

APPENDIX D-

FISH AND WILDLIFE COORDINATION ACT REPORT



United States Department of the Interior

FISH AND WILDLIFE SERVICE
10711 Burnet Road, Suite 200
Austin, Texas 78758
(512) 490-0057

October 11, 2002

Colonel Gordon R. Wells
District Engineer
U.S. Army Corps of Engineers
(Attn: CESWF-PER-EE)
P.O. Box 17300
Fort Worth, Texas 76102-0300

Dear Colonel Wells:

This letter provides planning assistance for the Onion and Williamson Creeks Interim Feasibility Study within Travis and Hays counties, Texas. The purpose of this letter is to identify and describe existing fish and wildlife resources within the proposed project areas.

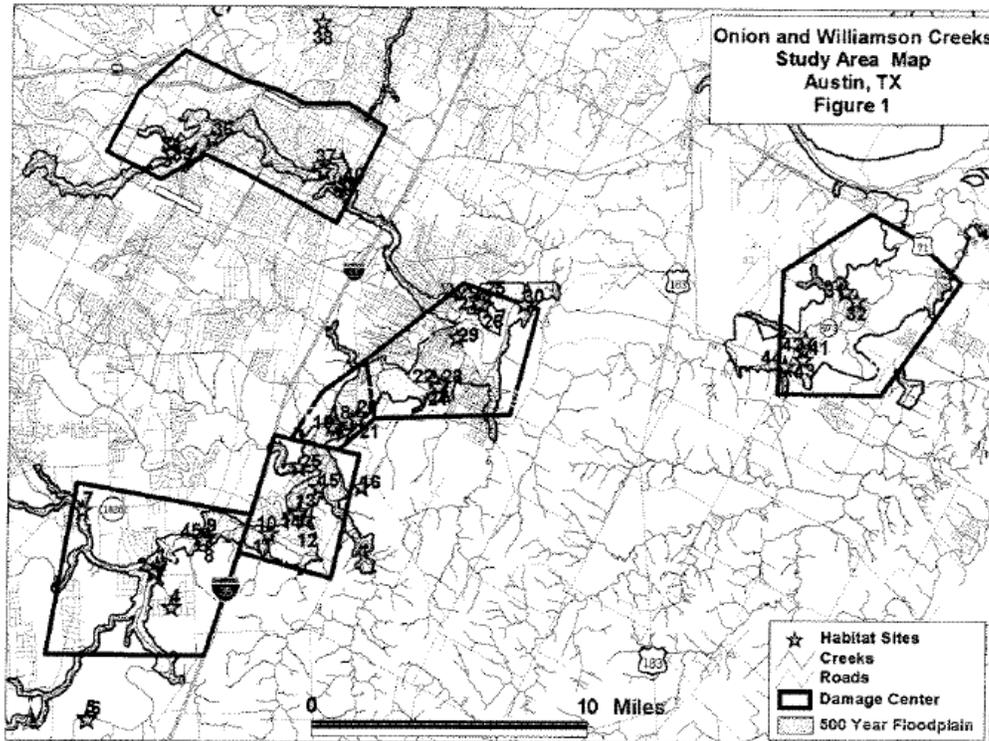
This planning assistance is provided, in part, pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and is intended to assist in the development of your draft feasibility report. It does not represent a final report of the Secretary of the Interior within the meaning of Section 2(b) of the Act. A complete draft Fish and Wildlife Coordination Act report will be prepared, for consideration and to accompany the feasibility report, after we have reviewed all available pertinent information during the planning process.

These studies were initiated at the request of the City of Austin and Travis County, where plans are being made to reduce flood damage, restore ecosystems, and provide additional and improved recreational opportunities along Onion and Williamson Creeks. Project area inspections were conducted in April, August, and October of 2001 and in May of 2002 by U.S. Fish and Wildlife Service (Service) staff. The May and July, 2002, field visits to gather habitat evaluation procedures data were accomplished with help from Texas Parks and Wildlife Department and your environmental planning staff.

