



BIRD FRIENDLY HABITATS

HOUSTON, TEXAS



CONTENTS

00.HOUSTON AUDUBON.....	05
01.SITE POTENTIAL.....	11
02.HABITAT.....	17
03.HABITAT DEVELOPMENT.....	23
04.HABITAT MAINTENANCE.....	39
05.COMMUNITY.....	49

THIS HABITAT GUIDE WAS PREPARED FOR HOUSTON AUDUBON BY CLARK CONDON WITH SUPPORT FROM THE GARDEN CLUB OF HOUSTON.

A bald eagle is perched on a dark, gnarled pine branch, looking towards the right. The eagle has a white head and neck, a yellow beak, and dark feathers on its body. The background is a dense, green pine tree with many needles and branches. The lighting is soft, suggesting a natural outdoor setting.

"THE FLIGHT AND SONG WE NURTURE TODAY DEFINES THE QUALITY OF LIFE AND SENSE OF PLACE WE SHARE TOMORROW. HOUSTON AUDUBON AIMS TO INSPIRE A CULTURE OF CONSERVATION AND A WAY OF LIFE THAT ALLOWS US TO THRIVE IN HARMONY WITH NATURE. OUR VISION IS THE CREATION OF A HEALTHIER, MORE BEAUTIFUL PLACE TO LIVE BY LEADING AND NURTURING A COMMUNITY THAT VALUES AND SUPPORTS BIRDS."

HOUSTON AUDUBON

On September 24, 1969 The Houston Audubon Society was formed by a dedicated group of eighteen men and women who saw the need for environmental education for the youth and environmental advocacy for wildlife habitats. For almost 50 years, Houston Audubon has been a committed leader in conservation and continues to serve as a financially independent chapter of the National Audubon Society in an assigned eleven county area surrounding Galveston Bay. Within this area Houston Audubon manages seventeen sanctuaries spanning 3,500 acres comprised of many diverse habitats including piney woods, marshes, and endangered coastal prairies. Today, Houston Audubon operates on the same values and purposes established by its founding fathers which were: to promote educational, scientific, literary, historical, and charitable purposes; to provide education and instruction in natural science through nature walks, field trips, and seminars, both to its members and through programs in the public school system; to create awareness of conservation problems and to explore solutions for said problems; and to promote conservation of wildlife and natural resources through education, maintenance and management of sanctuaries and coordinated activity with governmental conservation agencies.

Houston Audubon began a land acquisition program in 1987 and continues to acquire land whenever necessary and possible for preserving bird habitats. However, demands on property suitable for development often overlap with areas beneficial for wildlife habitat. As more open space is developed, alternative methods are required for creating habitat within the built environment. The design of commercial, industrial, educational, public and various other projects can incorporate the elements of Bird Friendly Habitats into their development criteria. **The purpose of this booklet is to provide the necessary guidelines for the creation of Bird Friendly Habitats into the planning of developing sites and to encourage site owners to think of the whole site - not just a piece of the site - as potential habitat.**

ADVOCACY

Promote educational, scientific, literary, historical, and charitable purposes. Create awareness of conservation problems and explore solutions for said problems.

EDUCATION

Provide education and instruction in natural science through nature walks, field trips, and seminars, both to its members and through programs in the public-school system.

CONSERVATION

Promote conservation of wildlife and natural resources through education, maintenance and management of sanctuaries and coordinated activity with governmental conservation agencies.

MISSION

Over the past century urbanization has taken contiguous, ecologically productive land and fragmented and transformed it with sterile lawns and exotic ornamental plants. We've introduced walls of glass, toxic pesticides, and domestic predators. The human-dominated landscape no longer supports functioning ecosystems or provides healthy habitats for birds.

Each community has a unique ecological and cultural story to tell. Creating Bird-Friendly Habitats is Audubon's commitment to the sustainability of our urban, suburban, and rural landscapes. We can restore and reconnect these places. We can reestablish the ecological functions of our cities and towns. We can provide essential, safe habitat for birds. With simple acts of hope, everyone can help make their community bird-friendly.

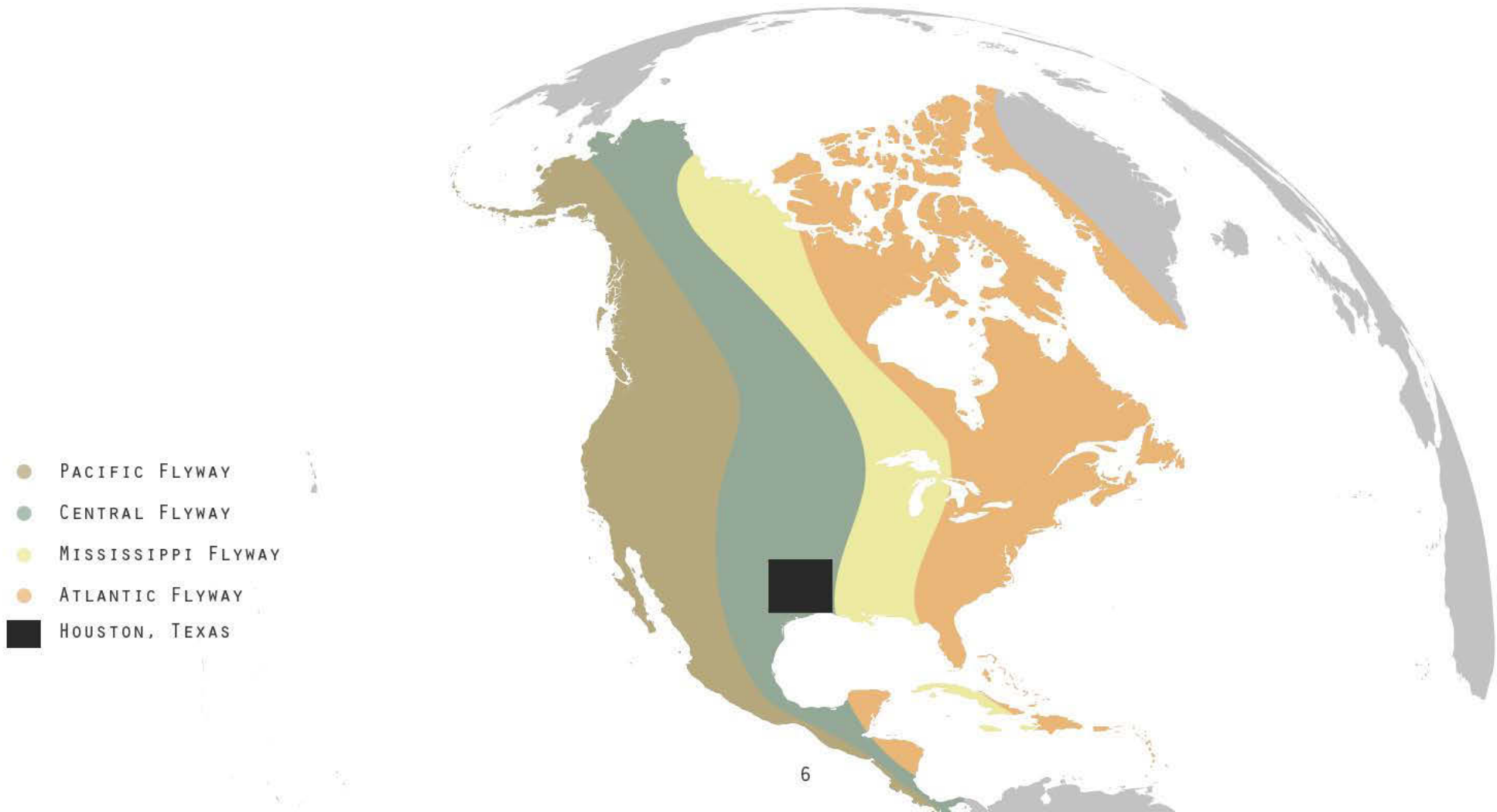
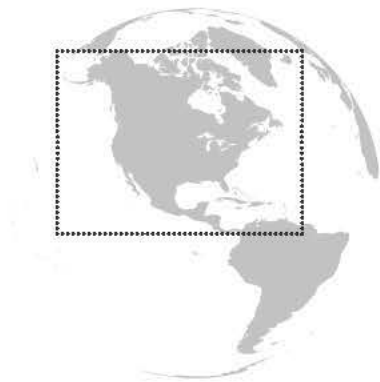
Houston Audubon's mission is to advance the conservation of birds and positively impact their supporting environments. This is accomplished in three main ways: conservation advocacy, environmental education, and habitat protection and restoration. Our key mission-focused program areas are protecting priority habitats for birds, creating bird-friendly communities, and inspiring people to learn more about and appreciate wild birds.

