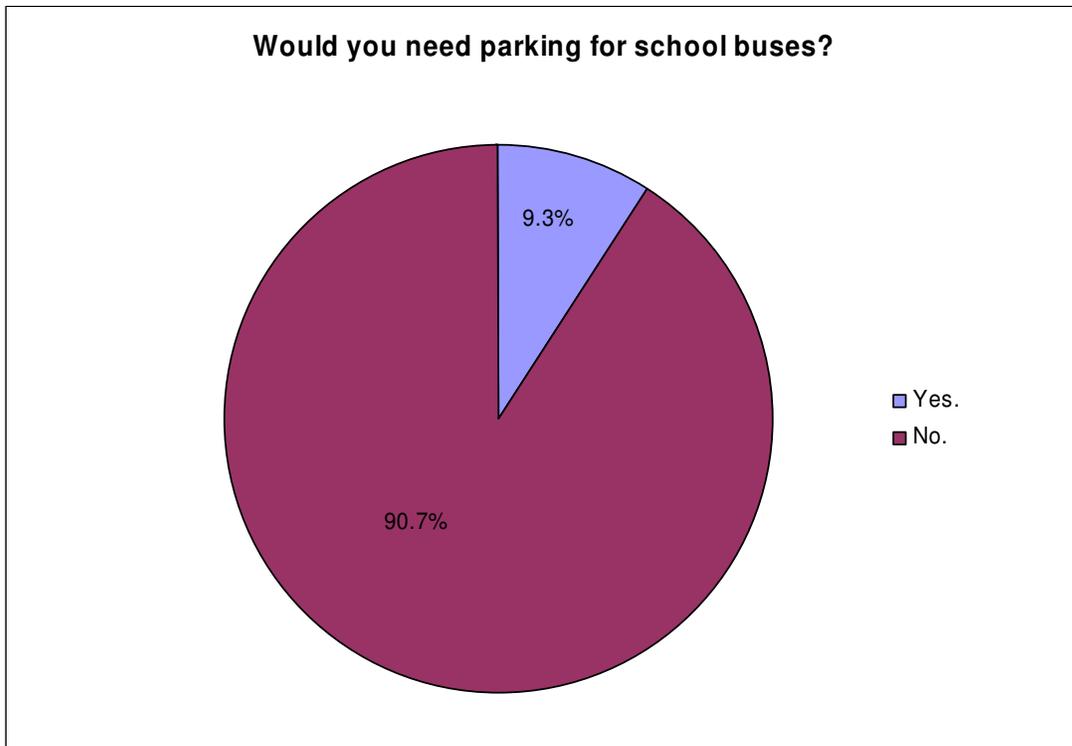


Figure 8

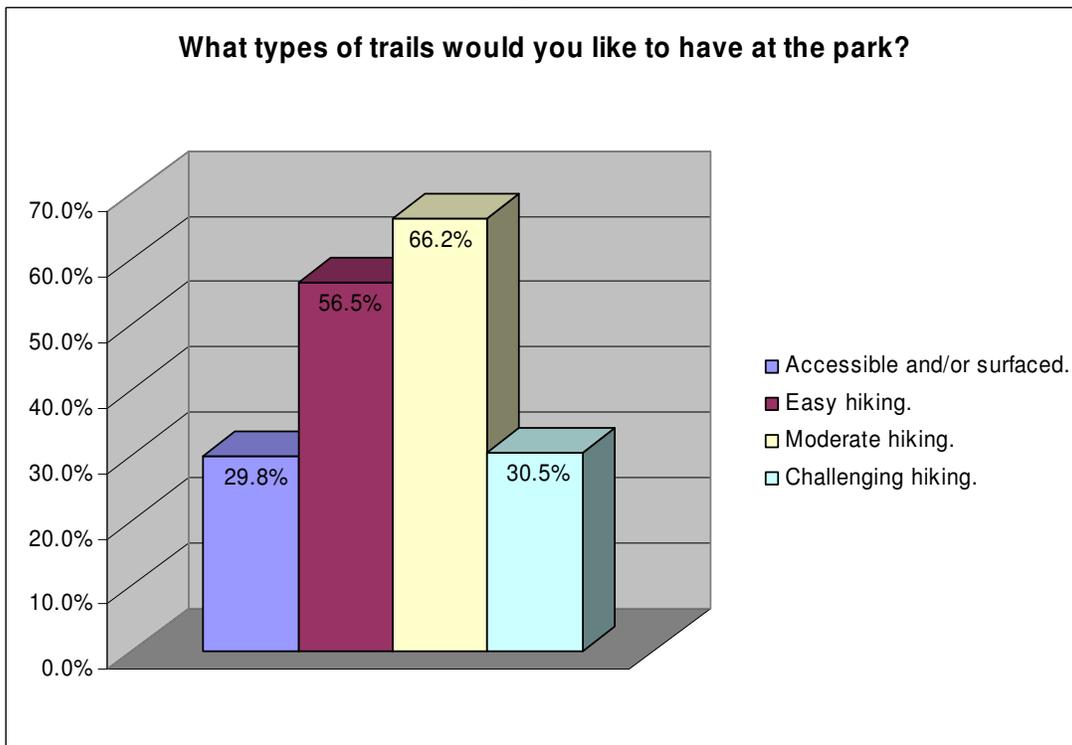