DESCRIPTION OF THE STUDY AREA

Location

The study area is located in Travis and Hays counties, Texas and the watershed is entirely within the Lower Colorado River Basin. The Onion Creek watershed includes Williamson, Slaughter, Bear, Little Bear and Onion Creeks. The headwaters of the Onion Creek watershed are located in Hays, Blanco, and Travis counties, Texas. Six specific damage areas have been identified for study within the Onion and Williamson Creek subwatersheds (Figure 1).



Climate, Topography, and Ecology

The climate in Travis and Hays counties is generally mild with hot summers, with average temperatures ranging from 90° F in the summer and 61° F in the winter. The annual mean rainfall is about 33 inches. Onion Creek lies primarily within the Blackland Prairies and the Edwards Plateau ecoregions. Williamson Creek lies primarily within the Edwards Plateau ecoregion. The vegetation in the Onion and Williamson Creek watersheds displays tremendous biological diversity as a result of numerous factors, including the region's climactic and geologic variations and its location as a transition zone between the eastern deciduous forests and the central North American grasslands.

Blackland Prairie

Portions of the project area lie within an ecoregion known as the Blackland Prairie. This area mixes with the post oak savannah in the southeast and has divisions known as the San Antonio and Fayette Prairies. This ecoregion represents the southern extension of the true prairie that occurs from Texas to Canada. The upland blacklands are dark, calcareous shrink swell clayey soils, changing gradually with depth to light marls or chalks. Bottomland soils are generally reddish brown to dark gray, slightly acid to calcareous, loamy to clayey and alluvial. Generally,

these soils are productive and fertile, however, many have lost productivity through erosion and continuous cropping (TAMU, 1998).

Due to grazing pressures the tall grass prairie, once dominated by big and little bluestem, indiagrass, tall dropseed and Silveus dropseed, has been dominated by minor species such as sideoats and hairy grama, Mead's sedge, Texas wintergrass, and buffalograss. Common forbs consist of asters, prairie bluet, prairie clover, and late coneflower with snoutbeans and vetch occurring as the common legumes. Mesquite, huisache, oak, and elm are common invaders on poor conditioned rangelands and on abandoned croplands. Lowland hardwood species that are common along drainages consist of oak, elm, cottonwood, and pecan (TAMU, 1998). Much of the Blackland Prairie has been cultivated to produce cotton, sorghum, corn, wheat, and forage during the latter part of the 19th century and the first part of the 20th century. Since then, pasture and forage crops have increased for the production of livestock.

Edwards Plateau

The original vegetation of the Edwards Plateau ecoregion was grassland or open savannah-type plains with tree or brushy species found along rocky slopes and stream bottoms. Tall grasses such as various bluestems, indiagrass, and switchgrass are still common along rocky outcrops and areas having good soil moisture. Mid-grasses and short-grasses such as sideoats grama, buffalograss, and Texas grama dominate the shallow xeric sites. The creek banks are wooded with a variety of trees, some of them ranging 20-50 inches in diameter at breast height. Species common to this area include cottonwood, bitter pecan, American elm, hackberry, various oak, mesquite, juniper, cedar, bald cypress and willow.

Several sensitive environmental features have been documented within the Edwards Plateau Ecoregion of the Onion and Williamson Creek watersheds. Because of the uniqueness of the Edwards Aquifer, the springs and streams flowing through rugged terrain, present exceptional recreational opportunities to residents and visitors to the area. The aquifer has been designated as a sole source aquifer serving in excess of 1.5 million people. The primary aquifer recharge area extends along the Balcones Fault Zone and is crossed by major streams within the study area. In addition to the sensitive aquifer, several federally listed threatened or endangered species have been identified within the study area. Several of these species are associated with the karst topography and others are associated with the aquifer or its springs. Others are associated with the Ashe juniper and or mixed oak woodlands on the Edwards Plateau. The riparian forests that extend along the streams also provide important habitat for resident and migratory birds. Year round flow of waters occurs on the Colorado River from springs, channel lakes, and return flows. Periodic thunderstorms with high intensity rainfall can trigger flooding due to rapid runoff from the rugged Hill Country terrain and impervious surfaces associated with urban development. Storm runoff has the potential to adversely affect water quality within the receiving streams.