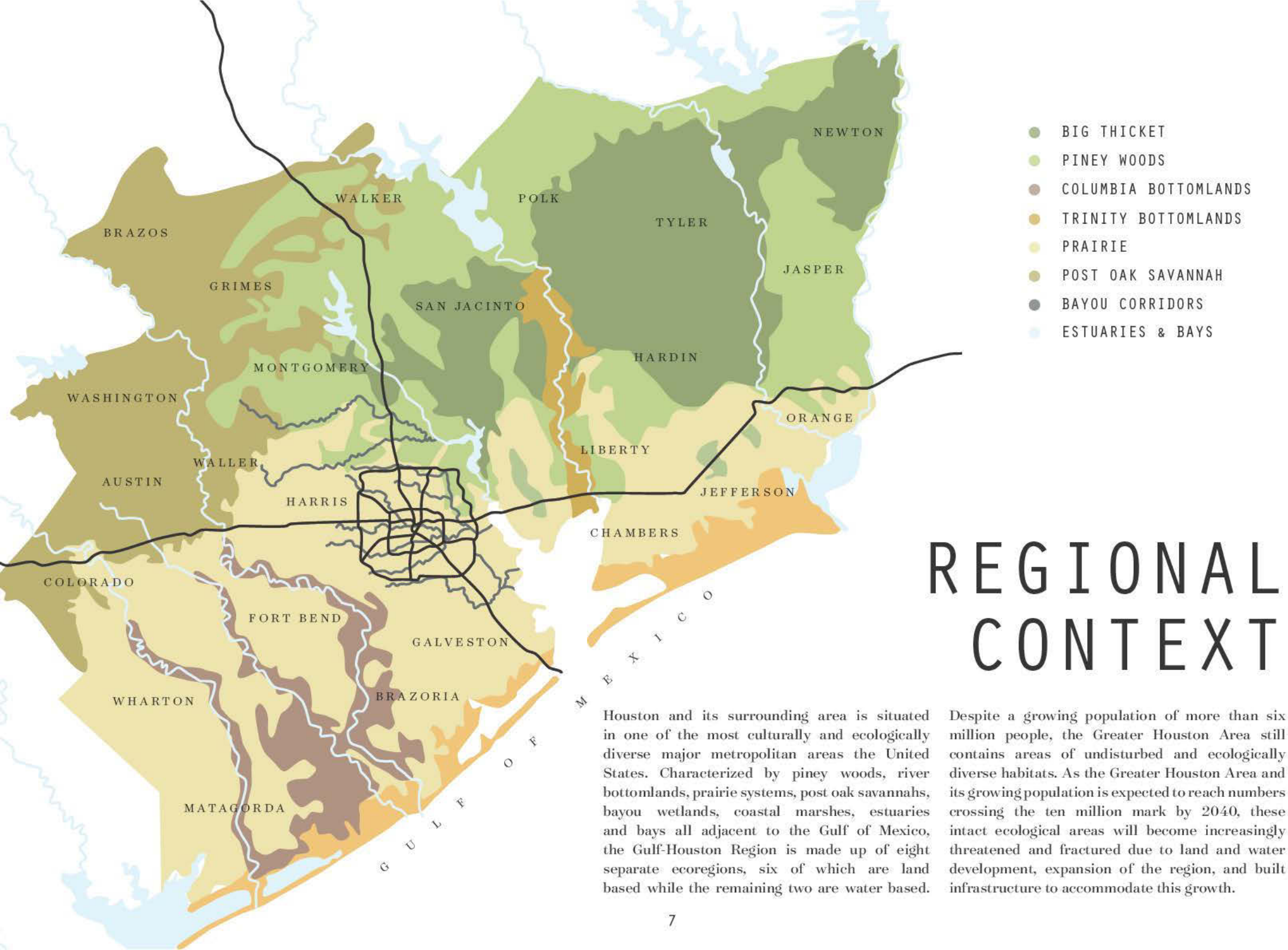
NATIONAL CONTEXT

CENTRAL FLYWAY

AN EXPANSE OF MOUNTAINS, RIVERS, PLAINS, AND SHORES

The Central Flyway comprises more than half the landmass of the continental United States, before extending into Central and South America. When constructing a quality habitat, it is helpful to understand the geographic range of certain species, both native and migratory. Certain species may extend their range in search of food and water or due to competition from other species and predators. In terms of our national context, many of North America's migratory birds rely on the Central Flyway's diverse prairie and wetland habitats for their spring and fall journeys.

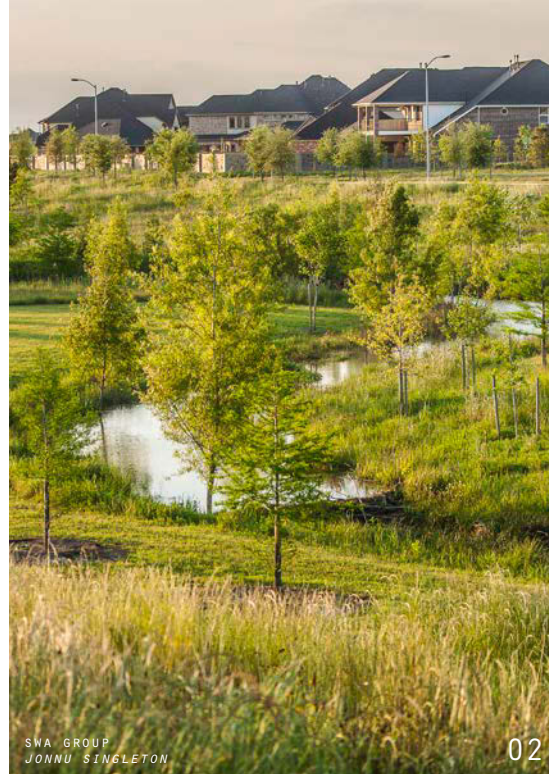






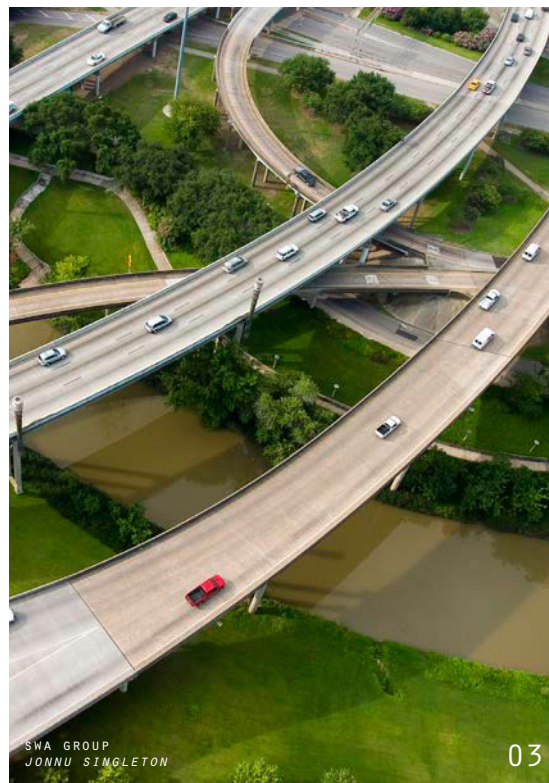
CLARK CONDON
JOE AKER

01



SWA GROUP
JONNU SINGLETON

02



SWA GROUP
JONNU SINGLETON

03

PRIORITY SPECIES

Although the Greater Houston Area supports eight separate ecoregions, urban landscapes, prairies, and bayou corridors are three of the most impacted areas within Houston's city limits. As development in Houston continues outwards, more and more of these ecosystems are impacted. Understanding the importance of these ecosystems and the role they serve to priority bird species is critical to the development of bird friendly habitats.

01. URBAN

Fueled by booming economic growth, Texas is currently the 3rd fastest growing state in the nation. Eight of the fifteen fastest growing large cities in the United States are in Texas, and today, roughly 85% of Texans live in a major metropolitan area. This unprecedented growth is taking a heavy toll on resources vital to the health and stability of both Houston's urban landscapes and the birds that rely on these environments.

02. PRAIRIES

What's left of Houston's prairies is a dwindling reminder of the once nine-million-acre system that covered parts of present-day Texas and Louisiana. Similar to the tall-grass prairies of the Midwest, these coastal prairie systems are best maintained by the wildfires and drought that have historically prevented invasive species from taking over. With development continuing to invade Houston's Katy Prairie, the 300+ species of resident and migratory birds remain at risk.

03. BAYOU CORRIDORS

Locally known as The Bayou City, Houston's wild and winding signature waterways weave their way around neighborhoods, across landscapes, and right through the cities dense central business district. These natural resources within our community not only provide opportunities to enjoy the outdoors but also mitigate damage from floods, recharge underground water supplies, clean stormwater and serve as habitats for wetland species both native and migratory to the Gulf Coast.

01.URBAN SPECIES



CAROLINA CHICKADEE



CAROLINA WREN



EASTERN SCREECH OWL



NORTHERN CARDINAL



RED-BELLIED WOODPECKER

02.PRAIRIE SPECIES



EASTERN MEADOWLARK



LOGGERHEAD SHRIKE



NORTHERN HARRIER



SEDGE WREN



SCISSOR-TAILED FLYCATCHER

03.BAYOU CORRIDOR SPECIES



BELTED KINGFISHER



GREAT BLUE HERON



OSPREY



SNOWY EGRET



WOOD DUCK



CROSS CREEK RANCH
SWA GROUP, HOUSTON

BIRD FRIENDLY ELEMENTS: DIVERSE, NATIVE GRASSES | DIVERSE, NATIVE TREES | WATER
PHOTOGRAPH: JONNU SINGLETON

01

SITE POTENTIAL

WHAT MAKES A GOOD SITE?

By developing an understanding of a site's characteristics and size as it relates to relevant bird species, future developments from the smallest community parks to the city's largest, master planned communities have the potential to provide more diverse and beneficial habitats to native and migratory species. Site characteristics such as location, size, existing vegetation, and proximity to water and open space influence, and can enhance, the potential to create and/or preserve beneficial habitat. Sites of special interest are those with established vegetation, availability of water, and proximity to surrounding habitats. The study of precedent projects and sites can be used as a resource for the development of beneficial habitat.

CHARACTERISTICS

It is important to assess a site's characteristics and the development requirements as decisions are made with regards to the preservation of or improvement to existing habitat and the creation of new habitat. Understanding how a site relates to the local ecoregion and its proximity and connectivity to water such as bayous, drainage channels, detention lakes and to open spaces such as prairies, woodlands, and parks is necessary in order to maximize the site's habitat potential. An understanding of proposed or existing land use and site development, weighing existing and potential opportunities in regards to vegetation, and availability and proximity to a water source are critical to understanding how and where beneficial habitat can occur.

SIZE

The size of a site is another critical factor in the preservation or development of bird habitat. Like us, bird populations simply require enough space to comfortably find shelter, food and water. While the amount of space required depends largely on both the individual species as well as the availability of these three necessities, the desire for space also mirrors social habitats and predatory instincts. For example, while some species flock together in large colonies, many species disperse and defend individual territories. Although these nesting colonies occupy much less space, many species of birds often require large areas to survive. Small sites may offer an opportunity for a few trees as temporary shelter. Larger sites may offer areas to create habitat for permanent nesting or feeding.

PRECEDENT

Referencing existing and established projects can serve as a valuable resource when seeking to promote and establish bird friendly habitat within existing or proposed developments. As the push towards environmentally conscience and sustainable design practices becomes increasingly prevalent, the preservation and reestablishment of native landscapes appears to be a growing concern. There are numerous examples of sites that have been successfully developed while taking habitat into consideration.

CHARACTERISTICS

The most valuable habitat in the developed environment is one that has connectivity to other habitats. This means more developed sites can increase habitat value more readily if adjacent to waterways, parks, and other open spaces. Connectivity allows both limited-range species to move into adjacent habitat and larger ranging species to access resources dispersed across a broader area. For migratory species, persistence of a bird depends on its ability to find favorable habitats en-route to their destination.

The first step to including wildlife habitat into a plan for a developing or previously developed site is to create a Wildlife Management Plan. A plan prepared by a biologist or other knowledgeable professional will improve the chances of successfully creating quality habitat. The plan may include the following steps:

1. Evaluate existing potential of the site, existing vegetation, open space, surrounding land use, availability of water, and proximity to adjacent parks or open space.
2. Analyze the on-site space available to be reserved for the development or enhancement of habitat.
3. Determine goals of one or more selected bird species.
4. Determine what the requirements are particular to the selected species and analyze what is lacking within the home range of your featured species.
5. Remove or reduce liabilities to birds.
6. Preserve and/or restore existing habitat.
7. Develop a plan that fits the sites goal for bird habitat, also allowing for restrictions and budget.
8. Identify the sequence for implementation.
9. Create long-term management plan for habitat areas.
10. Document a long-term maintenance plan for the entire site that integrates how maintenance of the site may influence birds and bird habitat.

Connectivity and/or proximity can help to meet the needs for species with ranges larger than your property size. Even if not large in acreage, a site can become a link between other sites with larger habitat areas. Continuous linkages are most desirable but, if close enough together, a site can become a stepping stone between adjacent habitats. The opportunity to add different options for water on a site and preserve or add a significant number of native trees, shrubs, grasses and wildflowers will enhance the value of the site for wildlife.



CROSS CREEK RANCH
SWA GROUP, HOUSTON
PHOTOGRAPH: JONNU SINGLETON

SIZE

The size of a site affects its potential as a wildlife habitat. With larger sites you may be able to allocate enough land to preserve or create significant portions of habitat. Smaller, urban or more densely developed sites, however, will be more valuable if perceived as a small part of a larger ecosystem.