Figure 9

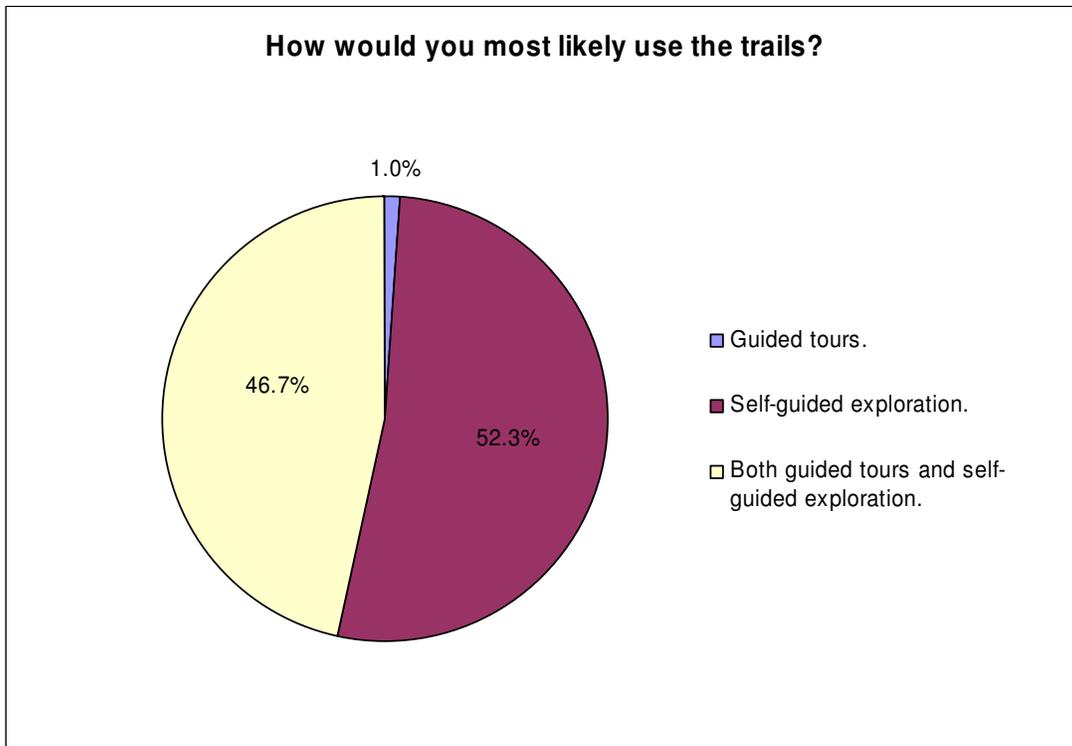


Figure 10

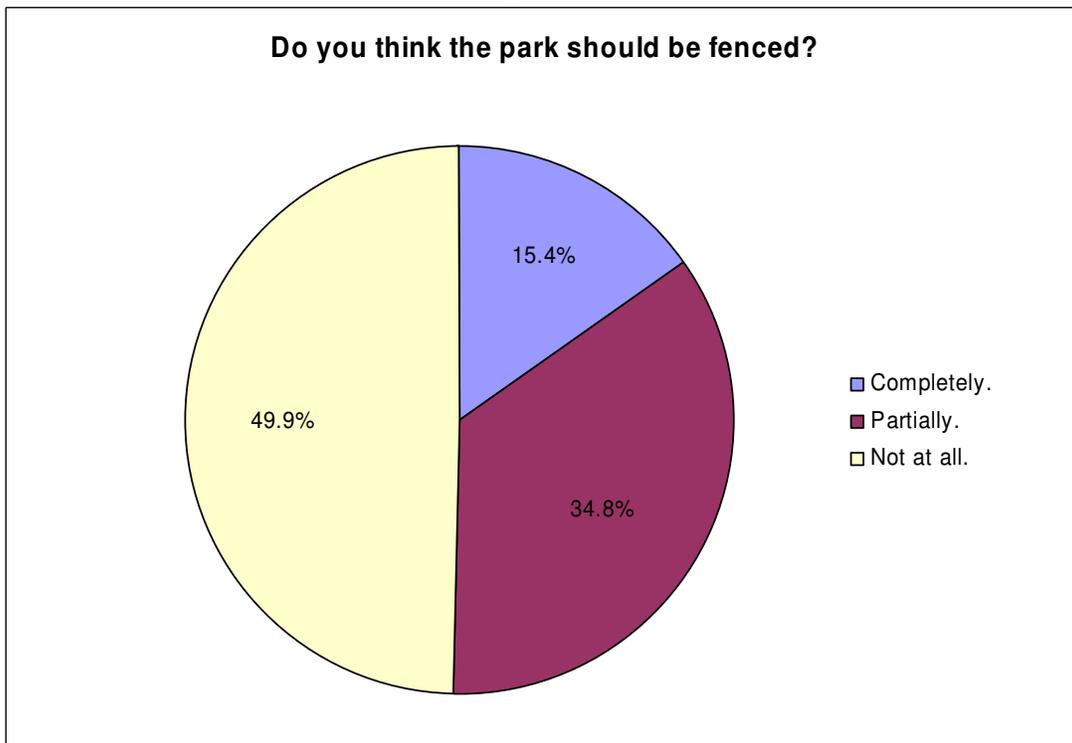