FISH AND WILDLIFE RESOURCES

Habitat Cover Types

1) **Riparian Woodlands/ Bottomland Hardwood Forest** - This cover type is predominately composed of mature pecan, oaks, and elms within the riparian corridors, or areas that are

periodically flooded on public and private lands. These bottomland ecosystems have been created by the interaction of streams, floodplains, and the adjacent terrestrial habitat. These hardwood forests, particularly old-growth hardwoods (greater than 100 years old), contribute to the biodiversity and provide important food and shelter for wildlife. Periodic flooding enhances the diversity of habitat types within these areas. The disturbance of the bottomland forest by flooding is a natural and important part of the proper functioning of these areas. Bottomlands help to contain floodwaters and lessen the impact of flooding when rivers overflow. In addition, these bottomland forests help maintain water quality by trapping sediments, wastes, and pollutants from stormwater runoff.

Trees found in the damage areas include bald cypress, pecan, sycamore, oaks, elm, ashe juniper, cottonwood, and hackberry. According to reports by the Texas Department of Parks and Wildlife (Fentress, 1986), at least 189 species of trees and shrubs, 42 woody vines, 75 grasses and 802 herbaceous plants are known to occur in the bottomland hardwood ecosystems in Texas. Even though central Texas (i.e. Onion Creek) bottomland hardwood ecosystems are not quite as diverse as the east Texas woodlands described by Fentress (1986), they are complex and dynamic habitats with large diverse communities. These plant communities provide habitat for a diversity of animal species.

Bottomland hardwoods in Texas also support at least 116 species of fish, 31 species of amphibians, 54 species of reptiles, 273 species of birds and 45 species of mammals (Fentress, 1986). Over 50 percent of all the neotropical songbirds are associated with bottomland hardwood forests (Fentress, 1986). The Onion Creek bottomlands support a large diversity of insects, fish, amphibians, reptiles, birds, and mammals. Signs of armadillos, raccoons, and opossums were fairly numerous throughout the damage areas. Leopard frogs and cricket frogs were abundant, as were snakes, butterflies, bees, and other flying insects. These areas provide some habitat for white tail deer. Bird species sighted were typical of bottomland riparian areas.

Overall, the riparian habitat along the damage areas is fairly fragmented and impacted by suburban and rural development and agricultural uses along the streambank. Dense pockets of properly functioning riparian habitat do exist within the damage areas and the degree of fragmentation varies among sites.

2) **Grasslands** - The grasslands are generally located in parks, fallow farm fields, pastures, or in the floodway zone along the stream system. There are two types of grasslands in the study areas, short grasslands and tall grasslands. The short grass areas, that are routinely mowed, are comprised of short native and introduced grasses and forbs, and sometimes scattered trees. The tall grass fallow fields also contain a combination of native and introduced grass and forb species, but the composition is different than those in the short grass areas.

3) **Shrublands** - These cover types are located in disturbed areas and considered to be in an early secondary successional stage. They are not as common in the project area as the other cover types but are interspersed within the woodlands and grasslands. They are composed of scattered mesquites, willows, young oaks and elms, cedars, tall grasses, and various forbs.

4) **Wetlands** - This cover type is comprised of rushes, sedges, wetland grasses, and aquatic plants which are located along the edges of creeks and seasonally flooded areas. Some of these

wetlands are permanent, but most are seasonal. The emergent wetlands along the creeks provide important habitat for wildlife species. These areas are relatively small and are usually included within other habitat types because in these stream situations they are seldom large enough to map.

Wildlife Resources

The project area is used by both resident and migratory species that are somewhat tolerant of human activity. Migratory waterfowl and shorebirds, and resident wood ducks, can be seen in the open water and emergent wetlands. A variety of migratory and resident passerine, owl, and hawk species use the woodlands. Some common resident birds that may be observed in the study area are sparrows, northern cardinals, blue jays, grackles, scissor-tailed flycatcher, common crows, kestrels, and red-tailed hawks. Mammal species that may utilize all habitat types in the study area include raccoons, armadillos, striped skunks, opossums, coyotes, bobcats, cottontail rabbits, foxes squirrels, and small rodents. Common fish species that can be found in the perennial water portions of streams are largemouth bass, channel catfish, crappie, sunfish, white bass, green sunfish, and various minnows and shiners. Several species of frogs and turtles may be found in the creeks and wetlands, while lizards and snakes can be found throughout the damage areas.

