

# **DEVELOPING SIGNAGE AS EFFECTIVE OUTREACH**

**Environmental Survey Consulting**

**[www.envirosurvey.com](http://www.envirosurvey.com)**

# **WHY SIGNAGE?**

**“To the average passerby,  
a restoration project  
without a sign  
is a bunch of weeds.”**

# WHY SIGNAGE?

**Attract attention**

**Tell a story**

**To change behavior**

**Represent the city**

**In lieu of on-site staff**



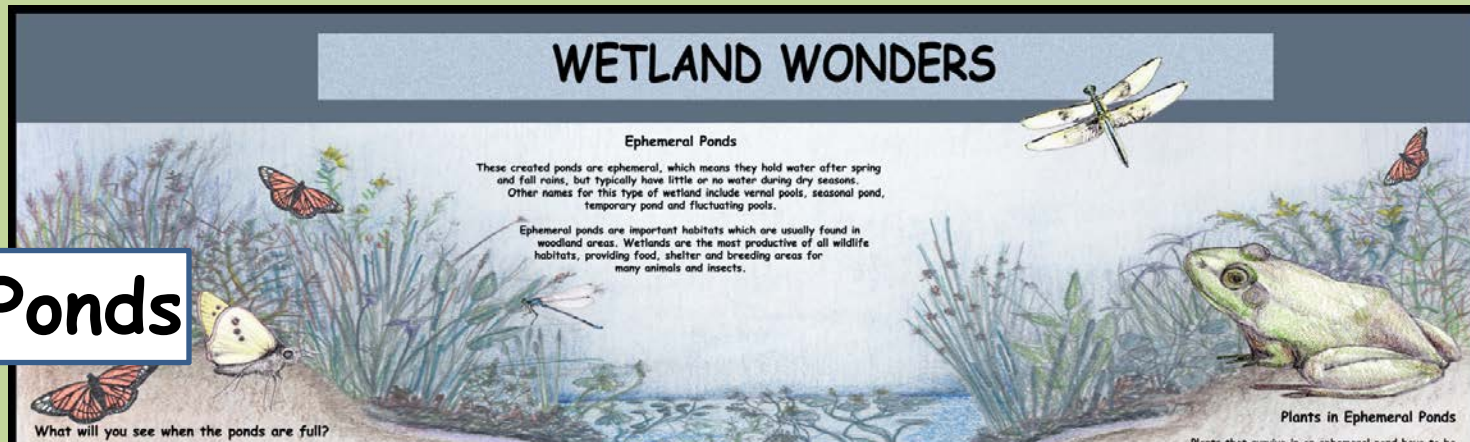


# Opportunity to Educate the Public

## Importance of protecting the environment

## Opportunity to translate science to citizens

### Ephemeral Ponds



### What will you see when the pond is full?



### What will you see when the pond is empty?



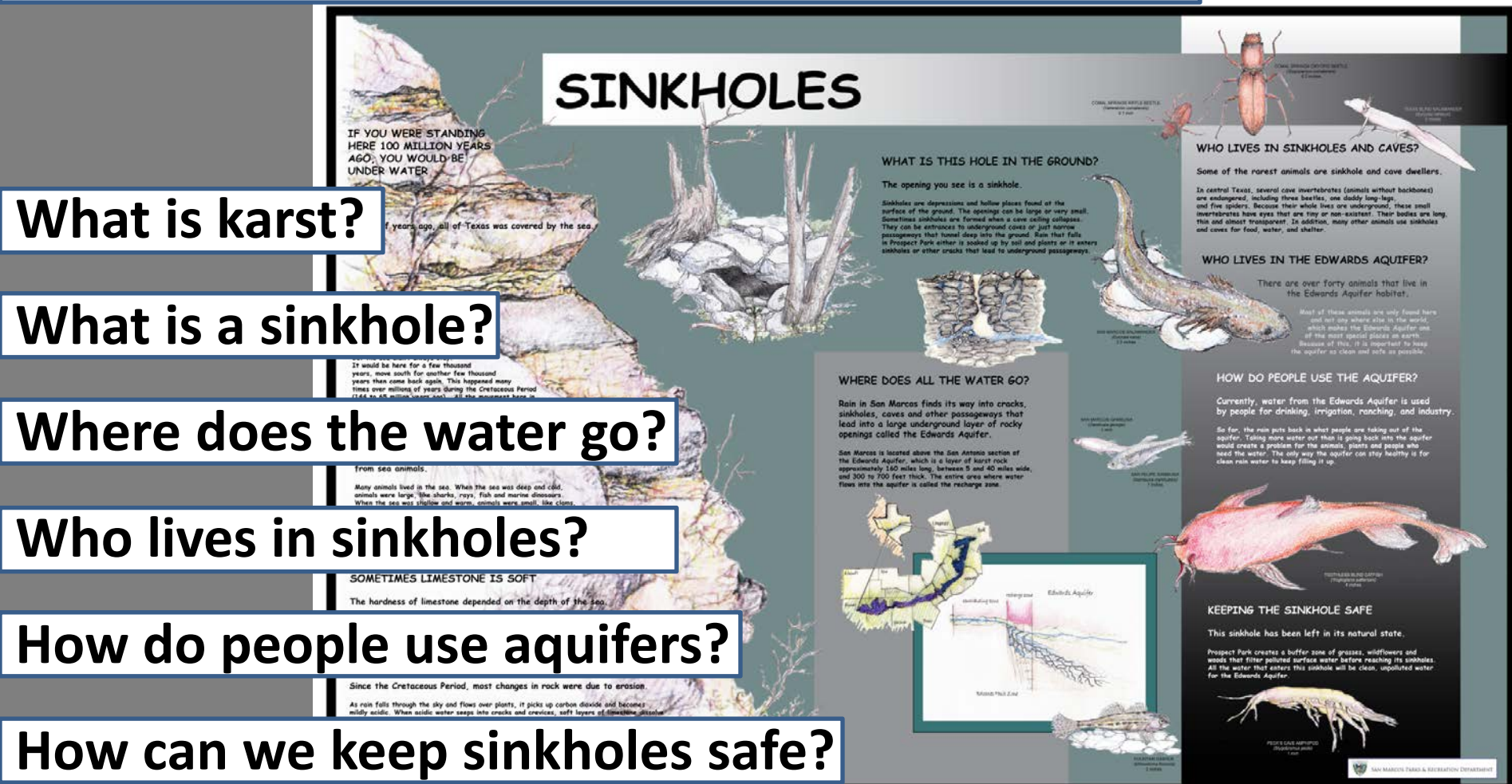
### Importance of protecting wetlands



# Increase Environmental Literacy

# Environmental problems of your project

## Opportunity to put your project in perspective

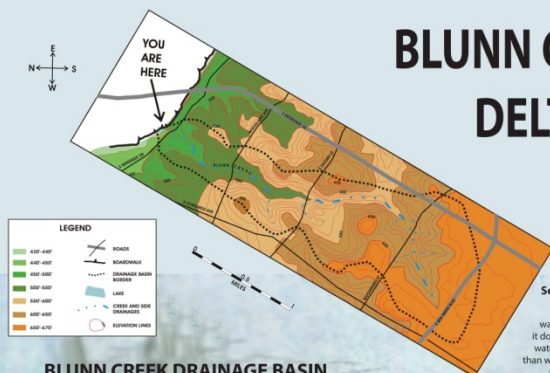




# Increase Environmental Literacy

## Teach habitat restoration principles

### BLUNN CREEK DELTA



#### BLUNN CREEK DRAINAGE BASIN

##### WHAT IS A DRAINAGE BASIN?

A drainage basin is the entire area collecting rainwater into a creek. The outer rim of the basin connects high points surrounding the creek.