Figure 11

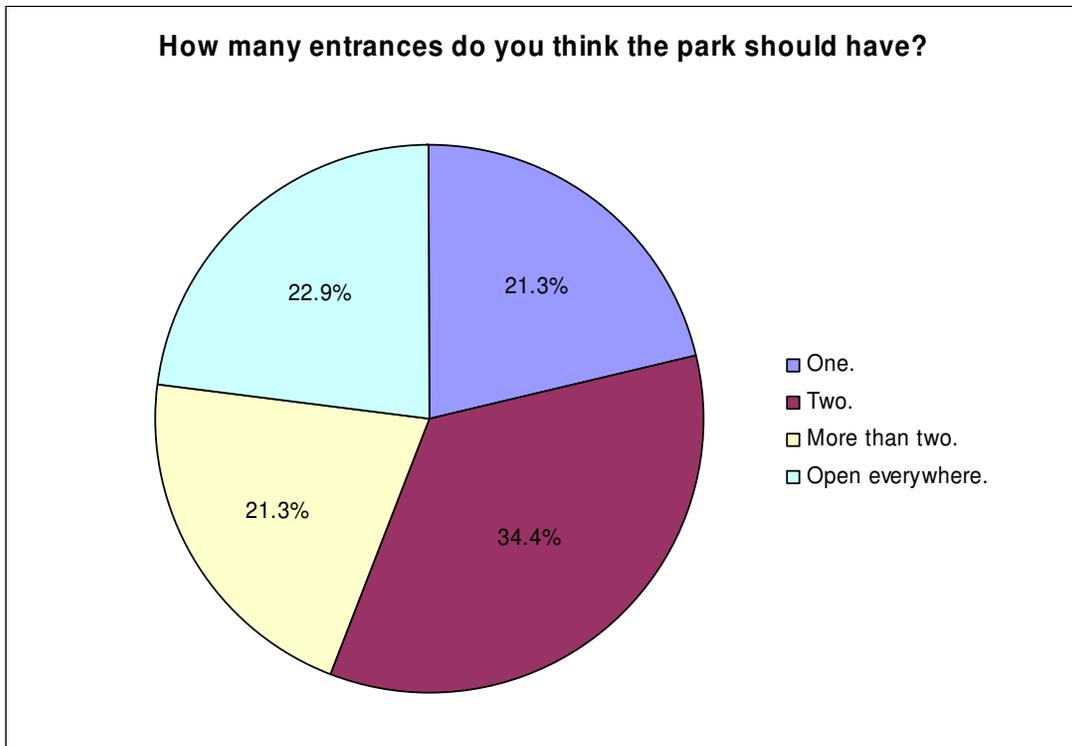


Figure 12

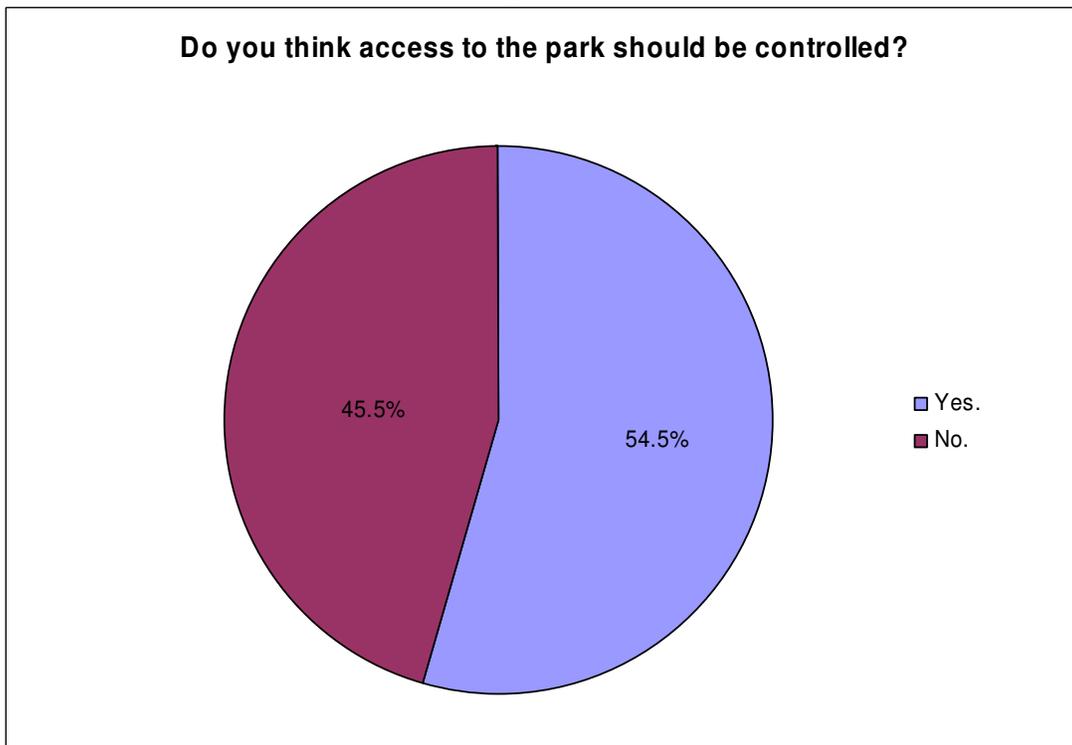