Habitat Evaluation Procedures

Wildlife values were analyzed using the Service's *Habitat Evaluation Procedure* (HEP) (U.S. Fish and Wildlife Service, 1980) to describe and measure key habitats in the project area. Appendix A lists the geographical locations of data collection plots. The HEP requires the use of Habitat Suitability Index (HSI) models developed for indicator species that best represent groups of species that use the habitats in the project area. The 13 wildlife species utilized for the habitat evaluations indicative of the mostly urban mammalian and avian species found within the Onion and Williamson Creeks are as follows:

1. **Riparian Woodlands** - raccoon, barred owl, fox squirrel, downy woodpecker
2. **Grasslands** - red-tailed hawk, scissor-tailed flycatcher, eastern meadowlark
3. **Shrublands** - raccoon, scissor-tailed flycatcher, eastern cottontail
4. **Wetlands** - raccoon, green heron, wood duck

Using these models, baseline habitat conditions are expressed as a numeric function (HSI value) ranging from 0.0 to 1.0, where 0.0 represents no suitable habitat for an indicator species and 1.0 represents optimum conditions for the species. Habitat units (HU) are calculated by multiplying the HSI by the amount of acres of the habitat type available within each damage area. Acreages were derived from floodplain maps provided by the Corps of Engineers. Site specific Habitat Evaluation Procedures/Habitat Suitability Index data is included in Appendix B.

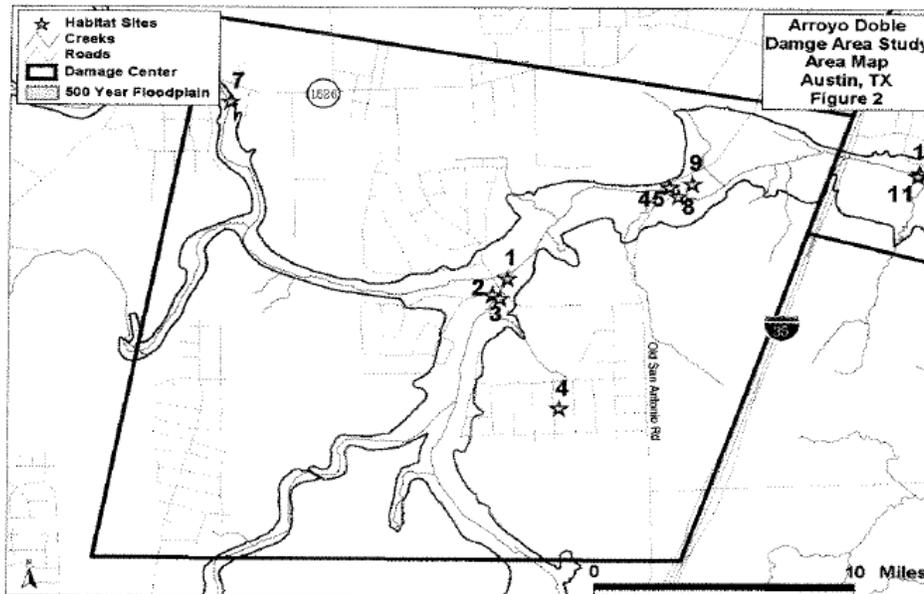
Project Site Descriptions

Arroyo Doble Damage Area

The Arroyo Doble Damage Area covers about 476 acres; all within the 100 year floodplain and contains several habitat and non-habitat land use types as follows:

- Riparian Woodlands: 326 acres (68%)
- Grasslands: 93 acres (20%)
- Shrublands: 49 acres (10%)
- Wetlands: 4 acres (0.8%)
- Urban/bare soil: 4 acres (0.8%)