##### LENGTH AND SHAPE

Blunn Creek is about 3 miles long, with several small tributaries. Land at the headwaters near E. Ben White Blvd is flat and wide. Northward towards Lady Bird Lake, the land becomes steeper along the banks.

##### ELEVATION

The elevation of the creek bed is about 670' at its headwaters and 420' at its mouth.

#### EXOTIC PLANT INVASION

Non-native plants growing in Blunn Creek delta are on federal and state noxious weed lists.

At Blunn Creek delta, the dominant exotic is elephant ear, an aggressive native of Southeast Asia. Two other exotic invasive wetland plants include alligator weed and yellow flag iris.

##### WHAT IS AN EXOTIC INVASIVE PLANT?

An exotic plant is not native to this region. It's invasive if it outcompetes our native plants.

Invasive exotic plants tend to reproduce abundantly, out-compete other plants, adapt to many conditions, and are not affected by native diseases. They dominate and change the native habitat. They are not susceptible to checks and balances controlling native species, thus disrupting natural ecology and causing a decline in healthy diversity.

##### HOW DO YOU CONTROL INVASIVES?

Measures have been taken to manage exotic species at Blunn Creek delta.

Removal techniques include hand removal and careful herbicide treatment. Experimental areas have been set up to monitor management strategies. Results will be shared with The Trail Foundation and City of Austin.

#### WHAT IS A DELTA?

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##### Sediment is suspended then deposited.

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#### EVOLUTION OF A DELTA



##### 1952: Before Longhorn Dam

Before construction of the 1960 dam, the Colorado River raged through Austin during floods, shifting sediment deposits and sandbars. During the 1930s, major floods left thousands of people homeless and destroyed dams, bridges, and livestock. In 1935, floodwaters submerged Congress Avenue Bridge and reached the steps of the Capitol.

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Longhorn Dam created the 7th Highland Lake. Buchanan, IMA, Witt, Mac Crackie, Mansfield and Ten Miller were constructed in the 1930s and 1940s by CMAA for flood control. City of Austin built Longhorn Dam as a cooling pond for Seaboard and Holly Street Power Plants and for public enjoyment. The dam controlled and defined the river as a lake. Sediment deposited from the river was deposited along the banks to create New Land.

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##### 2002: Extension of Shallow & New Lands

New land continued to form as sediment from Blunn Creek accumulated in the delta.

As sediment piled higher than the lake, upland vegetation sprouted and thrived. New land became stable, with new deposits creating more sandbars, including a new island at Blunn Creek's mouth. The delta began to extend beyond the parking lot and Jari's Crab Shack.

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##### 2014: What is the Future?

Nature never stands still. There is always change.

In Blunn Creek delta, large storms could blow out sand bars, creating openings for water flow. An extreme current could cut out the island's bank, causing the island to collapse. Deep-rooted trees create stability, minimizing change. But changes will happen over time, whether building up, tearing down, or shifting the delta's drainage patterns.

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#### Restoration of Native Habitat A diversity of native plants has been planted in the Blunn Creek delta.

Native plants support native insects, reptiles, birds and mammals, who suffer when exotic plants are dominant. Native animals and plants have evolved an interdependent web of life. In addition to creating healthy ecosystems, native plants reinforce a sense of identity and pride in our natural heritage.

#### Woodland

Since 1960, woody plants took root as new land was formed, expanding into the current woodlands.

Tree roots hold soil, creating stable habitat. Older trees are located furthest away from the lake, since they've been there longest. The island started formation about 2002 and has the youngest woodland. There is a moderate woodland diversity in the delta. Twenty-six trees, shrubs and woody vines were found during a 2013 plants survey of Blunn Creek delta, including seven non-native species.

#### Aquatic Plants

Aquatic plants grow under water, partially emerging or at water's edge in marshy areas.

Aquatic species have specific needs. Carolina fanwort grows completely submerged, except for its flowers. Emory sedge has its roots in moist soil, but can't tolerate flooding. Smooth water-pennywort has no roots, growing in floating mats. Sixteen aquatic species were found during a 2013 plant survey of Blunn Creek delta, including three non-native species.

#### Upland Grasses

Upland areas near water support grasses and wildflowers that need both extra water and soils that periodically dry out.

Grasses near water have either deep root systems or densely matted shallow roots, both of which are good for erosion control. Deep-rooted Eastern gamagrass is a workhorse, holding riverbanks through flood events and removing unwanted nutrients from water and soil. Canada wildrye grows quickly, with shallow matted roots excellent for erosion control. Six grass species were found during a 2013 plant survey of Blunn Creek delta, including two non-native species.

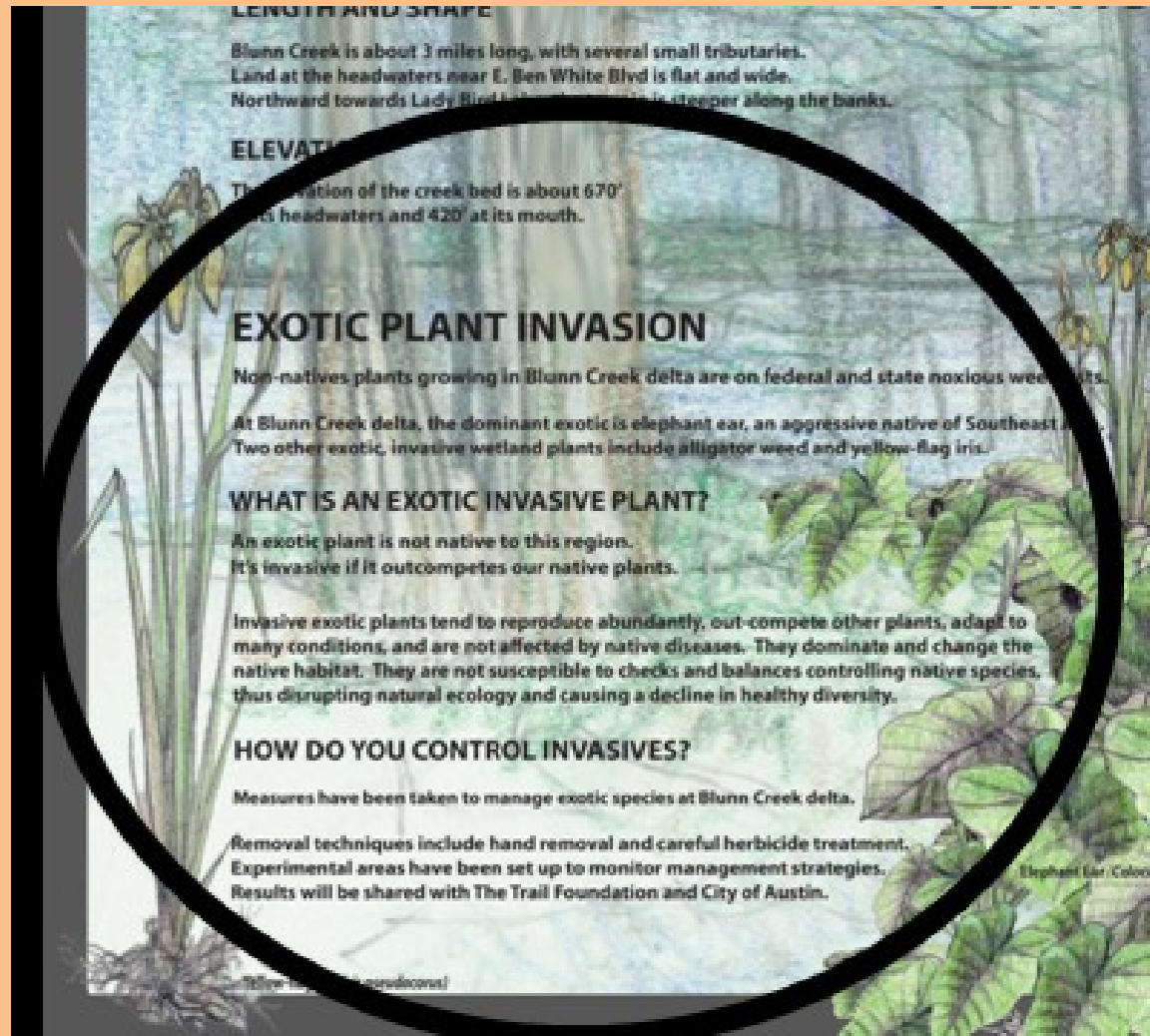
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Open, newly established land is a place for sun-loving, early succession vegetation. These stabilizing pioneer plants grow rapidly, often annuals with lots of seeds and weak root systems. Giant ragweed and common sunflower are examples of quick-growing annuals. With maturity come slower-growing, more stable perennial plants. Goldenrod and Texas aster are examples of perennial wildflowers. Nine native wildflower species were found during a 2013 plant survey of Blunn Creek delta.