Figure 13

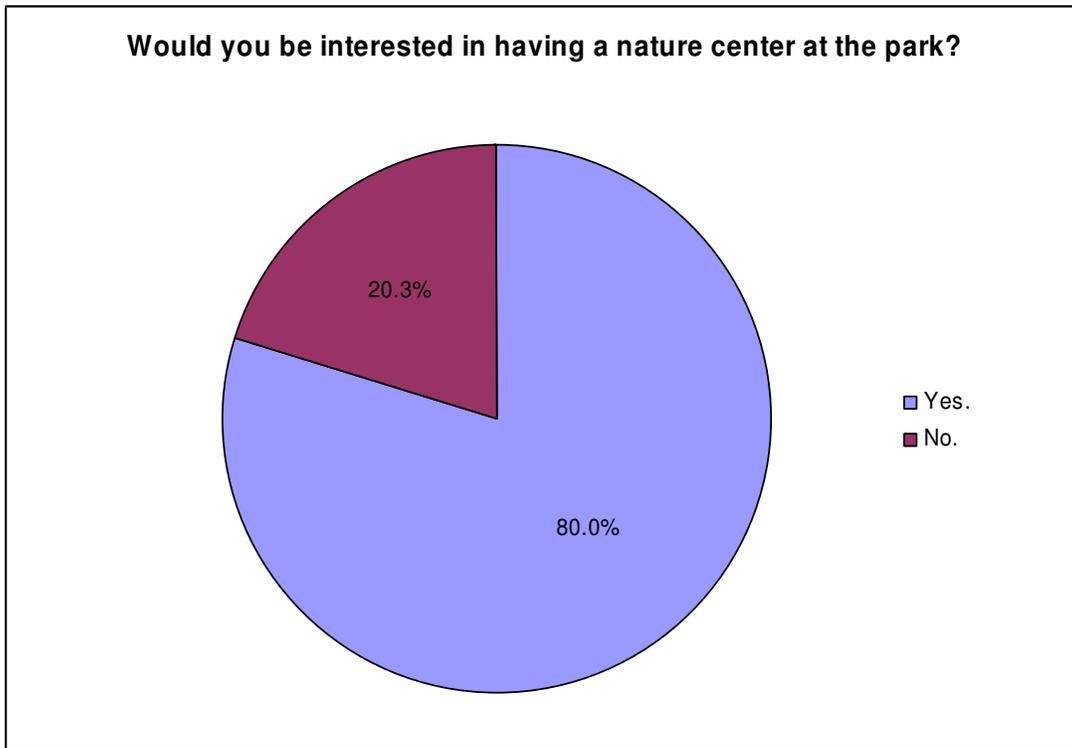


Figure 14