The Arroyo Doble Damage Area is located near the confluence of Bear Creek and Onion Creek west of Interstate Highway 35 (Figure 2). There are several older neighborhoods built on the isthmus between these two streams and on the banks of both streams. The riparian zone here is starting to take on more of an Eastern character, like the Blackland Prairie, with flatter topology, soil/clay banks and large deciduous trees. The understory for at least 20 meters on either side of Onion Creek in this area is well established and diverse. The canopy is dense, consisting of primarily pecan, walnut, and cedar elm. The extent of the riparian zone for both streams is about 75 meters on either side of the stream (150 meters total), but is encroached upon regularly by residential development. Outside the 75 meters riparian zones there is a mix of upland juniper and live oak, residential development and light cultivated agriculture and pastureland.



Several low water dams in this damage area have greatly altered the natural channel of Onion Creek within the damage area. Above the upstream dam (about 1/4 mile above Twin Creeks road) the channel is flat and filled in with cobble and gravel. The gradient of Onion Creek from the top of the damage area to the dam is very low. Water willow and emergent vegetation are dominant in this wide, flat section of the stream. Stream flow through this section typically goes subsurface by July with water found only in several deep pools throughout the damage area.

The second low water dam in this damage area is formed by the old low water crossing of the original San Antonio road (now at Twin Creeks road). This old bridge is just upstream from the confluence of Bear Creek and Onion Creek. Onion Creek is a bedrock channel in this section of stream. The bridge creates a deep pool upstream and is a popular fishing spot. The pool probably holds water throughout most years. The bridge does act to back water up and the culverts beneath the bridge routinely clog with woody debris.

The damage area has a large watershed above it and the floodplain has adapted to the effects of flooding. The riparian community is healthy and growing and the wildlife is well adapted to this environment. The aquatic resources in the Arroyo Doble damage area are limited by the intermittent nature of stream flow throughout the area. This area lies directly below the recharge zone of the Barton Springs segment of the Edwards Aquifer. The streams crossing the Edwards aquifer recharge zone tend to go dry during the summer months because much of the flow is infiltrated into the aquifer through recharge features in the streambeds. Throughout the damage area, there are several deep pools that retain permanent water throughout most years. These pools act as refugia for fish and aquatic macroinvertebrates. These creeks have evolved with this flow regime. The deep pools and the creeks when flowing provide habitat for catfish, bass, sunfish, frogs, and water snakes.

Riparian woodlands - Arroyo Doble Damage Area

Riparian woodland habitat was assessed at four sites along Onion and Bear Creeks (1, 2, 5, and 7). Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. The overall HSI value for Arroyo Doble is 0.76 with 248 Habitat Units (Table 1) providing good habitat. Raccoons require large diameter trees, which were fairly common throughout the woodlands. However, the majority of the trees in these riparian areas were less than ten inches in diameter and that lowered the overall habitat rating for raccoon cover and reproduction. Barred owl habitat was good, however, the relatively thick understory reduces cover and reproductive values. Similarly fox squirrel habitat value for cover and reproduction was reduced by the relatively thick understory. Barred owls and fox squirrels require a more open understory. Mast producers greater than or equal to 6 inches diameter at breast height (dbh) were fairly common throughout the woodlands producing good food value for fox squirrels.

Grasslands - Arroyo Doble Damage Area

Grassland habitat was assessed at four sites along Onion and Bear Creeks (3,4,6, and 9). Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. Most of the grasslands along the creeks in the Arroyo Doble Damage Area are in good condition with an overall HSI value of 0.79, with 73 habitat units. The grasslands generally had good ground cover and a fair to good mixture of grasses and forbs. One exception was site four which was a heavily grazed pastureland. The grasslands were adjacent to wooded

Table 1. Habitat Suitability Indices (HSI) and Habitat Units (HU) for Each Damage Area.