0 - 25 ACRES

Projects on smaller sites may be limited in amenities and/or the amount of space that can be reserved or developed as wildlife habitat. If close enough to existing habitat, a small site may serve as a connection between other habitat. While small acreage may not become a permanent home to some species, it may become part of a greater range. The addition of trees and other native plants and water will benefit local species that are commonly found in urban areas. The inclusion of three to five acres of native grass and wooded area may support a diversity of species and be able to provide habitat for target species or a respite for migratory birds, especially if the site is contingent to other high-quality habitat. Sites of this size may include neighborhood parks, schools and local offices.

25 - 75 ACRES

Depending on project type, sites of this size are more than capable of serving as habitat for large numbers of bird populations. While it is possible to dedicate habitat areas, a comprehensive approach that considers the entire site as a potential habitat is recommended for projects of this size and larger. Sites of this size may include community parks, regional offices and corporate campuses.

75 ACRES +

Sites of a large scale present the highest potential to create habitat and corridors that can have a profound impact on bird populations. Large scale habitat restoration and preservation is possible, as well as the potential to create actual preserves dedicated to wildlife. Considering the scale of these projects, disturbance to existing habitat may be widespread and careful consideration needs to be made in order to maximize habitat potential. Sites of this size may include corporate headquarters, college campuses, master planned communities and regional parks.

BIRD FRIENDLY SITE GUIDELINES

- INCLUDE EIGHT TO TEN LARGE, NATIVE SPECIES TREES PER ACRE OF DEVELOPED LAND
- INCLUDE TWENTY-FIVE TO THIRTY-FIVE LARGE SHRUBS, EIGHT FEET OR LARGER, PER ACRE OF DEVELOPED LAND
- CONVERT 50% OF MANICURED LAWNS TO NATIVE PRAIRIES INCLUDING VEGETATION FROM BOTH TALL GRASS AND WILDFLOWER GROUPS
- PROVIDE AT LEAST ONE SOURCE OF WATER FOR EVERY FIVE ACRES OF DEVELOPMENT
- SITES WITH OPEN SPACES LARGER THAN FIVE ACRES HAVE THE POTENTIAL TO PROVIDE MORE DIVERSE AND BENEFICIAL HABITATS
- IF SIZE OF SITE ALLOWS, CREATE WILDLIFE PRESERVES THAT INCLUDE SOURCES FOR NESTING, WATER, AND FOOD



PRECEDENT PROJECTS

01 MD ANDERSON KATIE PRAIRIE CONSERVANCY HOUSTON, TEXAS

Located within Houston's sprawling medical center, this two acre prairie and trails system was developed on the MD Anderson campus as a civic ecology practice for healing both people and nature. The prairie includes native grasses, forbs, and wetlands restoration complete with educational signage. As the prairie has matured, ecologists from the Katy Prairie Conservancy and grounds crews from MD Anderson have learned which windows of time are best for mowing, seeding, and planting.

03 CROSS CREEK RANCH SWA GROUP, HOUSTON FULSHEAR, TEXAS

Cross Creek Ranch is a 3,200 acre master planned community in Fulshear, Texas just 30 miles west of downtown Houston. Vast areas of reforestation, naturalized landscapes and reestablished native prairies make up over 65% of the community's open space. Contiguous habitat belts provide wildlife corridors while no-mow prairies replace suburban "carpet grass". One of the community's key features is their water systems which doubles as a natural filtration service for the entire neighborhood, cleaning wastewater for reuse in irrigation emphasizing a sustainable approach.

05 BUFFALO BAYOU PARK SWA GROUP, HOUSTON HOUSTON, TEXAS

Covering 160 acres in the shadow of downtown Houston, renovation within Buffalo Bayou Park sought to not only improve the urban ecological function of the city's most prominent bayou but also promote pedestrian connectivity. The design served to enhance the bayou's natural meanders, offering increased resiliency against floodwaters while preserving and restoring Buffalo Bayou's native riparian woodlands and meadows providing habitat to a number of bayou corridor species.

02 SOUTHWESTERN ENERGY CLARK CONDON SPRING, TEXAS

The wooded landscape accented by drifts of native grasses and wildflowers on this corporate campus was designed to entice employees out into a natural environment to reflect, stroll and exercise. A rooftop deck helps link the building's two main towers while offering an alternative gathering space. An outdoor dining space provides a water wall for cooling and ambiance. Connectivity is a key design feature because the site's pedestrian and bike trails lead to the Springwoods trail system and open spaces.

04 SPRINGWOODS VILLAGE CLARK CONDON SPRING, TEXAS

Springwoods Village is a 2,000 acre master planned development coming to life in Spring, Texas in a unique ecosystem where the piney woods of East Texas meets the prairies of the Gulf Coast Plains. Habitat was developed along a 25 acre stretch of roadway. Areas of existing trees were expanded and enhanced with additional hardwood and evergreen trees as well as woody herbaceous understory. The bioswale in the right of way along Springwood Village Drive and the meadow were planted with a mix of native grasses and forbs to establish a prairie.

06 WILLOW WATER HOLE HARRIS COUNTY FLOOD CONTROL HOUSTON, TEXAS

The Willow Waterhole Greenspace Conservancy is a 10-year-old nonprofit organization. Willow Waterhole was a unique project created by a collaboration of the Texas Parks and Wildlife Department, City of Houston Parks and Recreation Department, and Harris County Flood Control District. The concept is part of a 400 acre, federally funded flood control project. The goal of the project is to combine detention needs with park amenities. The trail amenity will link into the larger Braes Bayou trail system.



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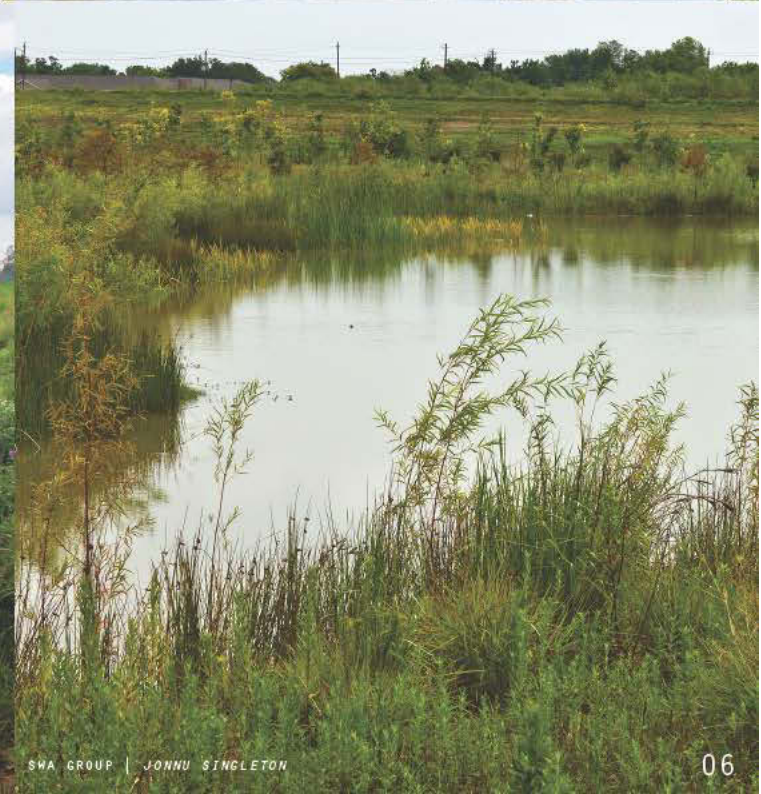
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HABITAT COMPONENTS

Every species of plant and animal, including humans, requires a proper combination of shelter, food and water to survive comfortably. When combined these necessities make up what's known as a habitat. Without a habitat that is unique and individual, species cannot survive. Since bird species are incredibly diverse in their physical forms and individual behaviors, their habitats often vary tremendously. However, regardless of physical location, be it urban landscapes, prairies, or bayou corridors, a habitat must fulfill the following three essential necessities:

HABITAT COMPOSITION

Most species of birds, nestling's in particular, require shelter from the elements as well as from predators. Shelter not only describes a space to inhabit but also protection from predators and material for nesting. Shelter may include trees, shrubs, grasses and groundcover as well as man-made structures. Species often show a preference for nesting and foraging at certain heights and in certain types of vegetation. Understanding how targeted species relate to the spectrum of physical environments is essential to developing bird friendly habitats.

FOOD

Not only are birds unique in the environments in which they thrive, they are also unique in their individual diets. Many species of birds are herbivores, eating nectar, fruits, nuts, and seeds while some species are carnivores, eating larval insects, fish, and in some instances other birds. Many species, however, are omnivores, eating both a variety of plant and animal matter. The type of food that birds select depends on availability, abundance, dietary requirements, and seasonal change.

WATER

Like all living organisms, birds require water. While most species obtain water from drinking, some species obtain their water almost exclusively from their diet. Birds such as hummingbirds and other nectar-feeding avians obtain their water almost exclusively from the foods they eat. Aside from meeting dietary needs, water can also be essential as a medium for activities such as preening and resting in particular species.

HABITAT COMPOSITION

In nature the forests has layers, from high in the tree tops of the canopy, to the understory and groundcovers below, to the prairies and waterways nearby. Structure matters for birds, and different species need different levels of structure made up of different types of vegetation. Every kind of bird has its own preferred habitat. Larger birds may nest and hunt in high places. Some birds may prefer evergreen trees and some deciduous. Smaller birds may nest in dense shrubs and still others may nest or feed in waterways. Some birds adapt and build their homes on man-made structures such as building niches or walls.



ABOVE CANOPY

BRIDGES
BUILDINGS
CLIFFS
DEAD TREES
POLES
TOWERS

CANOPY

ELMS
HICKORIES
MAPLES
OAKS
PECANS
PINES

MIDSTORY

ASH
ELMS
HACKBERRIES
MAPLES
OAKS
SWEETGUM

UNDERSTORY

BEAUTYBERRIES
DOGWOODS
HAWTHORNES
VIBURNUMS
WAXMYRTLES
YAUPONS

GROUNDCOVER

BLUESTEMS
MILKWEEDS
MUHLYS
SEA OATS
SEDGES
WINTERGRASS

HAWKS
SWALLOWS
SWIFTS
VULTURES

HAWKS
OWLS
VIREOS
WOODPECKERS

JAYS
KINGLETS
VIREOS
WARBLERS

BLUEBIRDS
DOVES
MOCKINGBIRDS
WRENS

THRUSHES
SHOREBIRDS
SPARROWS
WADINGBIRDS
WATERFOWL



01



02

FOOD

Developing an understanding of the unique and individual diets of target species is essential when creating a bird friendly habitat. Each species of bird has varying dietary preferences and means of acquisition often connected to the changing seasons. By understanding the many different types of diets and using that knowledge to your advantage, plant selections can be made to attract individual species to your site.

01. INSECTS

Insectivorous birds are specialized carnivores that feed on insects, from gnats to mosquitoes to dragonflies. Flycatchers and Warblers are insectivorous, and most birds will eat insects to feed hatchlings sufficient protein for healthy growth. Other types of birds that are primarily insectivorous their entire lives include Swallows, Swifts, Martins, Dippers and Nighthawks.

02. NECTAR

A nectivore feeds on flower nectar. The most well known nectivorous birds are the more than 300 species of Hummingbirds in the world. Nectivorous birds will visit both flowers and nectar feeders. Many other birds will also eat some nectar, including Finches, Woodpeckers, Chickadees and Orioles.