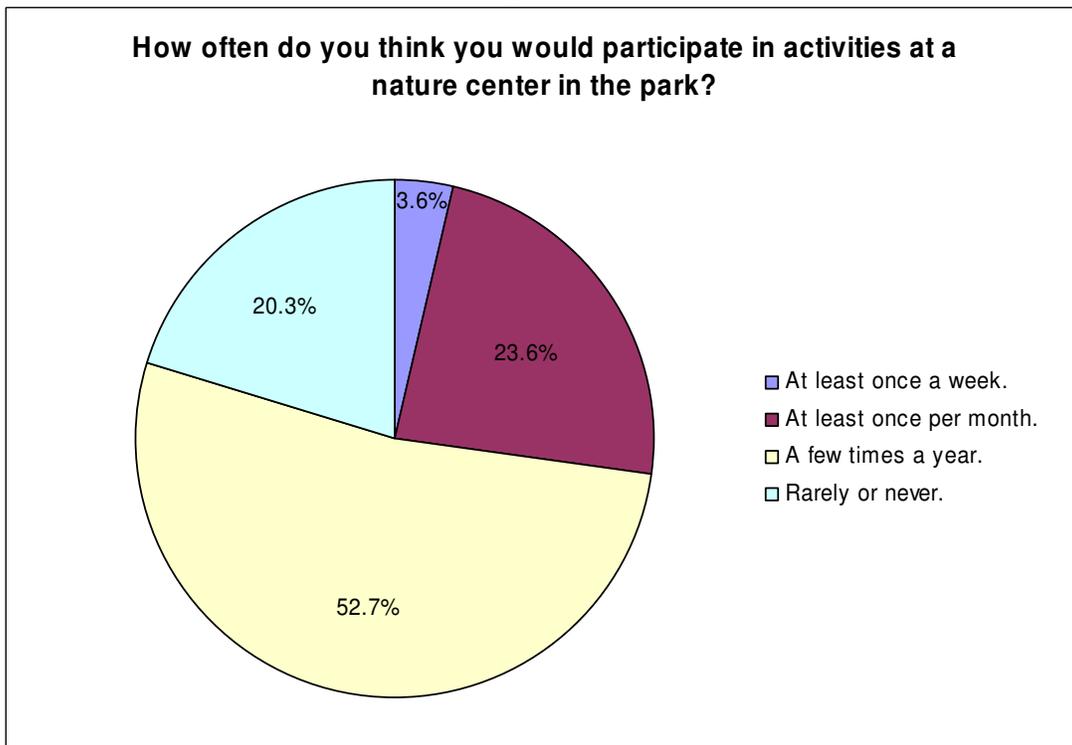


Figure 15

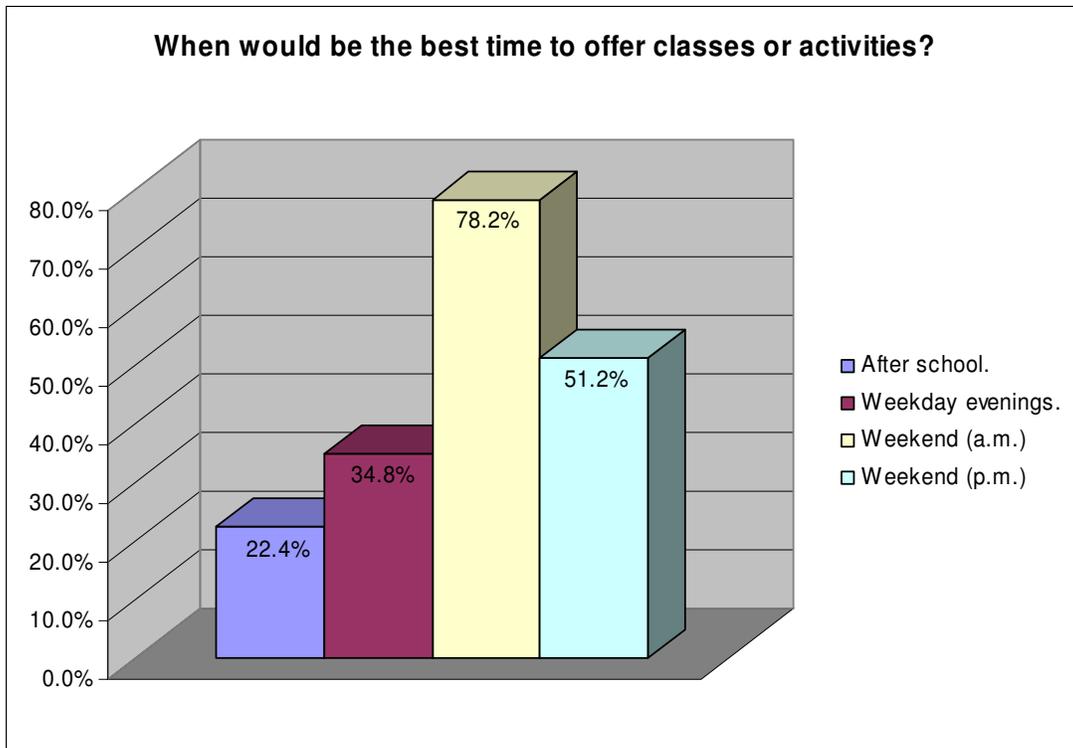


Figure 16