# Increase Environmental Literacy

## Teach habitat restoration principles





# Increase Environmental Literacy

**Teach habitat restoration principles**

**Develop a sense of stewardship**



# Increase Environmental Literacy

Explain thinking behind solutions



Web site



# Increase Environmental Literacy

Explain thinking behind solutions





# Increase Environmental Literacy

Explain thinking behind solutions

Generic sign

Opportunity to go further



# Learn About Your Audience

## Public engagement phase





# Learn About Your Audience

## Public engagement phase





# Develop Citizen Support

Signs are one valuable tool in how people learn about a project.



People feel included when there's a sign specific to their neighborhood.

# Develop Citizen Support

Encourage practice of good stewardship



**Austin has many popular volunteer opportunities**



# Develop Citizen Support



**Watchdogs can  
reduce vandalism**

**Pride could increase  
management success**



# **Signage Design**

**Site and project specific**

**Time required – for design, layout, fabrication**

**Research and graphics/artwork**

**Easily understood language**

**Clear graphics and layout**

**Contact information for citizen participation**

# Signage Design

## 3 – 30 – 3 Approach

3 seconds

30 seconds

3 minutes

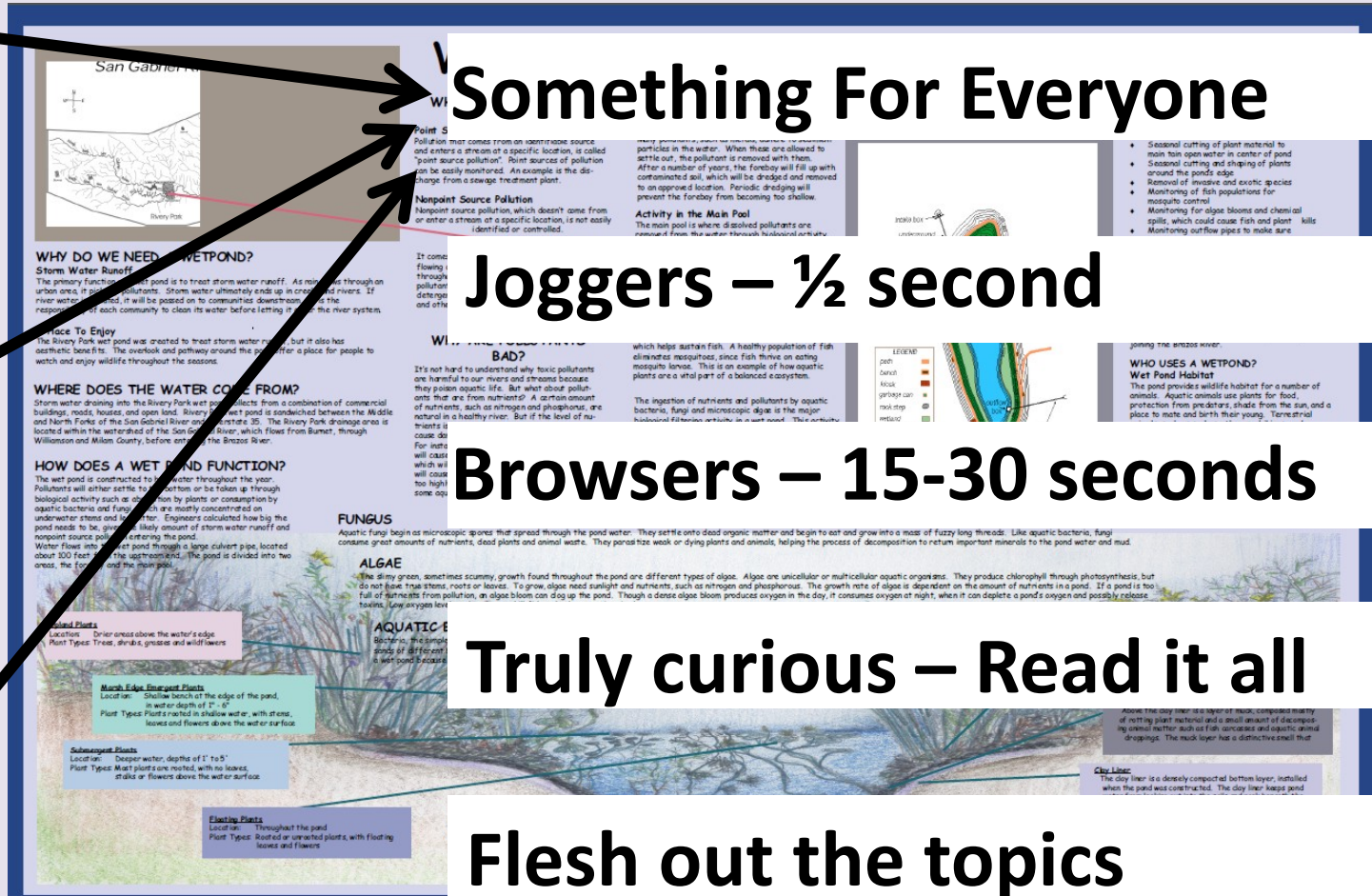
Something For Everyone

Loggers – ½ second

Browsers – 15-30 seconds

Truly curious – Read it all

Flesh out the topics





# **Signage Materials**

**Vandal-Proof as Possible**

**Permanent Vs. Temporary**

**Permanent:    Phenolic Resin**

**Temporary:    Laminated Paper**

**Printed Metal**

# Permanent Sign





# Permanent Sign

**FRIENDLY OAKS PARK**

**WATER TOWER SINK**

Water Tower Sink is an Edwards Aquifer minor recharge feature.

Karst is a limestone area with caves and sink-holes. Sink-holes are hollow places where rainwater collects and flows underground. They form when water dissolves limestone layers or when a cave ceiling collapses. Sink-hole openings can be large or small.

The opening of Water Tower Sink is so small, only tiny animals can enter. In this area, the sink-hole layer, called a solution zone, is about eighteen feet thick.



Typical Sink-Hole

**KARST FEATURES**



**WHO USES AQUIFERS, SINK-HOLES & CAVES?**

For eons, the Edwards Aquifer has kept many springs flowing, which attracted early humans to this area.