03. FRUITS

Frugivorous birds, or frugivores, are fruit-eating specialists. Orioles, Waxwings and Tanagers are all frugivorous and will eat fruit, as well as berries in . Many other birds will also sample fruit, including Thrushes, Grouse, Quail, Jays, Wrens, and even some Finches and Sparrows. Many tropical birds also eat fruit. Frugivorous birds may be considered pests in orchards.

04. NUTS & SEEDS

A granivore eats primarily grains or seeds. Many birds are granivorous, including Sparrows and Finches. These are easy birds to attract with different types of birdseed. Planting seed-bearing flowers in the yard or opting for ornamental grasses are easy ways to provide natural foods for granivores. Many of these birds also eat large amounts of weed seeds or spilled grain in fields.



03



04

WATER

Like all living organisms, birds require water. While most species obtain water by drinking, some species with very moist diets, such as Hummingbirds and other nectar-feeding avians, obtain their water almost exclusively from their food. Aside from meeting dietary needs, water can also be essential as a medium for activities such as preening and resting.



DRINKING AND FEEDING

Although most species of birds consume water daily, their mechanisms of consumption are much different from that of mammals. With a few exceptions most birds lack the ability to create suction when ingesting water, leaving them to resort to other methods. While most species fill their beaks with water, relying on gravity to do the rest, some species are able to lap water, similar to cats and dogs. Other species such as swifts and swallows, however, skim along the surface of ponds, lakes and rivers, collecting water as they fly.



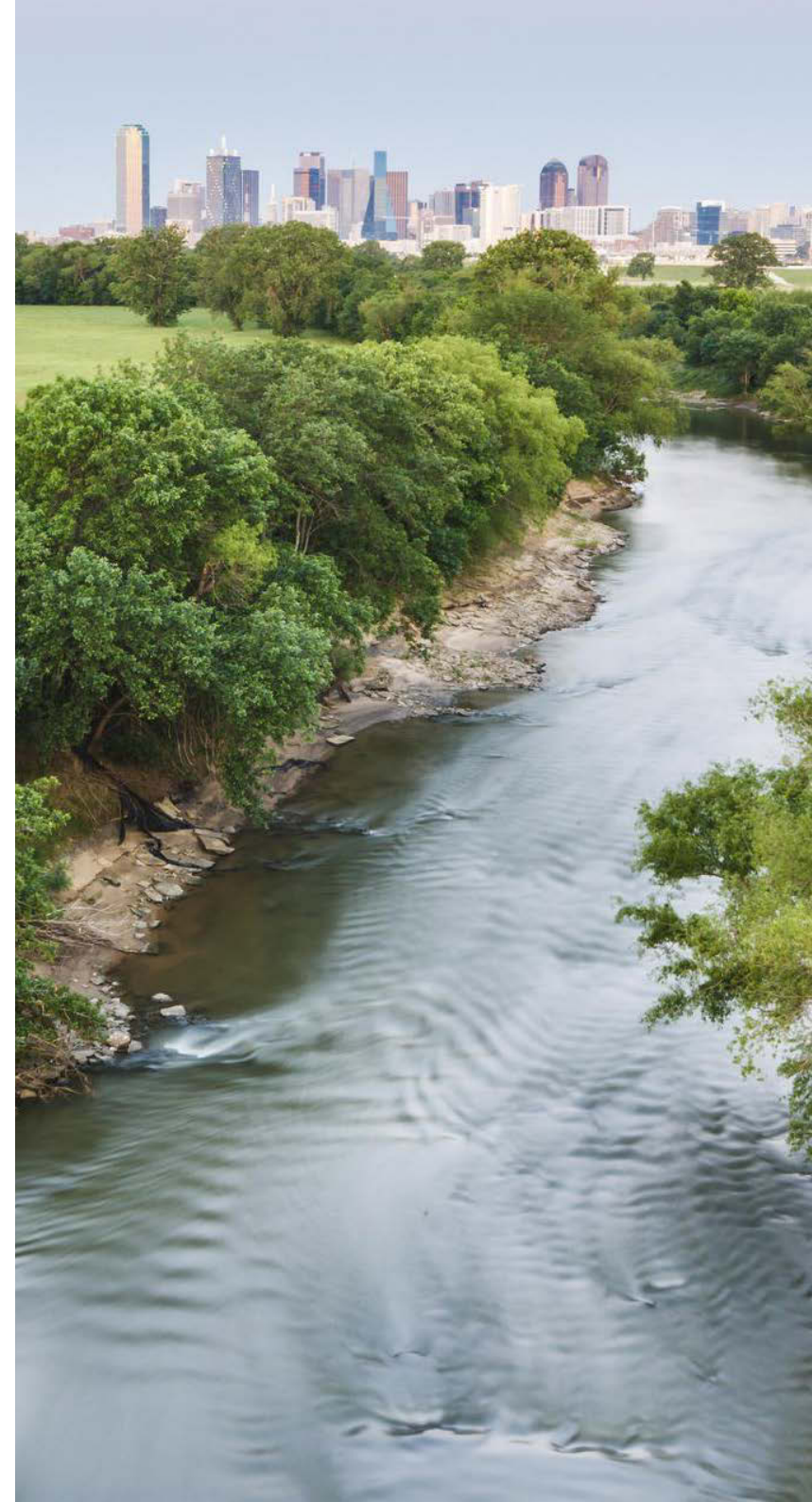
PREENING

Second only to eating, preening is one of the most common behaviors in bird species. With up to 25,000 individual feathers, regular preening keeps them both healthy and strong. While preening, birds remove dust, dirt and parasites while aligning each individual feather relative to adjacent feathers, adding a protective coating of oil during the process. Most species will preen several times a day to maintain a healthy well-being.



RESTING

Most smaller species flock towards dense brush and foliage to avoid predators while they rest, though some larger species can often be found resting on or around bodies of water. Depending on the species, size, and individual characteristics, most waterfowl, such as Ducks, Herons, Egrets and Shorebirds, are ill equipped to rest in traditional environments such as brush and foliage. Many of these species rely on adaptations such as reacting to vibrations in the water to alert them of imminent threats.





SOUTHWESTERN ENERGY
CLARK CONDON, HOUSTON

BIRD FRIENDLY ELEMENTS: DIVERSE, NATIVE GRASSES | DIVERSE, NATIVE TREES | WATER
PHOTOGRAPH: JOE AKER

BUILDING A HABITAT

Aside from subtle modifications the introduction of quality habitat into existing and future developments can be achieved within the framework of standard design and construction procedures. Through the use and application of responsible building materials, careful selection of native and adaptive plant species, addition of habitat enhancements that promote nesting and feeding, and implementation of appropriate irrigation strategies, existing and future projects have the potential to become sanctuaries for both bird populations and wildlife.

ARCHITECTURE

Both architectural glass and lighting present major hazards to native and migratory species, killing hundreds of millions of birds each year. Birds hit buildings at all hours during the day and night. During the day the problem is reflection or other confusing aspects of glass such as transparency. At night migrating birds can be distracted by bright lights in our cities. With responsible design and adaptations to approach and function, the skies can become much safer for thousands of species in the future.

PLANTS FOR BIRDS

By simply choosing native plants for community parks, corporate campuses, and master planned communities, we can restore vital habitats for birds in Houston and help them adapt and survive in the face of climate change. Texas provides critical habitats for approximately 500 of our 914 North American bird species. These birds depend on our native plants to provide them with various sources of shelter, food, and water. The presence of a few native trees in place of exotic species can make a significant difference, especially when you consider the impact invasive species can have on our landscapes.

NESTING + FEEDING

From Bluebirds and Wrens to Screech Owls and Martins, many species of birds can be given a better chance to survive and thrive through a little assistance from structures we build including nesting platforms, artificial cavities, and roosting towers. For some species these structures tip the scales back in favor of their survival, reducing declines in populations and restoring species to landscapes they once inhabited.

WATER

Water is important to beneficial habitat. Shallow water such as sloped lake edges, puddles in mud flats, littoral shelves in wetlands, and moving water such as slowly dripping springs or a light spray provide areas for preening and drinking as well as habitat for insects and other small food sources. Deeper water will provide habitat for fish and provide food, such as gambusia and other small prey, for wading and shore birds.



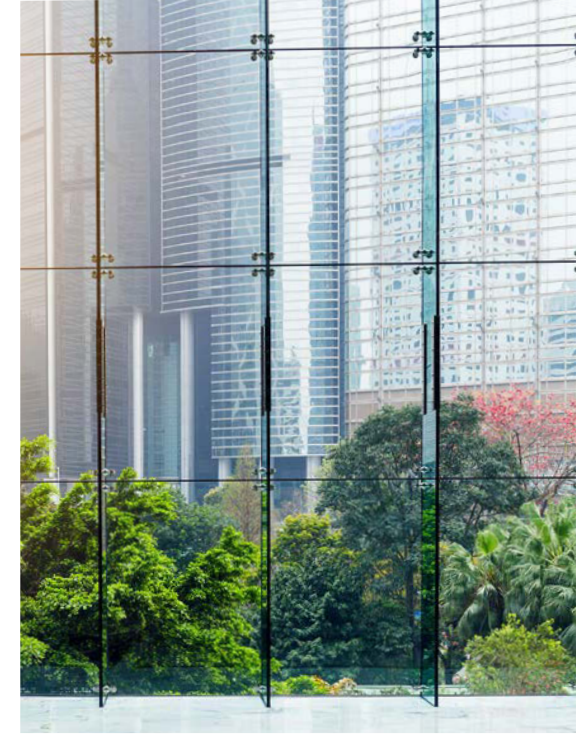
PROBLEM 01: REFLECTION

When observing most buildings from the outside in, architectural glass is often highly reflective especially when being viewed from an oblique angle. Under proper conditions and circumstances, just about every type of architectural glass reflects surrounding vegetation and trees, as well as the clouds and sky above mimicking and reproducing habitats birds find both familiar and enticing. Birds are often killed as they attempt to fly around or through perceived passageways that are in fact reflections of vegetation and trees. Reflections caused by architectural glass pose the greatest threat to most species.



PROBLEM 02: LIGHTING

During evening hours, overnight, and well into the early morning, the illumination of large structures and buildings has the tendency to create a particularly hazardous environment to migrating nocturnal species. While flying at heights of well over 500 feet, migrants rely heavily on visual cues and references below to maintain orientation and trajectory. Weather conditions can cause birds to become trapped in an illuminated zone where they will often become disoriented, circling until they regain their sense of awareness. This circling can lead to exhaustion, predation, or in worst case scenarios lethal collision with buildings.



PROBLEM 03: TRANSPARENCY

In an attempt to access vegetation, shelter, food, and water, birds often strike transparent glass of buildings and structures during daylight hours. When landscapes are developed within a building's interior, birds are often lured inside beyond the glass separating them by the prospect of shelter, food and water. This threat, however, is magnified when transparent glass is installed on opposite ends of a building or used at treatment along the corners of structures. Birds will often perceive these transparent structures as unobstructed passageway and fly into glass without noticing the obstacle in their way.