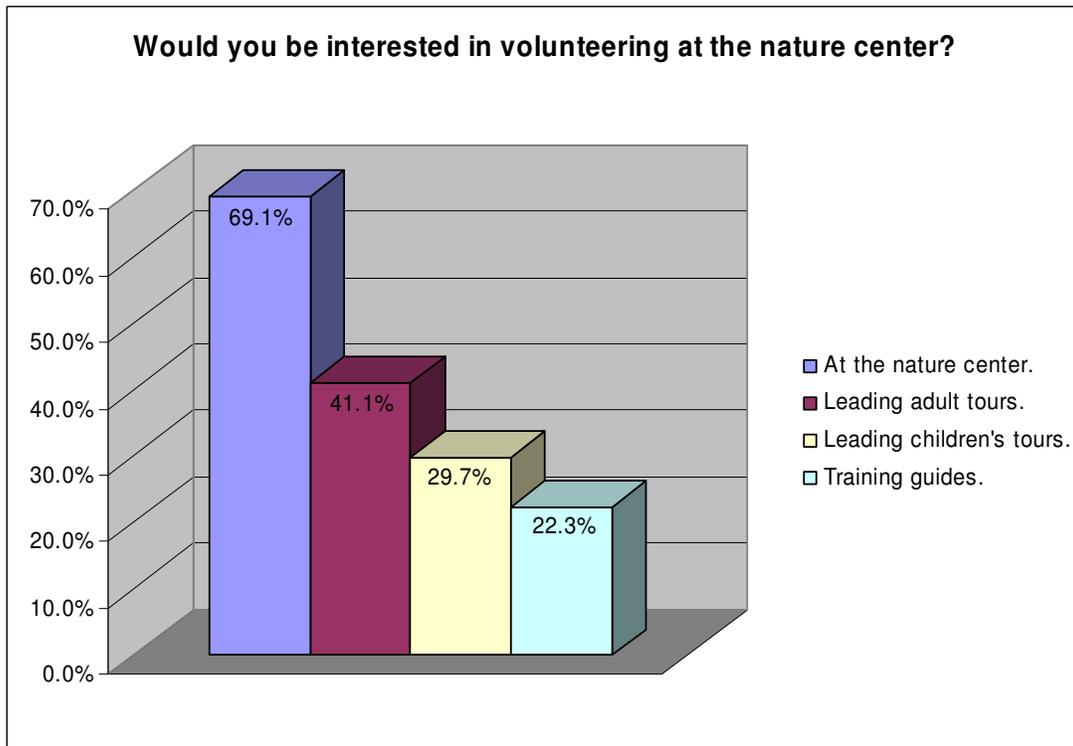


Figure 17

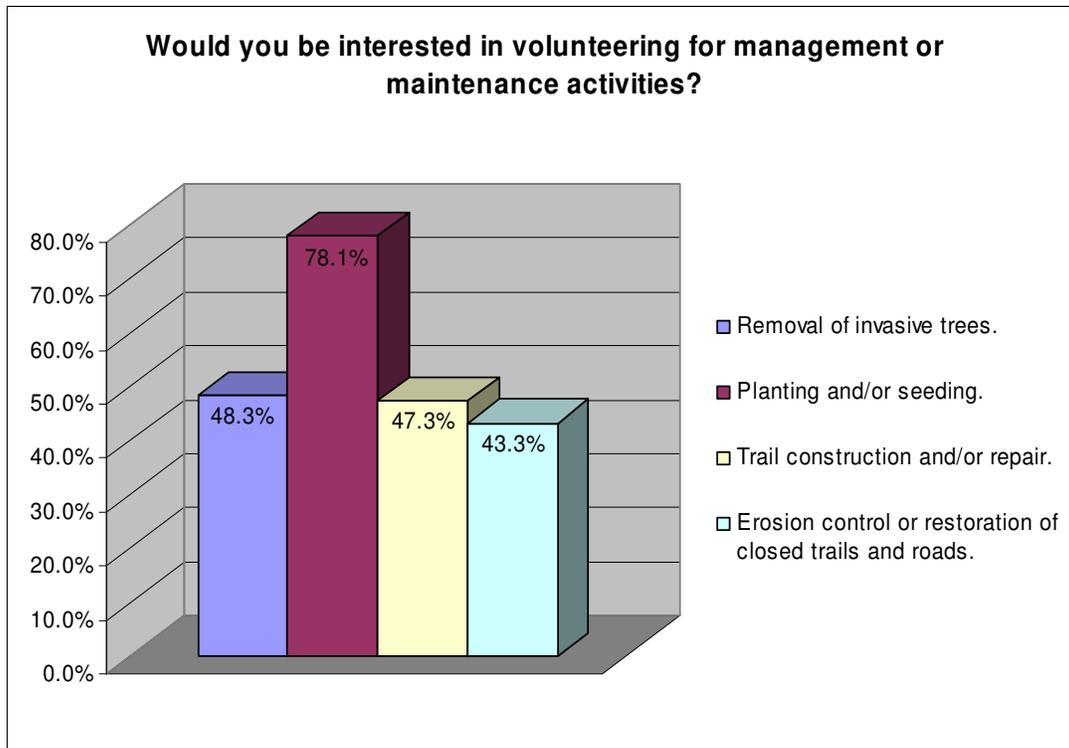