During the past 200 years, springs were important to Indians and early settlers. Currently, water from the Edwards Aquifer is used by people for drinking, irrigation, ranching, and industry.

Many animals use caves and sink-holes for food, water, and shelter. Some rare animals are cave dwellers, including three beetles, one daddy long-legs, and five spiders.

**NORTHERN EDWARDS AQUIFER RECHARGE ZONE**

Edwards Aquifer has three segments: San Antonio, Barton Springs, & Northern. Water Tower Sink is in the Northern Edwards Aquifer recharge zone, which extends from Bell County to the Colorado River.

The recharge zone is where surface water flows into the aquifer. Where limestone layers are near the surface, water can seep through cracks, fissures, caves, sink-holes and other openings. Rainwater entering Water Tower Sink flows directly into the Northern Edwards Aquifer, which is close to the surface and about 200 feet thick.



EDWARDS AQUIFER

**IS THERE A PROBLEM?**

Polluted water in the aquifer can affect both people and animals that use the water. Caves and sinkholes do not filter water. If polluted water reaches caves and sink-holes, it flows directly into the aquifer. Many pollutants can be in surface water, including leaking sewer and gas lines, animal waste, insecticides, herbicides, fertilizers and urban run-off.

**WHAT ARE THE SOLUTIONS?**

Friendly Oaks Park is part of the Fern Bluff M.U.D. Master Plan, that protects karst features such as caves and sinkholes.

Most of the park has been left in its natural state, which creates a buffer zone of grasses, wildflowers and woods. This helps filter out surface water pollutants before reaching Water Tower Sink. For additional protection, the sink-hole is fenced in. These efforts help the natural ecosystem thrive without interference.

Fern Bluff M.U.D. By Environmental Survey Consulting 2003



# Permanent Sign





# Temporary Sign





# Temporary Sign





# Temporary Sign





# RIVERY PLANTS

The following native plants were placed in and around the Rivery Park wet pond. The list is divided into planting categories. Latin names are listed in parentheses.

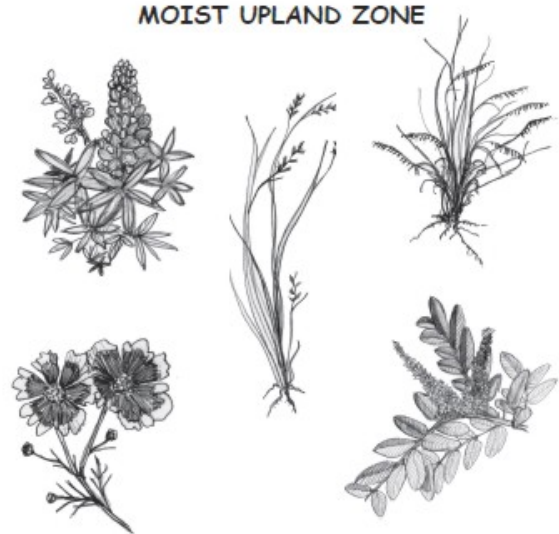
	bloom time and color			
	SPRING	SUMMER	FALL	WINTER
<b>SUBMERGENT ZONE</b>				
Coottail ( <i>Ceratophyllum</i> sp.)				
Water Thread ( <i>Najas guadalupensis</i> )				
<b>FLOATING AQUATIC ZONE</b>				
Pondweed ( <i>Potamogeton diversifolius</i> )				
Pondweed ( <i>Potamogeton illinoensis</i> )				
Yellow Water Lily ( <i>Nymphaea mexicana</i> )				
White Water Lily ( <i>Nymphaea odorata</i> )				



WETLAND PLANTS

	SPRING	SUMMER	FALL	WINTER
<b>MARSH DIVERSITY ZONE</b>				
Coastal Water Hyssop ( <i>Bacopa monnieri</i> )				
Common Arrowhead ( <i>Sagittaria latifolia</i> )				
Flat Sedge ( <i>Cyperus ochraceus</i> )				
4-Spikerush ( <i>Eleocharis quadrangulata</i> )				
Giant Bulrush ( <i>Scirpus californicus</i> )				
Horsetail ( <i>Equisetum hyemale</i> )				
Lizard's Tail ( <i>Saururus cernuus</i> )				
Louisiana Iris ( <i>Iris Louisiana</i> )				
Pickereel Weed ( <i>Pontederia cordata</i> )				
River Fern ( <i>Thelypteris kunthii</i> )				
Short Spikerush ( <i>Eleocharis macrostachys</i> )				
Soft Rush ( <i>Juncus effusus</i> )				
Star Grass ( <i>Dichromena colorata</i> )				
Thalia ( <i>Thalia dealbata</i> )				
Tri-Square Bulrush ( <i>Scirpus Americana</i> )				
Water Clover ( <i>Marsilea macropoda</i> )				
Water Pennywort ( <i>Hydrocotyle umbellata</i> )				

	SPRING	SUMMER	FALL	WINTER
<b>WILDFLOWERS</b>				
American germander ( <i>Teucrium canadense</i> )				
Aster ( <i>Aster subulatus</i> )				
Beebalm ( <i>Monarda citridora</i> )				
Black-Eyed Susan ( <i>Rudbeckia hirta</i> )				
Blue Mistflower ( <i>Eupatorium coelestinum</i> )				
Bluebonnet ( <i>Lupinus texensis</i> )				
Coreopsis ( <i>Coreopsis tinctoria</i> )				
Cutleaf Daisy ( <i>Engelmannia pinnatifida</i> )				
Frog Fruit ( <i>Phyla incisa</i> )				
Golden Groundsel ( <i>Senecio obovatus</i> )				
Indian Blanket ( <i>Gaillardia pulchella</i> )				
Lyre Leaf Sage ( <i>Salvia lyrata</i> )				
Marsh Fleabane ( <i>Pluchea purpurascens</i> )				
Maximilian Sunflower ( <i>Helianthus maximiliani</i> )				
Obedient Plant ( <i>Physostegia intermedia</i> )				
Pink Evening Primrose ( <i>Oenothera speciosa</i> )				
Purple Prairie Clover ( <i>Petalostemum purpurea</i> )				
Rose Mallow ( <i>Hibiscus laevis</i> )				
Salt Marsh Mallow ( <i>Kosteletzkya virginica</i> )				
Snailseed Vine ( <i>Cocculus carolinus</i> )				
Spiderlily ( <i>Hymenocallis caroliniana</i> )				
Straggler Daisy ( <i>Calyptocarpus vialis</i> )				
Texas Yellow Star ( <i>Lindheimeria texana</i> )				
Tropical Sage ( <i>Salvia coccinea</i> )				
Woolly Hibiscus ( <i>Hibiscus lasiocarpus</i> )				
Zexmenia ( <i>Wedelia hispida</i> )				