ARCHITECTURE

Highly reflective windows, flat facades, and indoor atriums pose some the greatest hazards to airborne birds. The birds simply can't see well enough to distinguish the obstacles and stay clear. Reflective surfaces, the transparency of glass, and proximity of birds to structures pose problems. Brightly lit buildings at night are especially threatening to migratory birds. While mass collisions are dramatic, the bulk of bird deaths result from the cumulative effects of single, confused birds mistaking glass for a safe path of flight. Conservative estimates determine that a building kills upwards of ten birds per year on average in the United States alone and poorly designed building, up to hundreds. Over one billion bird deaths per year are attributed to buildings worldwide. This is an active field of research and one that is being considered by LEED, a rating system devised by the US Green Building Council to evaluate the environmental performance of buildings and encourage sustainable design.

SOLUTION 01:TREATED GLASS

Ceramic inlays, patterned prints, and textured etchings can be applied directly on or in-between layers of insulated, architectural glass in an attempt to reduce the transmission of light from the outside in. These standard practices can be applied in many different forms including varying colors and unique patterns and can most commonly be found on commercial buildings.

SOLUTION 02:LIGHTS OUT

Nonessential interior and exterior lighting can be shut off overnight during months that overlap with spring and fall migration periods. In rooms where interior lighting is essential to nighttime function, window coverings that are capable of blocking light transmission from the inside out as well as motion sensors that are able to control lighting in unoccupied spaces can be installed. Not only will this promote a bird friendly approach, it can also help to save on electricity costs year-round. Encouraging the use of task lighting overnight is also a viable approach.

SOLUTION 03:FACADE ENHANCEMENT

As an addition to the structural façade of a building, external screens are both effective and inexpensive while also having the ability to create a unique, aesthetic effect. For small scale projects such, individual coverings for windows can be used while entire façade enhancements can be used for larger, corporate projects. Screens have been used for decades and are proven to reduce collisions while also maintaining a non-obscured view internally.

BIRD FRIENDLY ARCHITECTURAL GUIDELINES

- 90% OF EXPOSED FACADE FROM GROUND LEVEL TO 40 FEET HIGH HAS BEEN DEMONSTRATED TO DETER 70% OR MORE OF BIRD COLLISIONS
- NO TRANSPARENT PASSAGEWAYS, CORRIDORS, ATRIA, OR COURTYARDS THAT CAN TRAP BIRDS
- OUTSIDE LIGHTING IS APPROPRIATELY SHIELDED AND DIRECTED TO MINIMIZE ATTRACTION TO NIGHT-MIGRATING SPECIES
- INTERIOR LIGHTING IS TURNED OFF AT NIGHT OR DESIGNED TO MINIMIZE LIGHT TRANSMISSION
- LANDSCAPING IS DESIGNED TO KEEP BIRDS AWAY FROM BUILDING FACADES

PLANTS FOR BIRDS

Plants are the foundation of creating quality habitat. While some introduced species can add to habitat value, native plants provide the primary supply of shelter and food necessary for local as well as migratory bird species. Communities of plants support healthy ecosystems, not individual plants. In selecting plant species consider the characteristics of the site as well as the bird species that will utilize the habitat. Data for existing and expected bird species in the area is important. Further research will reveal additional birds that may be attracted to the site with the creation of conducive habitat. Selection of plant materials should include a variety of species to provide diverse food sources such as insects, nectar, and berries throughout the year. It's critical to weigh the importance of planting opportunities as well. While nectar and berry producing plants are important, insects and larva, such as caterpillars, are essential and could be weighed more heavily in regards to planting priority. Roosting and nesting opportunities is another criteria to be considered in plant selection. Planting in layers, shade trees, small trees, woody understory, and native grasses and forbs, provides shelter and a food source for a wider variety of bird species and other wildlife. The location of trees in stands may be more beneficial than single trees. Proximity of trees and other plants close to water provides cover for birds as they approach the water source.



INSECT
HOSTS



NECTAR
PRODUCING



FRUIT
PRODUCING

WHAT ARE NATIVES?

A native plant is one that occurs naturally in the region in which it is located. Owing to this long-term relationship with a geography, native plants are the foundation upon which healthy ecosystems depend. Native plants have co-evolved complex relationships with native birds, insects, and wildlife, and removing these native plants severs critical ecological connections and webs. Replacing native plants with exotic plants from other continents or regions disrupts this fragile web of connections, as many of our native insects cannot forage on these exotics. Moreover, many exotic plants can become invasive pests, competing with native plants and further harming our ecosystems. While physical destruction of habitat is an enormous issue, most people don't realize that many of our preserved green spaces do not support the wildlife that depend on them due to exotic plant invasion.





































































































Over the last 100 years urban sprawl has transformed 150 million acres of farmland and native wildlife habitat across the United States into buildings, hardscape, and 40 million acres of highly manicured lawns. Filled with exotic plants, these urban landscapes no longer support the healthy, functioning ecosystems that birds and wildlife need.





































































































As our urban areas continue to grow, the natural areas that remain will not be large enough to support our bird populations. We can attempt to counteract this issue by simply choosing native plant species for our backyards instead of exotics. One native oak tree can support over 500 species of caterpillars, while most Asian alternatives only host up to 5 species. The presence of one native tree in the place of an exotic can make a significant difference, especially when you consider that a pair of chickadees must find 6000 to 9000 caterpillars to raise a single clutch.























BIRD FRIENDLY PLANTING GUIDELINES

- USE 80% - 90% NATIVE PLANT SPECIES
- SELECT PLANT SPECIES THAT PROVIDE FOOD AND SHELTER FOR BOTH DESIRED AND ANTICIPATED SPECIES
- CREATE LAYERS OF VEGETATION CONSISTING OF CANOPY, MIDSTORY AND UNDERSTORY TO MIMIC NATIVE HABITATS
- WHEN POSSIBLE, PLANT TREES IN STANDS OR GROUPS RATHER THAN INDIVIDUALLY
- PLANT LARGER VEGETATION SUCH AS TREES AND SHRUBS IN PROXIMITY TO WATER, FEEDING, AND NESTING SITES TO PROVIDE PROTECTION
- SELECT A VARIETY OF SPECIES TO PLANT THAT WILL PROVIDE DIVERSE FOOD SOURCES THROUGHOUT THE YEAR

	COMMON	SCIENTIFIC	TYPE	INSECTS	NECTAR	FRUIT/SEEDS	FLOWERS	COLOR
	AMERICAN BASSWOOD	TILIA AMERICANA	CANOPY	  	  	  	CONSPICUOUS FLOWERS	
	AMERICAN ELM	ULMUS AMERICANA	CANOPY	  	  	  		
	DRUMMOND RED MAPLE	ACER RUBRUM VAR. DRUMMONDII	CANOPY	  	  	  	CONSPICUOUS FLOWERS	FALL COLOR
	EASTERN RED CEDAR	JUNIPERUS VIRGINIANA	CANOPY	  	  	  		
	HACKBERRY	CELTIS LAEVIGATA	CANOPY	  	  	  		
	LOBLOLLY PINE	PINUS TAEDA	CANOPY	  	  	  		
	SHUMARD OAK	QUERCUS SHUMARDII	CANOPY	  	  	  		
	SOUTHERN RED OAK	QUERCUS FALCATA	CANOPY	  	  	  		FALL COLOR
	WATER OAK	QUERCUS NIGRA	CANOPY	  	  	  		
	WILLOW OAK	QUERCUS PHELLOS	CANOPY	  	  	  		

	COMMON	SCIENTIFIC	TYPE	INSECTS	NECTAR	FRUITS/SEEDS	FLOWERS	COLOR
	AMERICAN BEAUTYBERRY	CALICARPA AMERICANA	UNDERSTORY	  	  	  	CONSPICUOUS FLOWERS	
	AMERICAN HORNBEAM	CARPINUS CAROLINIANA	UNDERSTORY	  	  	  		FALL COLOR
	ARROWWOOD VIBURNUM	VIBURNUM DENTATUM	UNDERSTORY	  	  	  	CONSPICUOUS FLOWERS	FALL COLOR
	MEXICAN PLUM	PRUNUS MEXICANA	UNDERSTORY PRAIRIE EDGE	  	  	  	CONSPICUOUS FLOWERS	
	PARSLEY HAWTHORN	CRATAEGUS MARSHALII	UNDERSTORY	  	  	  	CONSPICUOUS FLOWERS	
	POSSUMHAW	ILEX DECIDUA	UNDERSTORY PRAIRIE EDGE	  	  	  		
	ROUGHLEAF DOGWOOD	CORNUS DRUMMONDII	UNDERSTORY	  	  	  		
	TURK'S CAP	MALVAVISCUS ARBOREUS VAR. DRUMMONDII	UNDERSTORY	  	  	  	CONSPICUOUS FLOWERS	
	SOUTHERN WAXMYRTLE	MORELLA CERIFERA	UNDERSTORY PRAIRIE EDGE	  	  	  		
	YAUPON HOLLY	ILEX VOMITORIA	UNDERSTORY PRAIRIE EDGE	  	  	  		

	COMMON	SCIENTIFIC	TYPE	INSECTS	NECTAR	FRUITS	FLOWERS	COLOR
	BIG BLUESTEM	ANDROPOGON GERARDII	PRAIRIE	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		
	BUSHY BLUESTEM	ANDROPOGON GLOMERATUS	PRAIRIE	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		
	EASTERN GAMAGRASS	TRIPSACUM DACTYLOIDES	UNDERSTORY PRAIRIE	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		
	GULF CORDGRASS	SPARTINA SPARTINAE	PRAIRIE	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		
	GULF MUHLY	MUHLENBERGIA CAPILLARIS	PRAIRIE	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		FALL COLOR
	INDIANGRASS	SORGHASTRUM NUTAS	PRAIRIE	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		FALL COLOR
	INLAND SEA OATS	CHASMANTHIUM LATIFOLIUM	UNDERSTORY	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		
	SILVER BLUESTEM	BOTHRIOCHLOA LAGUROIDES	PRAIRIE	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		
	SUGARCANE PLUMEGRASS	SACCHARUM GIGANTEUM	PRAIRIE	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		
	SWITCHGRASS	PANICUM VIRGATUM	PRAIRIE	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>	<div><div></div><div></div><div></div></div>		

	COMMON	SCIENTIFIC	TYPE	INSECTS	NECTAR	FRUITS	FLOWERS	COLOR
	AQUATIC MILKWEED	ASCLEPIAS PERENNIS	PRAIRIE	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	
	BLAZING STAR	LIATRIS SPP.	PRAIRIE	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	
	BLUE SAGE	SALVIA AZUREA	PRAIRIE	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	
	CARDINAL FLOWER	LOBELIA CARDINALIS	UNDERSTORY	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	
	GREEN MILKWEED	ASCLEPIAS VIRIDIS	PRAIRIE	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	
	GULF COAST PENSTEMON	PENSTEMON TENUIS	UNDERSTORY PRAIRIE EDGE	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	
	INDIAN BLANKET	GAILLARDIA PULCHELLA	PRAIRIE	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	
	LANCILEAF COREOPSIS	COREOPSIS LANCEOLATA	PRAIRIE	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	
	MAXIMILIAN SUNFLOWER	HELIANTHIS MAXIMILIANI	PRAIRIE	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	
	TEXAS CONEFLOWER	RUDBECKIA TEXANA	PRAIRIE	● ● ●	● ● ●	● ● ●	CONSPICUOUS FLOWERS	



WATER

Water is one of the most important elements that must be included to promote and sustain a bird friendly habitat. Providing clean water for both drinking and preening, to remove dirt and parasites, will attract even the most timid of species who may to avoid artificial feeders. The animals and insects that are in water also provides a food source for certain species. Any source of water is an improvement from a predominately dry landscape. While standing water is adequate for some species, other species may require slow moving water, shallow edges, puddles and mud flats, dripping water or a light spray. Moving water may be more effective when attracting migratory species due to the dynamic motion and sound. It's critical to research water needs of targeted species for the site. Birds utilize water in different ways including the following:

SHALLOW WATER

Most species of birds do not preen in deep or intimidating bodies of water. In order to attract an array of species, water levels of no greater than two inches deep should be available. This may occur in sloped lake edges, littoral shelves, and in the puddles of mud flats. At shallow depths songbirds are able to wade, splash, feed and rest without fear of threat from surrounding predators. If basins of water are deep, fine aggregates such as pea gravel or flat stones can be added to offer a choice of depths.