Figure 18

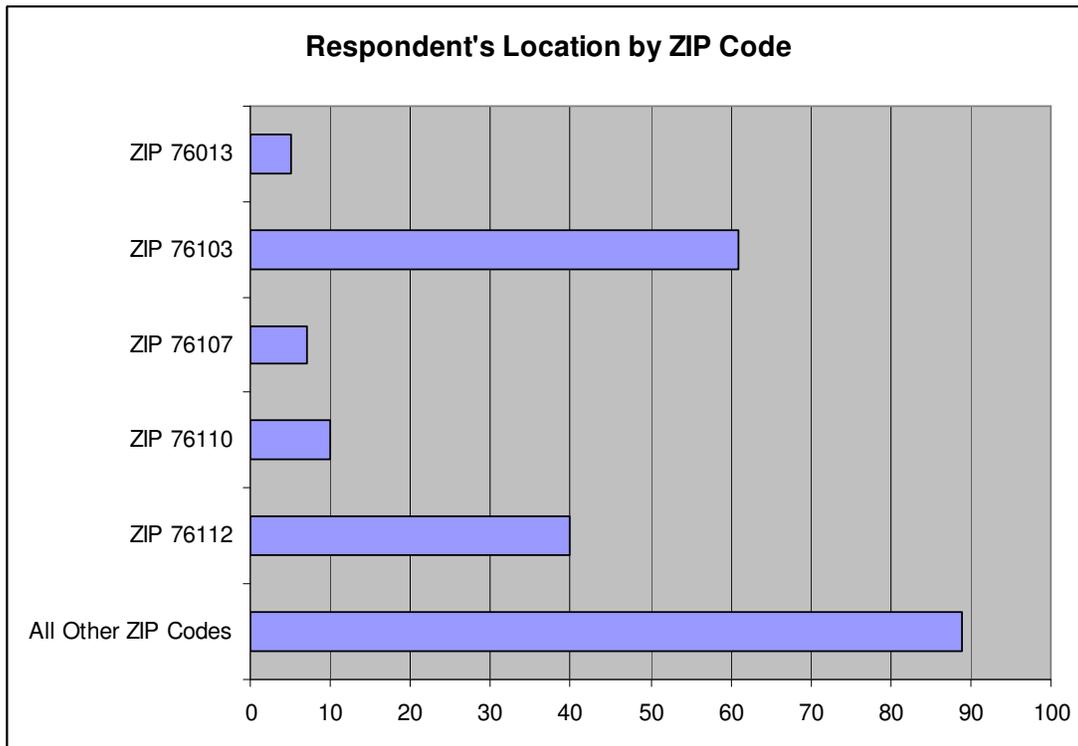
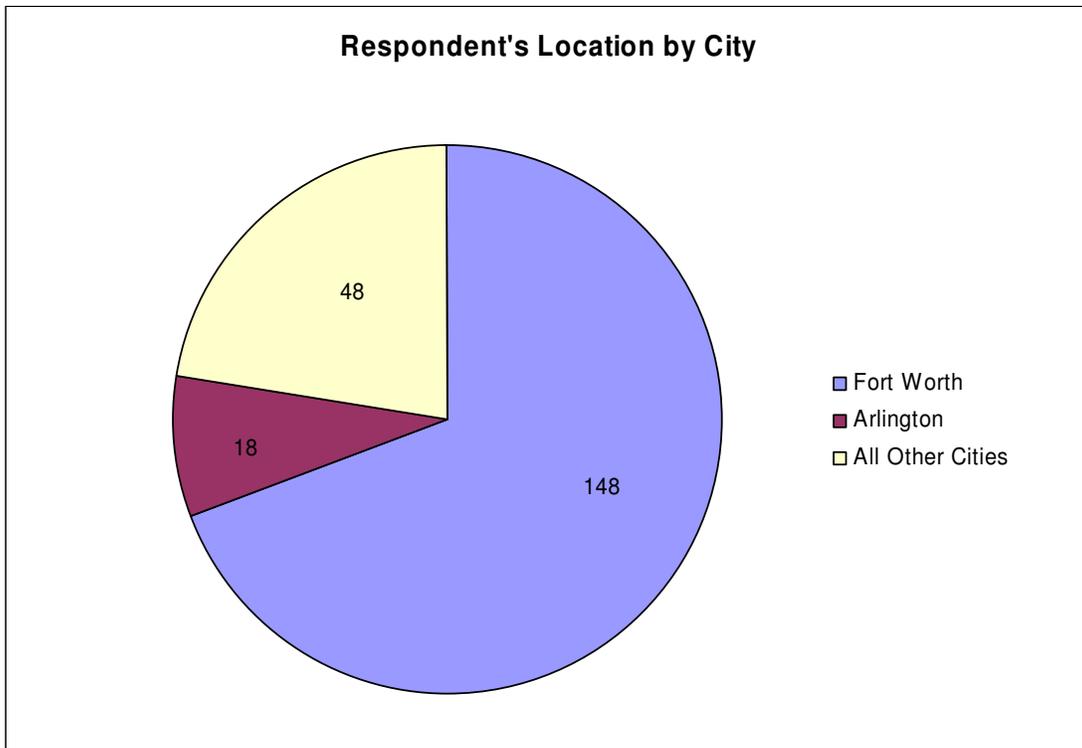