MOIST UPLAND ZONE

	SPRING	SUMMER	FALL	WINTER
<b>GRASSES</b>				
Big Muhly ( <i>Muhlenbergia lindheimeri</i> )				
Bushy Bluestem ( <i>Andropogon glomeratus</i> )				
Eastern Gamagrass ( <i>Tripsacum dactyloides</i> )				
Green Sprangletop ( <i>Leptochloa dubia</i> )				
Inland Sea Oats ( <i>Chasmanthium latifolium</i> )				
Jamaican Sawgrass ( <i>Cladium jamaicense</i> )				
Little Bluestem ( <i>Schizachyrium scoparium</i> )				
Sideoats Grama ( <i>Bouteloua curtipendula</i> )				
Switchgrass ( <i>Panicum virgatum</i> )				
<b>TREES and SHRUBS</b>				
Amorpha ( <i>Amorpha fruticosa</i> )				
Dogwood, Roughleaf ( <i>Cornus drummondii</i> )				
Dwarf Palmetto ( <i>Sabal minor</i> )				
Dwarf Wax Myrtle ( <i>Myrica cerifera</i> )				
Lantana, Texas ( <i>Lantana horrida</i> )				
Possumhaw ( <i>Ilex decidua</i> )				
Shrubby Water-Primrose ( <i>Ludwigia octovalvis</i> )				
Yaupon ( <i>Ilex vomitoria</i> )				
Yellow Buckeye ( <i>Aesculus pavia</i> var. <i>flavescens</i> )				





# NOTICE

NUDE SWIMMING OR  
SUNBATHING MAY BE  
OCCURRING BEYOND  
THIS POINT



# Interactive Signs



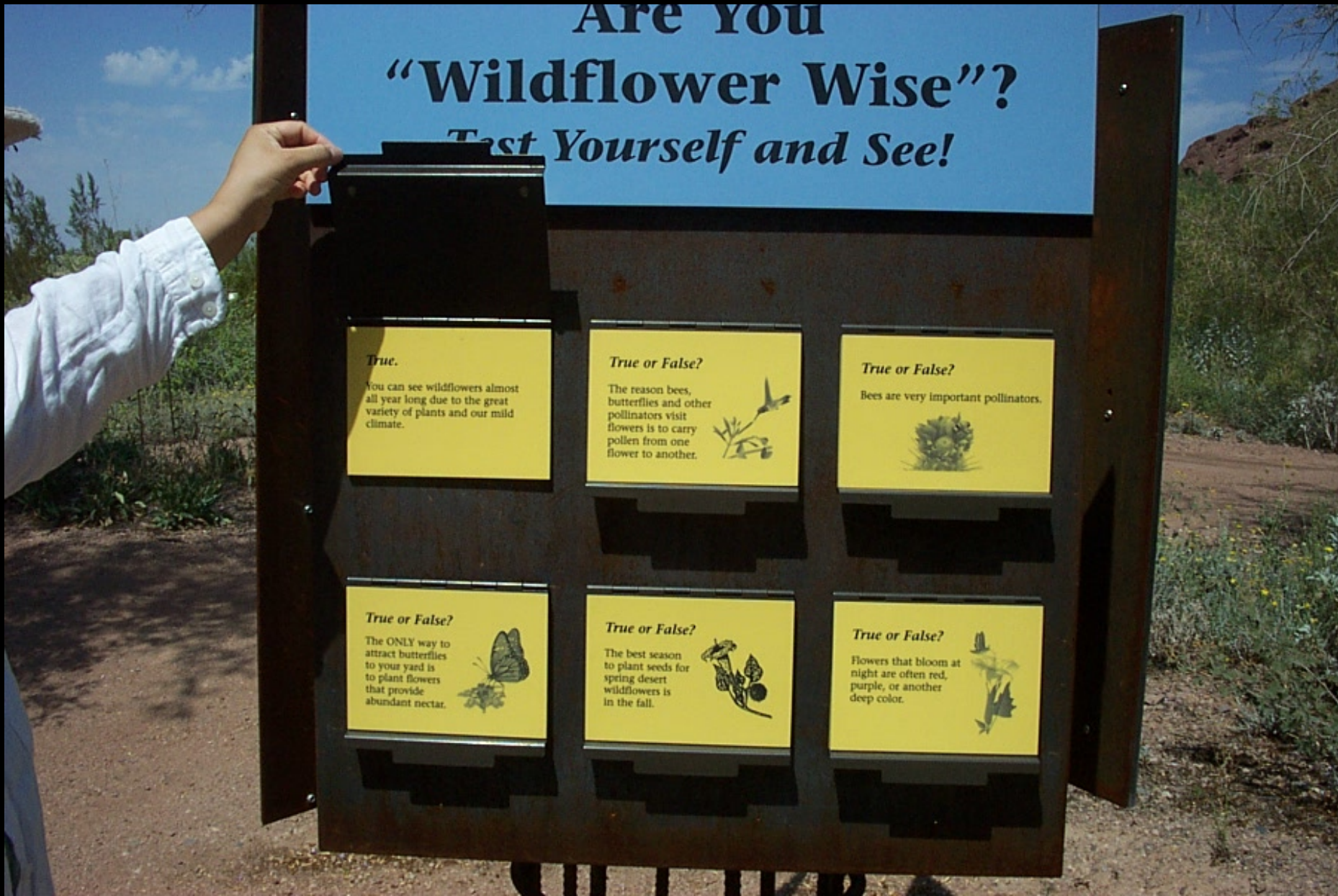


# Interactive Signs





# Interactive Signs



## Are You "Wildflower Wise"? *Test Yourself and See!*

### **True.**

You can see wildflowers almost all year long due to the great variety of plants and our mild climate.

### **True or False?**

The reason bees, butterflies and other pollinators visit flowers is to carry pollen from one flower to another.



### **True or False?**

Bees are very important pollinators.



### **True or False?**

The **ONLY** way to attract butterflies to your yard is to plant flowers that provide abundant nectar.



### **True or False?**

The best season to plant seeds for spring desert wildflowers is in the fall.



### **True or False?**

Flowers that bloom at night are often red, purple, or another deep color.





# Interactive Signs





# Interactive Signs





# Where Place Signage?

Place signs prominently



45° angle













Central Park is located around a series of "wet ponds" which hold water year-round. These ponds:

- Protect water quality by removing pollutants from the water that drains to the ponds, and
- Reduce flooding by storing rainfall runoff during storms.

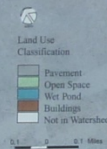


## CENTRAL PARK WET PONDS

Central Park is a 39-acre, planned community that includes housing, shops, businesses, health care and recreational facilities. It is the result of a public-private partnership between the Texas Department of Mental Health and Retardation, the Texas General Land Office, the Barshop & Oles Company, and the City of Austin's Watershed Protection Department. The multi-purpose development combines an attractive living and working environment with flood control and water quality protection.



BARSHOP & OLES  
CORPORATION



The Central Park Wet Pond Watershed covers 173 acres. Rainwater that falls on this land area drains to the wet ponds carrying trash, litter and pollutants with it.



**Pollutant Removal:** After rainfall runoff enters the wet ponds from storm drain pipes, pollutants drop from the water and settle to the bottom of the pond. Periodically, the pollutants will be removed by dredging. Wetland plants such as bulrush, arrowweed and algae also remove pollution from the water by absorbing nutrients, primarily phosphorus and nitrogen.

**Flood and Erosion Control:** During storms, rainfall runoff is stored in the ponds and released slowly to reduce flooding and erosion downstream in Waller Creek.

**Pond Ecosystem:** The average depth at the center of the ponds is 6 feet. Two waterfalls have been created between the ponds to increase oxygen in the water for fish and other aquatic life. Mosquitofish (*Gambusia affinis*) have been added to the ponds because they eat mosquito larvae. Wetland plants provide habitat for waterfowl and other wildlife.

**Pond Effectiveness:** Best pollutant removal will occur when runoff remains in the ponds for two weeks or more. During this time, a large percentage of the sediment, metals and petroleum products have been removed. The treated water is then released from the ponds to flow to the Hemphill branch of Waller Creek and eventually to Town Lake.