DRIPPING WATER

By allowing water to gently fall or drip into a basin, the subsequent noise and movement generated will catch the attention of passing birds such as Flycatchers, Warblers, and Thrushes, birds that would otherwise avoid stagnant water. As an added advantage moving water has a tendency to remain clean for longer periods of time and will discourage the presence of bacteria and parasites that could potentially harm certain species.

SPRAYING WATER

In nature birds shower regularly, every time it rains. Nature provides this way for birds to keep their feathers healthy through preening. Birds are attracted to the noise and movement of the water spray. A mist is important to birds that are molting as it can help to loosen the keratin sheath that covers new pin feathers. Sprays can be especially helpful in dry periods to help add moisture to the feathers and improve the skin underneath. While birds may avoid larger fountains due to the intensity of water flow, they may be lured into the environment where they can rely on other enhancements such nesting areas, feeders, and smaller baths.

BIRD FRIENDLY WATER GUIDELINES

- WHERE POSSIBLE, KEEP WATER LEVELS LOW
- SITUATE FEATURES AWAY FROM HIGH TRAFFIC AREAS WHERE BIRDS WILL FEEL THREATENED
- PROVIDE ADEQUATE COVER NEARBY WHERE BIRDS CAN APPROACH AND/OR FLEE IN THE CASE OF A THREAT
- INCLUDE ELEMENTS THAT ENCOURAGE STAGING SUCH AS STICKS OR SMALL SHRUBS NEAR WATER FEATURES
- KEEP WATERS FREE OF DEBRIS SUCH AS LEAVES, FEATHERS, STICKS, AND WASTE
- ADD MOTION TO WATER ELEMENTS TO ENCOURAGE USE AND PROMOTE A CLEANER HABITAT
- DESIGN DETENTION PONDS WITH PERMANENT WATER LEVELS AND A SHALLOW, LITTORAL SHELF AT WATERS EDGE



FEEDING

TABLE FEEDERS

Perhaps the simplest of feeder designs, table feeders hold seed and provide a place for birds to feed as they stand. Table feeders have the advantage of being easy to clean, and they tend to attract an array of species. Their open construction makes viewing birds easy from all angles. Table feeders can also be placed close to the ground to attract many ground-feeding birds. Ground feeders are especially favored by Doves, Juncos, Sparrows, Towhees, Goldfinches and Cardinals.

SUET FEEDERS

Suet is a type of high fat and protein feed that generally contains peanut butter or rendered fat mixed with grains and seeds. You can purchase feeders specially designed to hold suet cakes, which allow birds to feed through a wire mesh. Suet is readily eaten by titmice, chickadees, nuthatches and woodpeckers. In addition to the regular suet-feeder visitors, Wrens, Creepers, and Warblers occasionally pick at these mixes.

TUBE FEEDERS

Tube feeders are hanging feeders that allow birds to feed through screens or ports. They keep the seed fairly protected from the elements and often have small perches that certain species are attracted to. One of the main advantages of a tube feeder is that it prevents competition from larger birds, squirrels and other small mammals. These feeders are especially attractive to small birds such as Chickadees, Titmice, Nuthatches, Goldfinches, Siskins, and House Finches.

THISTLE FEEDERS

Especially designed to dispense niger seed, also known as thistle seed, these feeders typically have tiny holes that make the seed available only to small-beaked finches such as Goldfinches and Pine Siskins. Thistle-seed dispensing bags are not recommended since squirrels can easily tear holes in them and waste this expensive seed.

HOPPER FEEDERS

Hopper feeders provide dry storage for several pounds of mixed seed, which tumbles forward on demand. Position hopper feeders on a pole about five feet off the ground. Hopper feeders attract similar species as tube feeders including larger birds such as Jays, Grackles, Red-Winged Blackbirds, and Cardinals.

BIRD FRIENDLY FEEDING GUIDELINES

- PROVIDE FEEDERS AND SEED SPECIFIC TO DESIRED AND EXPECTED SPECIES
- DESIGNATE GROUP OR INDIVIDUAL TO CLEAN AND REFILL FEEDERS CONSISTENTLY
- SITUATE FEATURES AWAY FROM HIGH TRAFFIC AREAS WHERE BIRDS WILL FEEL THREATENED
- PROVIDE ADEQUATE COVER NEARBY WHERE BIRDS CAN APPROACH AND/OR FLEE IN THE CASE OF A THREAT
- INCLUDE ELEMENTS THAT ENCOURAGE STAGING SUCH AS STICKS OR SMALL SHRUBS NEAR WATER FEATURES
- PROVIDE A VARIETY OF FEEDERS TO INCREASE DIVERSITY OF HABITAT



NESTING

Trees, wooded areas and snags provide important natural nesting habitat, but for many bird species the loss of trees and natural habitat suitable for nesting has contributed to significant population declines. Man-made structures such as nesting platforms, artificial cavities, and roosting towers can make a real difference in terms of sustaining populations. While it is always best to preserve natural nesting and roosting habitats for birds, providing artificial structures can play an important role in the conservation of these species. Many species of birds can be given a better chance to survive and thrive through a little assistance from structures we build such as artificial cavities, bird houses, nesting boxes and roosting towers. For some species these structures tip the scales back in favor of their survival, reducing declines in populations and restoring species to landscapes they once inhabited.

WOODED AREAS & SNAGS

Wooded areas and snags are a natural nesting area for some species of birds. Larger birds may place their nests in open flat tops of dead snags or old wind-topped trees; other birds may nest in the small fork of a branch under dense cover.

CAVITIES

Nest boxes are important for birds where dead trees and other natural cavities are limited. These boxes will take on specific designs depending on the desired species to be supported. Small nesting boxes for Carolina Chickadee's and Carolina Wren's can be commonly found. Construction and installation are simple and economical.

OWL BOXES

Owl boxes are an example of a structure for species with specific nesting box requirements. Barn owls prefer to nest in buildings and boxes should be installed high to lessen human disturbance and the dangers of predation from snakes, raccoons and cats. Construction can be a simple exterior-grade plywood box with drainage holes. Eastern Screech Owl boxes, installed properly, attract these nocturnal birds successfully.

MARTIN HOUSES

One of the most beautiful of the swallows, martins live in colonies and their houses are built for community life. Their houses ideally have multiple rooms and may accommodate families from 8 to 50. They need to be in open areas such as a garden or open field and installed 15' to 20' above the ground on a pole and away from trees to keep them safe from predators.

SWIFT TOWERS

Another bird that nests in colonies, Swifts used to nest in hollow trees. Unused chimneys were another favorite. However, the loss of old-growth forests and screens over chimneys has reduced nesting places and led to population declines of swifts. By constructing Swift towers we can help save these remarkable birds. Towers may include a simple open vertical 'chimney' made of plywood or another exterior material. These towers allow birds access from the top with the bottom open for drainage. Raising the tower above the ground will provide additional access as well as providing a means for easier maintenance.

BIRD FRIENDLY NESTING GUIDELINES

- PROVIDE NESTS SPECIFIC TO BIRDS DESIRED AND EXPECTED
- CLEAN NESTING BOXES CONSISTENTLY
- SITUATE FEATURES AWAY FROM HIGH TRAFFIC AREAS WHERE BIRDS WILL FEEL THREATENED
- PROVIDE ADEQUATE COVER NEARBY WHERE BIRDS CAN APPROACH AND/OR FLEE IN THE CASE OF A THREAT
- INCLUDE ELEMENTS THAT ENCOURAGE STAGING SUCH AS STICKS OR SMALL SHRUBS NEAR WATER FEATURES
- LEAVE DEAD TREES (STAGS) FOR NESTING WHERE THEY ARE NOT A LIABILITY.



MAINTAINING A HABITAT

Once a bird friendly habitat has been developed, habitat maintenance plays a role that is just as significant, if not more so, than the establishment of the habitat itself. Although undisturbed native habitats are able to maintain themselves, influencing factors such as site maintenance for aesthetic perceptions, undesirable or invasive plant species, irrigation requirements, and introduced threats all need to be considered when maintaining a developed habitat.

INVASIVE REMOVAL

Invasive plant species can be characterized by three of their most common attributes: they reproduce and spread rapidly, they establish over large areas dominating native landscapes, and lastly, they persist even when faced with removal or adverse conditions. In Texas invasive species derive their success from not only favorable environmental conditions but also a lack of natural predators, competition, and disease that typically regulate their populations in their natural habitat. Having the ability to identify and remove invasive species is essential to establishing and maintaining native habitats.

SITE MAINTENANCE

Although necessary in most developed settings, common maintenance practices of pruning, and especially mowing, have proven to be devastating for many species of wildlife. For species such as grassland songbirds who are laying eggs and raising young in fields that are cut before offspring mature, however, mowing and general maintenance practices can threaten entire populations. Once development has been established, responsible and carefully considered maintenance approaches can make the difference between thriving and threatened habitats. A plan for seasonal maintenance should include how extensive pruning may affect birds roosting and nest in trees and how mowing and close shearing of groundcovers may affect not only ground nesting birds, but also the insects and small mammals, such as field mice, that provide food for bird populations. Maintenance should be “intended” not “untended.”

IRRIGATION MAINTENANCE

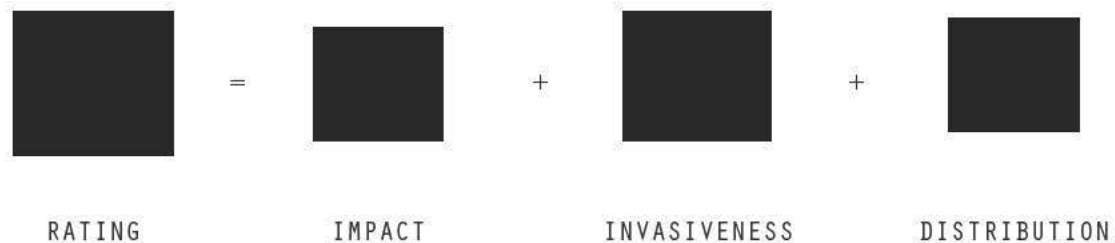
To establish habitats in the Greater Houston Area, supplemental water is often, if not always, necessary. On commercial sites permanent irrigation is a standard that will ensure the landscape is maintained throughout the hot summer months. In some cases a temporary system may be used to water plants until sufficiently established. Irrigation is especially effective when planting to aid in the successful establishment of native grasses and other species. Balancing plant selection with irrigation usage is important to optimize water conservation.