Figure 19



APPENDIX 4

Wildland Urban Interface Prescribed Burning Talking Points

Wildland Urban Interface Prescribed Burning Talking Points

Glen Gillman
Fire Management Specialist
glen.gillman@ci.austin.tx.us

General

- The primary goal for any treatment is to ensure that you have the opportunity to burn again which requires a conservative approach to mitigate negative impacts.
- You must take the long view and understand that no one burn is important enough to put your program in jeopardy.
- Every prescribed burn that is conducted either increases or decreases the public acceptance of prescribed fire as a management tool. WUI burns are generally high visibility burns which mean their successes or failures are magnified.
- WUI burns require a greater attention to detail because the heightened public scrutiny and the greater potential for legal claims do not allow for mistakes.
- Don't confuse risk with complexity. A burn conducted in the WUI increases the risk substantially but the complexity of the operation does not change greatly. The added complexity is generally due to off-site issues (media etc.) but nothing really changes with the implementation of the burn.
- The biggest concern on these operations is generally not the fire but the smoke. The technical challenges with implementing burns are easier to solve than managing the smoke properly. Successful smoke management is often a matter of communication with the public.
- The WUI problem has largely been misrepresented as a location when it is actually a condition. If the neighborhoods surrounding the project are not ignitable than an escape fire is not a critical issue and you are primarily dealing with smoke management issues.
- We are urbanizing rapidly and will need to increase our WUI burning in the future. If it's not a WUI burn now it probably will be soon.
- A prescribed burn is only one ember away from being a wildfire so we must ensure our suppression response is as good as it can be which requires regular communication and coordination with the fire departments.

Process

- Planning begins at least 6 months prior to project implementation.
- Contact local fire jurisdiction as soon as possible to indicate intent and provide them an opportunity to participate in planning.
- A site visit is generally conducted with the responsible fire jurisdiction to ensure they are comfortable with the plan.
- A permit is generally needed and secured during this site visit.
- Notify all schools, hospitals, HOA, or other large smoke receptors early in planning process.
- Letters are mailed to individuals that may be impacted by the smoke (generally within ½ mile of the unit but sometimes further) to identify individuals who may be impacted by the smoke. They are instructed to call the office and are added to a notification list and are called prior to the burn.

-
- Posters are placed at the entrances to surrounding neighborhoods with the same information to ensure individuals that did not get the letter have an opportunity to respond.
 - Conduct situational update meeting with fire departments to ensure they are comfortable with the project, particularly with the long range weather forecast.
 - Press release sent to media outlets at least 12 hours before the burn.
 - On burn day notify all of the dispatch offices (law enforcement and fire), the responsible fire jurisdiction, the responsible fire marshal, all surrounding fire jurisdictions, Texas Forest Service (not required), TCEQ (not required) and other agencies.
 - Post signs on adjacent roadways indicating that there may be “Smoke on the Road” or that this is a “Prescribed Fire-Do Not Report”.
 - Develop Incident Action Plan with fire department to outline expectations in the event of an escape fire and identify communications channel.

Implementation

- Plan for the media and expect them to arrive. Try and get the media close to the site. We want them to see us managing a fire and not provide them with a telephoto shot of fire coming through the tops of the trees.
- Identify a media staging location, a public information officer, and somebody to assist them (the media tends to come in twos or threes).
- Expect visitors of all types. We change our gate combos to keep our partners off the site during the burn but often get the public trespassing on our property to see what is happening.
- Ensure you have adequate smoke monitoring in place.
- Keep the units small and/or break the unit into small blocks in case you need to stop early due to smoke management concerns.
- It is sometimes more favorable to burn at the high end of your prescription to get better smoke dispersion.
- Plan for perceptions and not reality. We don’t want a column of smoke in the air when the kids are being picked up from school even though there is no greater risk.
- Use a standard training or qualification system to facilitate cooperation between partners and better manage safety concerns.
- Document your actions.