**Pollution Prevention:** While wet ponds are effective in cleaning polluted water, it is better to prevent pollutants from entering the water in the first place. Some things you can do to help are:

- Fertilize naturally and sparingly, never before rainfall.
- Use pesticides as a last resort.
- Wash your car at a car wash or on a non-paved surface.
- Dispose of household chemicals and automotive fluids safely.
- Maintain your car to prevent fluid leaks.



the Texas Natural Resource Conservation Commission and



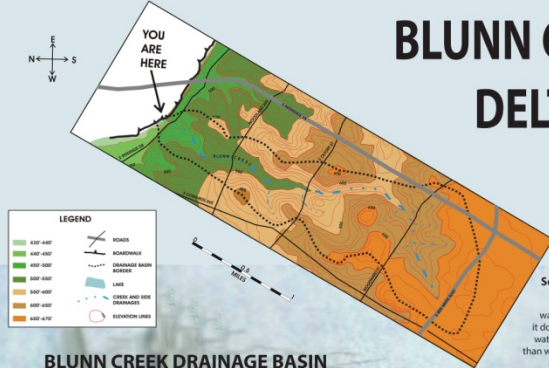
the United States Environmental Protection Agency

Additional support for the water quality pond project was provided by



# ESC EXAMPLES

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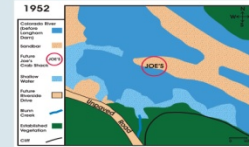
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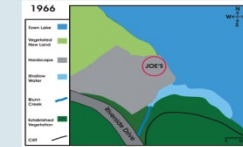
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Yellow flag iris (iris pseudacorus)

Elephant ear (Colocasia)



# ESC EXAMPLES

## WETLAND WONDERS

### Ephemeral Ponds

These created ponds are ephemeral, which means they hold water after spring and fall rains, but typically have little or no water during dry seasons. Other names for this type of wetland include vernal pools, seasonal pond, temporary pond and fluctuating pools.

Ephemeral ponds are important habitats which are usually found in woodland areas. Wetlands are the most productive of all wildlife habitats, providing food, shelter and breeding areas for many animals and insects.

### What will you see when the ponds are full?

When the ponds are full, they are wonderful places to watch, enjoy and wonder. If you sit quietly and patiently, you might see frog eyes peeking out of the water. You might observe dragonflies dipping their tails into the water as they lay next year's eggs. Perhaps you might spy animal tracks of deer, raccoons or other creatures who have visited the ponds for a drink.

### Animals in Ephemeral Ponds

These ponds are a safe place for the successful breeding of certain amphibians, reptiles and invertebrates because fish are not there to eat them. Fish require ponds with permanent sources of water. Animals that require water for reproduction need to mate and lay eggs before the ponds dry up.

Most birds aren't attracted to ephemeral ponds, since they prefer permanent wetlands. Smaller numbers of birds around the ponds makes it safer for frogs, dragonflies, as well as other amphibians and insects.

### What will you see when the ponds are empty?

When the ponds completely evaporate, there is only a dried up space. Many of the plants will be able to grow in the drought seasons, but a few will shrivel up, die and decompose. Exposed soil will look cracked and dry. The pond animals will be busy in other ways. In winter, amphibians will hibernate nearby. Some of the insects need the dry time to complete their life cycles. They will all be back when the rains return.

### Plants in Ephemeral Ponds

Plants that survive in an ephemeral pond have to be able to tolerate both flood and drought conditions. During wet seasons, the plants are adapted to survive, even though the oxygen in the soil is limited.

The plants need to grow quickly, to form as many seeds as possible before the water is gone. As you examine the ponds, either when they are wet or dry, you will see that most of the vegetation includes soft, short herbaceous plants and not tall, thick woody shrubs.

### Protecting Wetlands

People are becoming more aware how important it is to protect and save as many wetlands as possible. Many acres of wetlands have disappeared as wild lands were developed into cities and towns. These ponds will help introduce visitors to the value and wonders of wetlands.



# ESC EXAMPLES

## UPLAND KIOSK

The Nature Preserve Trail at River Place is located along part of Panther Hollow, a small drainage basin approximately three miles long and from one-third to one-half mile wide.

### GEOLOGY

#### Stratigraphic Topography

Stratigraphic topography of soft and hard limestone layers along the side creek creates many waterfalls and pools. Softer limestone erodes away long before hard limestone, leaving dense, hard layers that form ledges, overhangs, and level stretches of trail. You can see various layers of soft and hard limestone as you hike along exposed cliffs of limestone. Look for rocks that grow around hard limestone and enter the softer layers.

Waterfalls are ledges of hard limestone.

As water flows over the waterfall, there is a belouche effect that slowly erodes the soft limestone layers underneath. This creates an overhang, which eventually can crack and break off, leaving large boulders in the creek.

#### Intermittent Streams

Panther Hollow Creek and its tributaries are considered intermittent streams, which are watercourses that may dry up during periods of low precipitation. Seeps and springs are found along this creek. Spring-fed creeks are usually very clear, since the water has been filtered through underground rocks. You can tell if a creek has a constant flow of water by looking at the aquatic vegetation it supports. Some aquatic plants need constant water, while others can handle a certain amount of drying out. There is evidence that Panther Hollow Creek and Little Fern Creek nearly become completely dry.

#### Seeps

Seeps are similar to springs, but are often located at the headwaters of creeks and support a flowing body of water that is greater than a seep. Like seeps, springs provide important water for wildlife and unique wetland vegetation. Springs are uncommon and should be protected.

#### Dams

Seeps usually occur at the base of cliffs, streams, and pools. When water enters the ground through a crack, it will travel through rock layers until stopped by a dense hard layer of limestone. Water then will travel laterally until it can continue downwards to the water table, or it will end on exposed cliff where it seeps back out above ground.

#### Animals in the Watershed

Animals choose preferred habitat types based on vegetation and water requirements.

When arriving in an area, animals look for food, shelter and nesting spots. Oracle provides

important nesting holes, while wooded areas are used for potential water, hiding spots and perching places. Some animals will move between various habitat types, while others confine themselves to small areas such as the pond or pools along the creek. Waterways are important corridors that allow animals to travel and establish different territories.

Animals are indicators of environmental health. Development in an area can potentially have an effect on animal populations. Some animals will not be able to tolerate close human activity, while others, such as house sparrows and black rats, thrive in the closeness of people. Knowing what lives in the Preserve over time can provide valuable information for people shaping the area.

## NATURE PRESERVE AT RIVER PLACE



### TRAIL INFORMATION

TRAIL SECTION	LENGTH	ELEVATION	DIFFICULTY
LITTLE FERN TRAIL	5 miles	700' - 500'	steep, relatively difficult
PANTHER TRAIL / THE BOWEN WALK	5 miles	500' - 320'	about level, moderate walk
WATERS BASIN TRAIL	5 miles	500' - 320'	level, easy walk

### TRAIL RULES

These rules are intended to secure and preserve your fullest enjoyment of the Nature Preserve Trail at River Place.

- Pay traffic rules, as posted on standard vehicles.
- Hiking is allowed. Please try to avoid the vegetation.
- Please take your trash with you when you leave the trail.
- No fires, due to combustible boards of wood and dry grass.
- Firearms and hunting are prohibited.
- Persons causing damage to District property will be prosecuted to the full extent of the law.

★ The District will pay \$2500 to anyone providing information that leads to the apprehension and conviction of anyone violating this property.

### HABITAT TYPES

The Nature Preserve Trail at River Place passes through several vegetation types common to the Edwards Escarpment of the Edwards Plateau. Trails are patterned along creeks and cliff walls, offering visitors close-up views of fragile seeps and springs. Boardwalks along Panther Trail protect wetland vegetation from trampling and protect visitors from getting muddy.