LIMITING THREATS

Although factors such as climate change, habitat loss, and migratory disruption pose the single greatest threat to bird populations worldwide, there are a number of other threats with severe implications that can be easily addressed on a site-by-site basis. Invasive predators, pesticides, and increasing pollution threaten habitats of all sizes.

INVASIVE REMOVAL

The Texas Invasive Plant Inventory categorizes non-native invasive plants that threaten the state's wildlands. Categorization is based on a species assessment of the ecological impacts of each plant. These criteria have been designed to support categorized lists of invasive plants by ranking each plant's level of threat to the ecological health of wildlands through evaluation of its ecological impact, ability to invade natural vegetation communities, and current extent of its invasion.

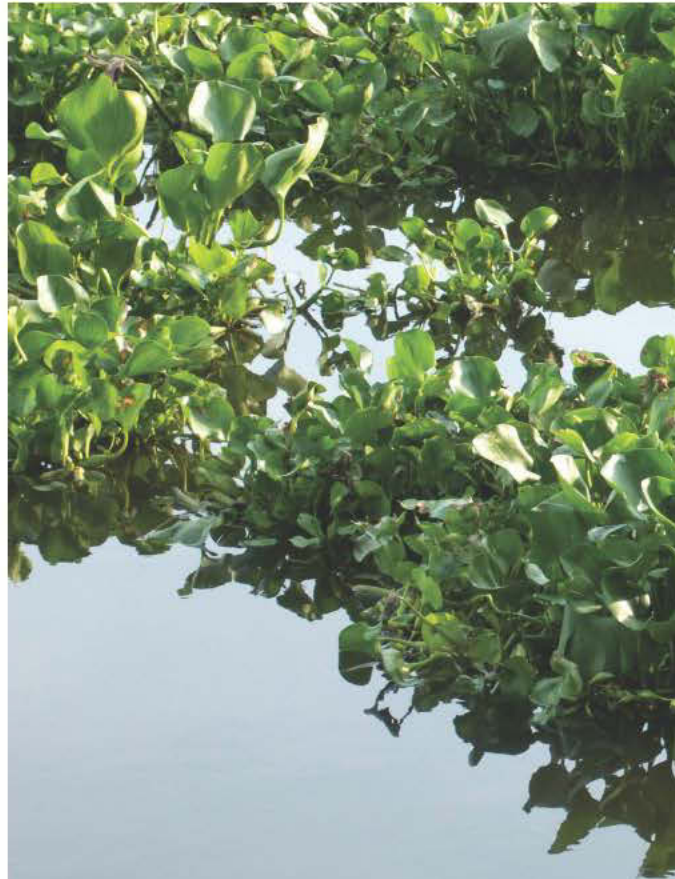


WHAT ARE INVASIVES?

An invasive species reproduces and spreads rapidly, establishes over large areas, and persists. Species that become invasive succeed due to favorable environmental conditions and lack of natural predators, competitors and diseases that normally regulate their populations.

This includes a wide variety of plants, insects and animals from exotic places. As invasive species spread and take over ecosystems, they decrease biodiversity by threatening the survival of native plants and animals. In fact, invasive species are a significant threat to almost half of the native U.S. species currently listed as federally endangered.

Removal of invasive species and replanting with native species will greatly enhance habitat value. However, even invasive species may provide cover for nesting, if no other vegetation is available. It is important to evaluate removal methods to minimize disturbance to existing permanent or migratory species. Invasives may need to be removed in part and not all at one time. Timing of removal should be coordinated to not occur during periods of migration and nesting. It is important to cover bare areas quickly as “nature abhors a vacuum” and open spaces may become quickly repopulated with undesirable species. A study of desired of targeted bird species should indicate the native plant species selected to replace removed invasives.





ALLIGATOR WEED



CHINESE TALLOW TREE



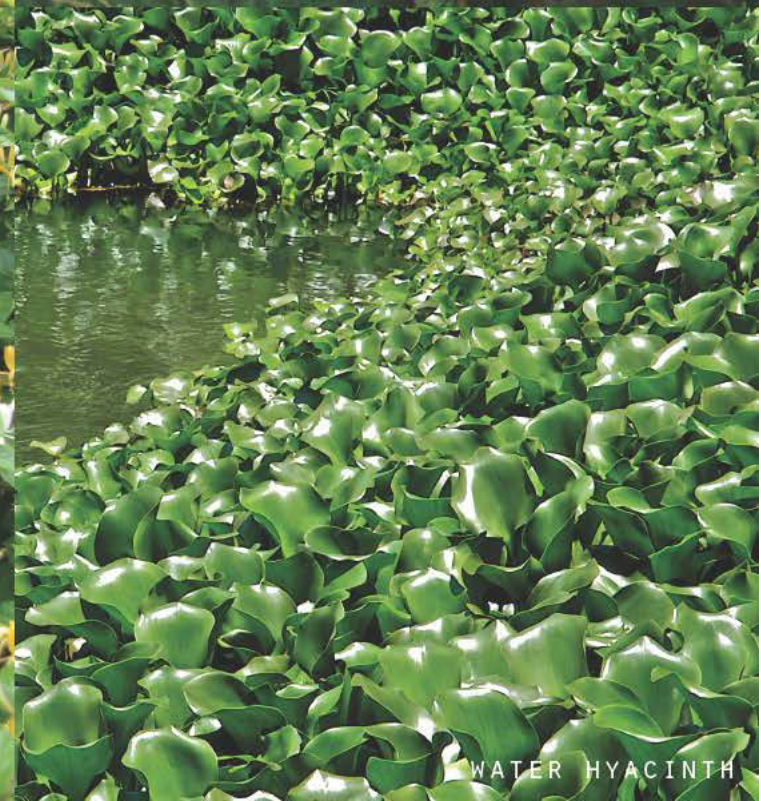
SALT CEDAR



CHINABERRY TREE



JAPANESE HONEYSUCKLE



WATER HYACINTH



COMMON

ALIGATOR
WEED

SCIENTIFIC

ALTERNANTHERA PHILOXEROIDES

CATCLAW
VINE

MACFADYENA UNGUIS-CATI

CHINABERRY
TREE

MELIA AZDARACH

CHINESE
PARASOL TREE

FIRMIANA SIMPLEX

CHINESE
PRIVET

LIGUSTRUM SINENSES

CHINESE
TALLOW TREE

TRIADECA SEBIFERA

ELEPHANT
EARS

COLOCASUIA ESCULENTA

GIANT
REED

ARUNDO DONAX

GLOSSY
PRIVET

LIGUSTRUM LUCIDUM

GOLDEN
BAMBOO

PHYLLOSTACHYS AUREA



COMMON

GOLDEN
RAINTREE

SCIENTIFIC

KOELREUTERIA PANICULATA



HYDRILLA

HYDRILLA VERTICILLATA

JAPANESE
CLIMBING FERN

LYGODIUM JAPONICUM

JAPANESE
HONEYSUCKLE

LONICERA JAPONICA

JOHNSON
GRASS

SORGHUM HALEPENSE

MALTA
STAR-THISTLE

CENTAUREA MELITENSIS



NANDINA

NANDINA DOMESTICA

PARROT
FEATHER

MYRIOPHYLLUM AQUATICUM

SALT
CEDAR

TAMARIX RAMOSISSIMA

SCARLET
FIRETHORN

PYRACANTHA COCCINEA

BIRD FRIENDLY MAINTENANCE GUIDELINES

- MAXIMIZE UNMOWED AREAS AND ENCOURAGE HABITATS THAT INCLUDE NATIVE TREES, SHRUBS, GRASSES, AND WILDFLOWERS.
- WHERE MOWING IS NECESSARY, PROCEED SLOWLY AND WORK FROM THE CENTER OF AREAS TOWARDS THE EDGE.
- SURVEY VEGETATED AREAS BEFORE TRIMMING OCCURS TO LOCATE ACTIVE NESTING SITES.
- WHEN CONDUCTING TRIMMING MAINTENANCE, AVOID LATE SPRING AND EARLY SUMMER NESTING MONTHS ALL TOGETHER.
- DURING PEAK NESTING AND POLLINATION ACTIVITY, AVOID UNNECESSARY MAINTENANCE AS MUCH AS POSSIBLE.
- IMPLEMENT RESPONSIBLE MAINTENANCE SCHEDULES THAT ADDRESS NESTING CONCERNS.
- LIMIT MOWING OF NATIVE GRASS AREAS TO 2-3 TIMES PER YEAR.

MAINTENANCE

Once habitats are developed careful consideration should be taken when conducting necessary maintenance during the late spring and early summer months. Trees, both large and small, shrubs, grasses and groundcover often serve as nesting habitat for a variety of species, especially during the spring migratory months. By practicing responsible maintenance techniques and developing an understanding of migratory schedules, maintenance programs can be developed to ensure the growth of safe and stable habitat.

MOWING

Most sites include areas of traditional manicured turf that is mown regularly throughout the spring, summer and into early fall. Areas of native grasses and wildflowers cannot persist if mowed too frequently. The optimum mowing schedule for prairie areas is two to four times per year. A schedule for mowing native prairie areas should avoid nesting periods from March through June. If native grasses are too tall close to pedestrian walkways, these areas may be perceived as unkempt. To help alleviate this issues, simply mow a strip along pedestrian walks, gathering spaces and even along street curbs.

TRIMMING

Similar to the criteria for mowing, nesting seasons should be considering when trimming trees. Postpone major tree trimming projects until mid-to-late summer or early fall whenever possible, surveying for nests when trimming does occur. If there are any dead trees that aren't currently posing an immediate threat or safety hazard to surrounding structures or pedestrians, consider leaving these stags for cavity nesting avian such as hawks, swifts, and swallows.

FREQUENCY

The most important aspect of maintaining a bird friendly habitat is developing and adhering to a responsible and effect maintenance schedule. By scheduling major projects during non-migratory seasons and allowing native habitats to establish without ongoing heavy maintenance, bird populations will continue to thrive on your site and promote a beautiful and active wildlife habitat.

IRRIGATION

To establish habitat in the Houston area, supplemental water is often necessary. On commercial sites permanent irrigation is a standard that will ensure the landscape is maintained throughout the hot summer months. Without supplemental water plants may struggle to establish or to decline during periods of drought. Under these circumstances bird populations will migrate elsewhere to find the shelter, food, and water they need to survive.

SYSTEMS

Traditional irrigation is dispersed through spray heads spaced evenly across the landscape. An alternate method of irrigation utilizes drip tubing. Drip tubes run in contact with the ground or under the mulch layer, applying water directly to the soil and root systems. Drip irrigation is more desirable in areas where birds could potentially be nesting on the ground or low in the landscape.

TECHNOLOGY

As irrigation practices become more comprehensive and developed, the implementation of new technology can not only be an economic benefit but an environmental asset as well. Smart Controllers can be used to program schedules that ensure responsible and adequate irrigation year-round making automatic adjustments based on input from local weather sensors. By having the ability to automatically determine water requirements for each irrigation zone, habitats are able to thrive independent of varying and ever-changing weather conditions.

FREQUENCY

Much like maintenance frequency, developing and adhering to a responsible and effective irrigation schedule is key for developed habitats to thrive. Especially during the establishment of native plantings it's critical that adequate irrigation takes place while avoiding the adverse effects of over irrigation such as erosion and sedimentation. As sites become established and mature, over-irrigation can be damaging to plant root systems while also encouraging the growth of fungal diseases.