Damage Area	Riparian Woodland		Grassland		Shrubland		Wetland	
	HSI ¹	HU ²	HSI ¹	HU ²	HSI ¹	HU ²	HSI ¹	HU ²
Arroyo Doble	0.76	248	0.79	73	0.83	42	0.86	3.4
Onion Creek Country Club	0.55	94	0.56	359	0.85	32	None	None
Perkins Valley	0.89	47	0.71	250	None	None	None	None
Yarabee Bend	0.80	286	0.71	524	0.93	55	None	None
Timber Creek	0.82	73	0.94	1016	0.80	64	None	None
Williamson Creek	0.53	77	0.57	22	0.78	57	None	None

1. HSI = Habitat Suitability Index
2. HU = Habitat Unit

riparian areas providing good red-tailed hawk nesting and perching. Meadowlark habitat value was fair to average because of the lower percentage of grass present in the areas. Scissor-tailed flycatcher habitat was excellent at two out of three sites with site four being less due to the grazing pressure. Habitat diversity in these areas could be improved by establishing a few native tall grassland areas along the floodway grassland boundary with scattered shrubs and scattered brush piles.

Wetlands - Arroyo Doble Damage Area

One wetland site was sampled on Onion Creek (Site 8). The Site is just downstream of Old San Antonio Road and just upstream of Interstate Highway 35. Photos of the site can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. According to the landowner, this wetland was enhanced by excavation 30 to 50 years ago. The wetland provides permanent water, which is required for good raccoon, green heron, and wood duck habitat (Table 1). The overall HSI for this four acre wetland was 0.86 with 3.4 habitat units. Raccoon habitat was excellent (0.97 HSI) with good water as well as good cover and reproduction values. Wood duck habitat was also very good (0.87 HSI) with adequate nest site availability and good brood cover habitat. Green heron habitat was good (0.75 HSI) but was lower than the other species due to the rocky nature of the substrate that lessens food productivity for herons.

Shrublands - Arroyo Doble Damage Area

The shrubland sampled in the Arroyo Doble Damage Area (Site 45) had very good habitat for scissor-tailed flycatchers and eastern cottontails. There was good ground cover and a good

mixture of forbs and grasses. The overall HSI for the shrublands was 0.83 with 42 habitat units. Photos of the site can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. There was a paucity of suitable denning habitat for raccoons which lowered the habitat value for that species.

Onion Creek Country Club Damage Area

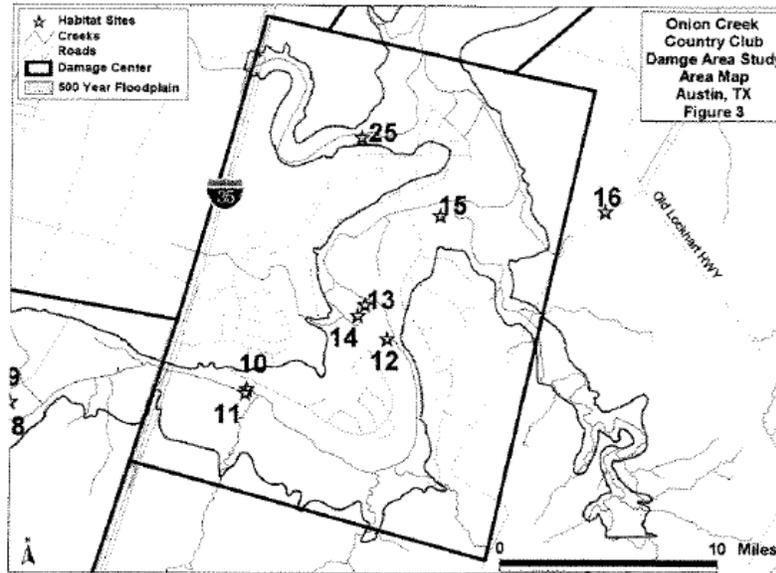
The Onion Creek Country Club Damage Area covers about 971 acres, all within the 100 year floodplain, and contains several habitat and non-habitat land use types as follows:

- Riparian Woodlands: 171 acres (18%)
- Grasslands (includes golf course): 641 acres (66%)
- Shrublands: 38 acres (4%)
- Urban/bare soil: 121 acres (12%)