#### Wetland Woodlands

Wetland woodlands are found on slopes above the creek, too far uphill to benefit from additional moisture from seeps and springs. The thin soils drain quickly, creating a zone where plants have adapted to dry conditions. The scattered larger trees have found cracks in the limestone where deeper roots can penetrate.

#### Cliff and Deep Woodlands

Along the creek there are areas with natural exposures of limestone overhangs and cliffs. The roots of hardy plants manage to grow in cracks and holes in limestone. Seeps usually occur at the base of cliffs. They are important ecological features that often support small and unique plant communities. Seeps are very sensitive and should be protected.

#### Woods

There are pockets of open areas throughout the Preserve, populated with sun-dependent grasses and wildflowers. Perennial grasses dominate these openings, with scattered perennial wildflowers competing for space. Annual grasses and wildflowers will only be found in disturbed areas or where soil is too shallow to support deep-rooted perennial vegetation.

#### Creek and Woodland Seeps

Wetland seeps feed pools and waterfalls in the limestone-bottom creek, supporting vegetation that needs extra moisture. From the Upland Black, Black Walnut Dens and Little Fern Creek drop about 240 feet in elevation before joining Panther Hollow Creek. Extra moisture along Little Fern Creek supports a "twice" wooded, which is neither extremely wet (hydric) nor extremely dry (xeric). Large trees are scattered along the creek in pockets of deeper, moister soil.

#### Wetland Woodlands

Where the trail intersects Panther Hollow Creek, the drainage basin becomes a wider Woodlands with deeper soils. At an elevation of approximately 520', the soils are composed of thousands of years of alluvial river deposits. Before the Colorado River was controlled with dams, it would regularly flood during rainy seasons. Deeper, continually moist soils support large trees and a thick understory of shrubs, ferns and vines, as well as numerous grasses and wildflowers.

#### Pond

The Pond provides important habitat for fish, birds, dragonflies, turtles, snakes and other animals. Animals use the tall marshy vegetation, both above and below the water, as protection from predators and as safe nesting spots. Vegetation around the Pond is composed of aquatic species dependent on a variety of water levels. Pond plants are either submerged (growing completely under water), emergent (rooted in water but with top growth above water), or sedge plants (growing in the moist soil surrounding the Pond).

Nature Preserve Trail at River Place is located in the foothills of the Edwards Plateau. The majority of the Nature Trail is comprised of Glen Rose Limestone, which was deposited 135 million to 70 million years ago during the Ordovician Period. Glen Rose Limestone, the most full Country limestone, has hard and soft layers of rock that have eroded into shag-top topography. Glen Rose soils are shallow, gravelly and calcareous. At lower trail elevations, the soils are an accumulation of thousands of years of Colorado River deposits of sand, silt, clay and gravel. Before the Colorado River was controlled with dams, it would regularly flood during rainy seasons and leave alluvial deposits.

During the Ordovician period a shallow sea often covered large portions of Central Texas. Each time the sea returned, sediment was deposited that included decomposed bodies, bones and shells of sea creatures. Calcium carbonate from these deposits gives the limestone its whitish color. When this solution reaches a waterfall, the additional turbulence accelerates the chemical reaction that creates travertine deposits. Over many years, these deposits build up to sizable travertine formations.

#### Travertine

Travertine deposits are forming along the creek. Travertine is a deposit of calcium carbonate that is common where water flows over limestone, especially at waterfalls. As mineral flows down the creek, it dissolves calcium carbonate from limestone, sometimes with the aid of fennic acid from decaying leaves. When this solution reaches a waterfall, the additional turbulence accelerates the chemical reaction that creates travertine deposits. Over many years, these deposits build up to sizable travertine formations.

See BOARDWALK KIOSK

For detailed information on plants and animals, as well as general information on cultural resources

RIVER PLACE M.U.D.

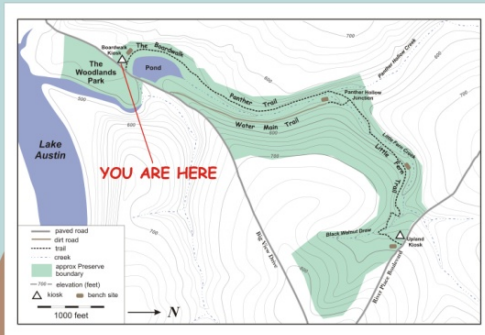
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# ESC EXAMPLES

## BOARDWALK KIOSK

## NATURE PRESERVE AT RIVER PLACE



### BURNED ROCK MIDDEN

Along the Nature Trail near the Pond are the mounded remains of a stone-lined baking pit, constructed during the Early or Middle Archaic Period (6000 B.C. - 2000 B.C.). This archeological feature, called a "burned rock midden," tells the story of how ancient hunting and gathering people of Central Texas cooked their food. A circular pit was dug and lined with small, hand-sized rocks. Fires were then built in the pit to heat the rocks, creating an "oven" for cooking animals and plants. These prehistoric people used their oven over and over. The accumulation of rocks, ashes and debris eventually created a mounded area around the center pit. After thousands of years, soil has filled in the openings, and shrubs and trees have grown on the mound. But many of the fire-cracked and burned limestone rocks are still visible at the surface and scattered around the mound.

Burned rock middens are one of the most common archeological features in Central Texas. For River Place, this is a special site, and it should be protected and valued. There is evidence of recent disturbance to the midden, probably from people hunting for archeological items. Since the site is close to the trail, neighbors can keep an eye out for vandalism. Each rock from the mound is part of an ancient story and should be left in place for posterity.

### TRAIL RULES

These rules are intended to secure and preserve your fullest enjoyment of the Nature Preserve Trail at River Place.

Foot traffic only; no bikes or motorized vehicles. Picnicking is allowed. Please take your trash with you when you leave the trail. No fires, due to combustible hazards of woodland undergrowth. Firearms and hunting are prohibited.

Persons causing damage to District property will be prosecuted to the full extent of the law.

The District will pay \$1500 to anyone providing information that leads to the apprehension and conviction of persons vandalizing this property.

Please leave everything as you found it. Please do not collect plants, animals, rocks or fossils.

### COMMON REPTILES AND AMPHIBIANS

T Travis County has about 92 species of reptiles and amphibians, the most common of which are listed below.

#### Frogs and Toads

Bullfrog  
Cliff Chorus Frog  
Crisp Frog  
Gulf Coast Toad  
Southern Leopard Frog  
Stricker's Chorus Frog

#### Turtles

Slider  
Shocking Turtle  
Spiny Softshell  
Texas Map Turtle  
Texas River Cooter  
Yellow Mud Turtle

#### Lizards

Fence Lizard  
Four-Lined Skink  
Greater Earless Lizard  
Green Anole  
Ground Skink  
Mojave Spiny-tailed Lizard  
Six-Lined Racerunner  
Texas Alligator Lizard  
Texas Spiny Lizard  
Texas Spotted Whiptail  
Western Slender Snail

#### Snakes

Black-necked Garter Snake  
Copperhead  
Common Garter Snake  
Copperhead  
Cottontail  
Diamondback Water Snake  
Eastern Corn Snake  
Eastern Hognose Snake  
Eastern Racer  
Mountain Pine Snake  
Rough Earth Snake  
Rough Green Snake  
Texas Blind Snake  
Texas Rat Snake  
Western Diamondback Rattlesnake

### COMMON MAMMALS

There are about 156 native mammals in Texas and six exotic species that have become established in the wild. The following are mammals that are common to Central Texas.