BIRD FRIENDLY IRRIGATION GUIDELINES

- UTILIZE DRIP IRRIGATION IN AREAS WHERE BIRDS COULD POTENTIALLY BE NESTING ON THE GROUND OR LOW IN THE LANDSCAPE
- IMPLEMENT SMART TECHNOLOGY TO ASSIST IN IRRIGATION SCHEDULING AND HELP DETERMINE NECESSARY WATER REQUIREMENTS FOR EACH ZONE DEPENDING ON WEATHER
- DEVELOP IRRIGATION SCHEDULE AND ADJUST SEASONALLY TO MINIMIZE WATER USAGE AND PREVENT OVER-WATERING
- FINE TUNE AND ADJUST SPRAY HEADS AS NEEDED TO PREVENT OVERSPRAY FROM AFFECTING EXISTING OR POTENTIAL NESTING AREAS
- MAINTAIN A STRICT IRRIGATION PROGRAM DURING THE ESTABLISHMENT OF NATIVE PLANTINGS
- AVOID THE ADVERSE EFFECTS OF OVER-IRRIGATION SUCH AS EROSION AND SEDIMENTATION





LIMITING THREATS

Threats to bird populations cause the loss of billions of birds each year. Predators such as cats, the use of pesticides and other chemicals in our landscapes, and environmental pollutants are significant factors responsible for the loss of birds in the U.S. Limiting these threats in existing or constructed habitat is important to the survival of bird populations.

PREDATORS



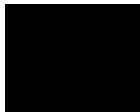
Domestic cats have been introduced into new habitats across the globe with terrible results. Outdoors cats are a non-native and invasive species that threaten birds and other wildlife, disrupt ecosystems, and spread disease. Cats, now numbering well over 100 million in the United States, kill over 2 billion birds and 12 billion mammals every year in the U.S. alone, making cat predation by far the largest human-caused mortality threat to birds. Over 70 percent of those birds are killed by an estimated 70 to 80 million stray or feral cats. More birds die from cat encounters than from collisions with buildings, communication towers, vehicles or poisoning by pesticides. Two-thirds of the killers' avian victims are resident species while one-third are migratory species.

PESTICIDES



The use of pesticides accounts for the majority of wildlife poisonings reported to the EPA each year. Birds are particularly vulnerable as they feed on the ground and often mistake pesticide granules for food. Pesticides also kill the insects that birds rely upon as an essential food source. It is estimated that approximately seven million birds are killed each year due to the aesthetic use of pesticides. Pesticides are also routinely used to control weeds and vegetation along roadsides and borders which are used by wildlife as habitat for nesting and raising their young. When a bird or small mammal is sickened by pesticides, they neglect their young, abandon their nests, and become more susceptible to disease and predators.

POLLUTANTS



Pollution is all around us; it's in the water we drink, the food we eat, and the air we breathe. Humans, however, are not the only species that are tasked with combating the adverse effects of pollution. For many avian species pollution presents itself in many forms. From noise and light pollution, which restricts certain species' abilities to communicate and travel, to water pollution which can cause illness and death in species dependent on healthy bodies of water as a habitat, it is becoming increasingly important to do everything in our ability to mitigate these issues and protect the species around us.



EDUCATION + INTERACTION

Houston Audubon aims to transform the greater Houston area into a thriving community that supports birds and provides more accessible opportunities for everyone to experience the wonder and joy of bird-watching. Site by site, acre by acre, Houston Audubon creates important corridors of healthy habitat for birds, butterflies and other pollinators. These advocacy efforts advance the conservation of birds while positively impacting their supporting environments, promote a healthier, natural environment, and create a more beautiful place to live by leading and nurturing a community that values education and interaction with the birds and other wildlife around us.

EDUCATION

A commitment to education is the cornerstone of conservation. Inspiring more people in more places to value and protect the natural world around them lays the foundation for a healthy future. From small scale applications such as the use of interpretive signage in habitat areas to much more involved operations such as corporate partnerships with local and national advocacy groups, valuing and promoting education is key for the sake of continued habitat growth and the preservation and enjoyment of birds.

INTERACTION

Each community has a unique ecological story to tell. Creating bird friendly habitats demonstrates a commitment to the sustainability of the urban, suburban and rural landscapes of Houston and the Gulf Coast. Promoting interaction with these landscapes can help restore and reconnect our relationship with these environments. We have the opportunity to reestablish the ecological functions of our cities and towns while providing essential and safe habitats for birds.



EDUCATION

Opportunities for education about birds and other wildlife is key for the conservation of birds and bird habitat. Some of the many avenues for education include informational signage at both birding and habitat sites, projects, programs and events that advocate for bird friendly habitat, and the partnerships that Houston Audubon continues to develop with the numerous other organizations, municipalities and corporations in the greater Houston area that support environmental and habitat issues. Another important educational tool is the Houston Audubon website houstonaudubon.org as well as the community resource birdfriendlyhouston.org.

INFORMATION

A variety of signage on site, whether geared towards wayfinding or educational use, can be a highly effective and an essential part of the experience for users. By including signage you are able to communicate simple yet valuable information that can evoke a strong connection to the surrounding habitats, creating narratives and giving value to the wildlife around us.

EVENTS

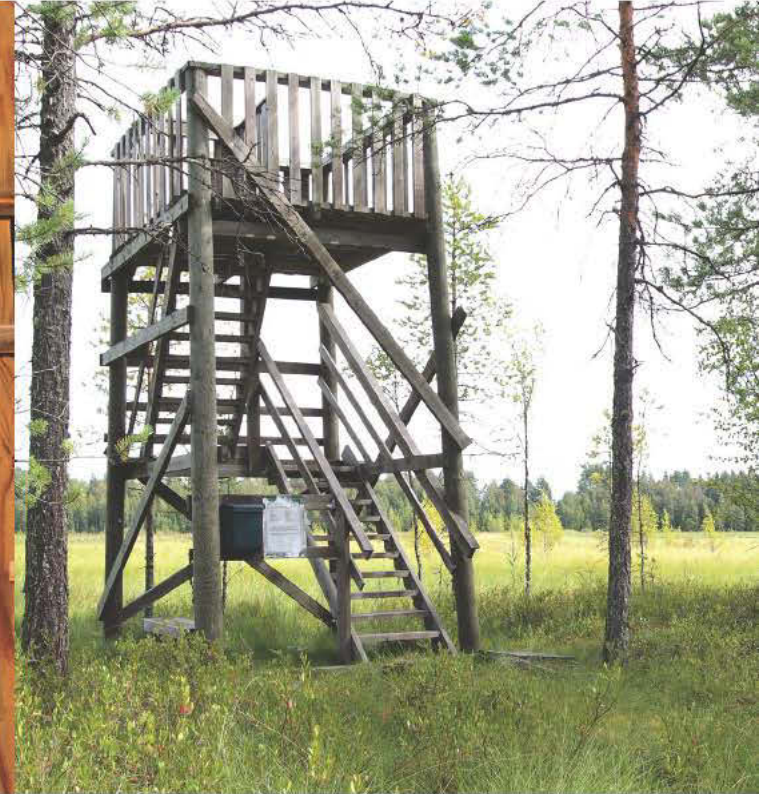
Depending on the type of project, programs and events can be scheduled post development to encourage and promote advocacy of bird friendly habitats. Whether it's hosting bird surveys, fostering a culture of volunteerism, scheduling educational nature walks, or simply encouraging users to experience the space around them, scheduled events not only help users develop an understanding of their surrounding habitats but can also be used as a tool to encourage social interaction and healthy lifestyles.

PARTNERSHIPS

Reaching out to any one of the numerous environmental groups in the Greater Houston Area is a perfect way to make a lasting impact on the environment and education. There are a number of local and national groups eager to engage with business, municipalities, and developers in an attempt to create short-term projects and programs that serve to protect and enhance the native habitats and natural resources that surround them. Not only do partners often receive recognition for their efforts, they also foster a community of environmental awareness and stewardship.

BIRD FRIENDLY EDUCATION GUIDELINES

- UTILIZE AND INSTALL SITE INTERPRETATIVE SIGNAGE AS BOTH WAYFINDING AND EDUCATIONAL TOOLS
- DEVELOP PROGRAMS AND HOST EVENTS THAT CREATE AWARENESS ABOUT BOTH BIRD HABITATS AND PRESERVATION
- PROVIDE OPPORTUNITIES TO PROMOTE ADVOCACY OF BIRD FRIENDLY HABITATS SUCH AS SURVEYS AND NATURE WALKS
- ENCOURAGE INTERACTION AND COOPERATION BETWEEN VARIOUS EDUCATIONAL AND ENVIRONMENTAL ORGANIZATIONS
- PARTNER AND ENGAGE WITH LOCAL BUSINESSES, MUNICIPALITIES, AND DEVELOPERS TO CREATE PROGRAMS THAT SERVE TO PROTECT AND ENHANCE HABITATS



INTERACTION

Promoting interaction with an existing or constructed bird habitat teaches children and adults alike to become more knowledgeable about birds and other wildlife and encourages preservation of bird habitat. The simple addition of strategically located walkways, trails, and greenways to provide access into habitat areas, and benches, towers or blinds to allow observation of birds without disrupting them, can increase interaction and awareness of birds and other wildlife species.

BENCHES

Bird watching can be an easy and inexpensive hobby for some while others refuse to travel without diasscopes, binoculars, and identification manuals. For the casual observer solutions as simple as including seating options near native habitats is an effective way to encourage interaction with a variety of bird species. Providing options to enjoy nearby species is a perfect start to promoting bird friendly habitats.

TRAILS

While trails and greenways are often viewed narrowly for their recreational benefits, they can also serve as a valuable educational resource on developments of any size. Trails and greenways can be programmed towards users of all ages giving them the opportunity to immerse themselves in a “natural classroom” and learn about their local habitats instilling a greater sense of appreciation and respect.

TOWERS & BLINDS

Birding towers and blinds allow users to experience natural habitat at many different levels, offering views and perspectives of the surrounding landscape and canopy that can't be accessed otherwise. Installing bird towers and blinds is a unique way to encourage the observation of wildlife without disturbing or disrupting native habitat. Towers and blinds must be designed to be in keeping with the size and scale of the site. If a large enough site, a birding tower or blind could be used as an aesthetic feature on site, accenting themes from surrounding architecture or could serving as an icon to the local community.

BIRD FRIENDLY INTERACTION GUIDELINES

- PROVIDE SEATING ALONG WALKWAYS, TRAILS AND GREENWAYS TO ALLOW CASUAL OBSERVATION WITHOUT DISTURBING WILDLIFE
- PROGRAM WALKWAYS, TRAILS AND GREENWAYS TOWARDS USERS OF ALL AGES
- DESIGN WALKWAYS, TRAILS AND GREENWAYS THAT IMMERSE USERS IN THE ENVIRONMENT AROUND THEM
- CONSIDER BLINDS AND TOWERS OF VARYING HEIGHTS TO OFFER VIEWS AND PERSPECTIVES OF THE SURROUNDING LANDSCAPE THAT CANNOT OTHERWISE BE ACCESSED
- BE MINDFUL OF SIZE AND SCALE WHEN CONSTRUCTING BLINDS AND TOWERS



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