Armadillo  
Black-Tailed Jackrabbit  
Bobcat  
Cave Mole Rat  
Common Gray Fox  
Common Raccoon  
Cottontail  
Coyote  
Eastern Cottontail  
Eastern Flying Squirrel  
Eastern Gray Squirrel  
Eastern Red Bat  
House Sparrow  
Killer  
Ladder-Backed Woodpecker  
Mallard  
Mourning Dove  
Northern Cardinal  
Northern Mockingbird  
Red-Bellied Woodpecker  
Red-Tailed Hawk  
Red-Winged Blackbird  
Rock Dove  
Turkey Vulture  
White-Tailed Deer

### COMMON BIRDS

Central Texas is home to approximately 410 common, uncommon and rare bird species. These are the common birds you might see in the Nature Preserve at River Place.

American Coot  
American Crow  
Belted Kingfisher  
Brewer's Wren  
Blue Jay  
Green Heron  
Carolina Chickadee  
Carolina Wren  
Chimney Swift  
Cliff Swallow  
Downy Woodpecker  
Eastern Bluebird  
Eastern Meadowlark  
Eastern Screech-Owl  
European Starling  
Great Blue Heron  
Green-Tailed Towhee  
Green Heron  
House Finch  
House Sparrow  
Killer  
Ladder-Backed Woodpecker  
Mallard  
Mourning Dove  
Northern Cardinal  
Northern Mockingbird  
Red-Bellied Woodpecker  
Red-Tailed Hawk  
Red-Winged Blackbird  
Rock Dove  
Turkey Vulture

### PLANTS IN THE PRESERVE AREA

There are five general habitat types in the Nature Preserve and Woodland Park areas. A detailed description of each habitat type can be found at the Upland Kiosk. A preliminary list of plants is posted on the back side of this kiosk. The list, divided into plant and habitat types, indicates bloom dates, flower colors.

#### HABITAT TYPES

Little Farm Creek and Upland Woods  
Panther Hollow Creek and Floodplain Woods  
Meadows and Open Areas  
Pond Edge and Slope  
Woodland Park Creek and River Backwater

### TIMELINE: A LOOK AT THE PAST...

#### PALEO INDIAN PERIOD

12,000 - 8500 Before Present  
First evidence of human settlement in North America.  
People began to settle on terraces of major rivers.  
Gradual change from forests to grassland.  
Hunted mammoths, bison, turtles, alligators, mice, badgers, raccoons.  
Tools included darts and oblong projectile points.

#### ARCHAIC PERIOD

8500 BP - 1250 BP  
People began preparing and cooking food.  
Population continued to increase.  
Continuing change to grasslands.  
Bison still important food source.  
Tools included darts, bison/horn, stemmed and lanceolate projectile points.

#### LATE PREHISTORIC

1250 BP - 800 BP (1500 AD)  
Introduction of the bow and arrow, ceramics and possibly agriculture.  
Population declined.  
Deer was main food source.  
Presence of bison depended on grasslands.  
Tools included arrow points, beveled knives.  
Decreased use of the atlatl (spear thrower).

#### PROTOHISTORIC

Early 1500s - 1690s  
First arrival of European people.  
Tonkawa Indian territory along streams and rivers.  
Also some Comanche, Wichita, Caddo, Jumano, Lipan Apaches.  
Indians traded glass beads, gun parts, gunflints, metal projectile points and European ceramics.  
Spaniards traveled through the Hill Country in 1528.  
First Europeans encountered Tonkawas and other Indians.

#### EARLY HISTORIC

1690s - 1720s  
El Comino Real constructed in 1688, passing within 50 miles of Travis County area.  
Spanish brought sheep, horses and mules for food and trade.  
One bull, cow, stallion, and mare left at each river crossing.  
Apache Lipan Indians fled to Hill Country to escape Comanches.  
Lipan lived in bison-hide tepees; preferred bow and arrows over firearms.  
Women grew maize, beans, squash, pumpkins, and gathered wild agave.

#### MIDDLE HISTORIC

1720s - 1800s  
Spanish built many missions, altering life of native people.  
In 1730, three missions were located near what is now Barton Springs.  
Many Comanches and Kiowas moved into Central Texas.  
Hill Country was southern edge of Comanche territory.  
Comanche raids severely affected area's early history.

#### LATE HISTORIC

1800s - 1890s  
Texas Revolution and fall of the Alamo delayed settlement activity.  
Forts were built for protection from Comanche raids.  
European settlement eliminated most of native population.  
Capital of Texas moved to its present location.  
First Austin newspaper, City Gazette, was published.  
Railroad brought economic growth after the Civil War.  
University of Texas, Tillotson College and public school system opened in 1881.

#### EARLY MODERN

1890s - 1940s  
Artistic and cultural life increased.  
Cotton remained the major crop for sixty years.  
Over-farming contributed to the impact of the Great Depression.  
Starting in 1893, dams were constructed on the Colorado for flood control and electricity.

### TONKAWA AND COMANCHE TRIBES

Archaeological evidence indicates that Native Americans were the earliest inhabitants of this area. Many springs, access to the river, plenty of vegetation for shelter and food, chert limestone for making tools, plus caves and overhangs for avoiding harsh weather probably contributed to their decision to settle here. Tonkawas and Comanches tribes were the most prevalent residents when European settlement began.

### EARLY EUROPEAN SETTLERS

According to records, settlers began purchasing land in the Panther Hollow area in the mid-1800's. A nearby graveyard holds twenty-one, mostly unmarked, graves of men, women and children who were among the first European settlers to inhabit this rough but beautiful land.

### GOLD IN THE HILLS?

Legend has it that Spanish explorers buried gold in Panther Hollow. It was commonly believed that lightning often hit the hollow during thunderstorms because gold attracted lightning.

### RIVER PLACE HISTORY

#### EAST RANCH (1913-1950s)

River Place was originally part of the 3,400-acre East Ranch, purchased by Leonard C. and Vida Holly East in 1913. East was a pioneer rancher and businessman who began the L. East Produce Company, one of the first produce businesses in Austin and Central Texas. At the ranch, East punched cattle along the banks of the Colorado and grew award-winning pecans. He moved the last herd of cattle across the Congress Avenue Bridge. His son, Alvin East, continued ranching cattle and horses through the 1950s. Every fall the East family held an annual barbecue picnic at the ranch for hundreds of guests. Huge pits were dug for hundreds of pounds of mutton and beef, for a memorable Texas event.

#### FROM THE 1950S TO 1985

The East Ranch property was purchased in the 1950s by Texas Governor Allan Shivers. In 1971, River Place and the adjacent property were acquired by an investment partnership for a resort development called The Wilding. Development was stopped during the recession of 1973.

#### RIVER PLACE TODAY

The Community of River Place began in 1985 as a waterfront and country club neighborhood. Cooperation with the Federal Fish and Wildlife Department and the Balcones Conservation Plan enabled River Place to create developed areas as well as greenbelt spaces. In addition to fulfilling conservation requirements, greenbelts offer a unique enhancement for all River Place residents. Hiking the trails and observing wildlife provide opportunities to experience local wilderness much the same way original occupants did.

### PANTHER HOLLOW

#### How did Panther Hollow get its name?

In the 1940's, ranch hands from the area began finding dead goats in front of caves along the creek. A search party tracked down and killed the guilty panther. Since that time, the creek has been called Panther Hollow.



# **DEVELOPING SIGNAGE AS EFFECTIVE OUTREACH**

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