The Onion Creek Country Club Damage Area begins just upstream of Interstate Highway 35 (Figure 3). The small stretch of Onion Creek upstream of the highway is accented with a diverse and healthy riparian area. The area downstream of the highway includes a large residential development and 3 golf courses that dominate this section of Onion Creek. The riparian zone in this reach is extremely narrow (less than 30 meters) and relatively non-functional, particularly within the Onion Creek Country Club, where the understory and much of the canopy cover has been cleared. The riparian area on the opposite side of the streambank from the golf course does contain some dense, healthy habitat. In addition to the clearing of riparian habitat, large growths of algae were noted along the stream. The algae can be detrimental to life in the stream because they decompose after growth periods and consume most of the stream's dissolved oxygen. The golf course uses wastewater effluent for irrigation and the high nutrient load may be acting synergistically with the increased sunlight from the cleared canopy to promote high levels of algae growth. This area needs an active riparian management strategy to reclaim the high potential habitat value for riparian species.

Several homes in the residential community were flooded in the November 15, 2001, storm event. The golf course sustained major erosion and stability problems throughout the floodplain. This damage area has been greatly altered and provides minimal habitat for fish and wildlife resources. As a result, several exposed banks have developed along the stream with little protective vegetation. The damage area also includes the downstream end of Slaughter Creek which has relatively good riparian habitat.

The aquatic resources in the Onion Creek Country Club Damage Area are limited by the intermittent nature of stream flow throughout the area. This area lies below the recharge zone of the Barton Springs segment of the Edwards Aquifer. The streams crossing the Edwards aquifer recharge zone tend to go dry during the summer months because much of the flow is infiltrated into the aquifer through recharge features in the streambeds. Throughout the damage area there are several deep pools that retain permanent water throughout most years. These pools act as



refugia for fish and aquatic macroinvertebrates. These creeks have evolved with this flow regime. The deep pools and the creeks when flowing provide habitat for catfish, bass, sunfish, frogs, and water snakes.

Riparian woodlands - Onion Creek Country Club Damage Area

Riparian woodland habitat was assessed at six sites along Onion and Slaughter Creeks (10, 11, 12, 14, 15, and 25). Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. The overall HSI value for Onion Creek Country Club Area is 0.55 with 94 Habitat Units (Table 1) providing fair habitat. Raccoons require large diameter trees, which were fairly common throughout the woodlands. However, the majority of the trees in these riparian areas were less than ten inches in diameter and that lowered the overall habitat rating for raccoon cover and reproduction. Barred owl habitat was fair, and the relatively thick understory reduces cover and reproductive values. Similarly fox squirrel habitat value for cover and reproduction was reduced by the relatively thick understory. Barred owls and fox squirrels require a more open under story. Mast producers greater than or equal to 6 inches dbh were fairly common throughout the woodlands producing good food value for fox squirrels.

Grasslands - Onion Creek Country Club Damage Area

Grasslands habitat was assessed at one site along Onion Creek (13). The grasslands along the creeks in the Onion Creek Country Club Damage Area are in fair condition with an overall HSI value of 0.56, with 359 habitat units. Photos of the site can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. The grasslands were adjacent to wooded riparian areas providing good red-tailed hawk nesting and perching habitat. However, the interspersions of urban impacts severely depresses red-tailed nesting success and therefore these areas did not provide good habitat for red-tailed hawks. Meadowlark habitat value was similarly lower (fair) because of the lower herbaceous cover of grass present in the areas. The

lower herbaceous cover also impacted scissor-tailed flycatcher habitat. Habitat diversity in these areas could be improved by establishing a few native tall grassland areas along the floodway grassland boundary with scattered shrubs and scattered brush piles.

Shrublands - Onion Creek Country Club Damage Area

The shrubland sampled in the Onion Creek Damage Area (Site 16) had very good habitat for scissor-tailed flycatchers and eastern cottontails. The overall HSI for the shrublands was 0.85 with 32 habitat units. Photos of the site can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. There was good ground cover and a good mixture of forbs and grasses. There was a paucity of suitable denning habitat for raccoons which lowered the habitat value for that species.

Perkins Valley Damage Area

The Perkins Valley Damage Area covers about 475 acres, all within the 100 year floodplain and contains several habitat and non-habitat land use types as follows:

Riparian Woodlands: 54 acres (6%)

Grasslands: 352 acres (71%)

Shrublands: 17 acres (6%)

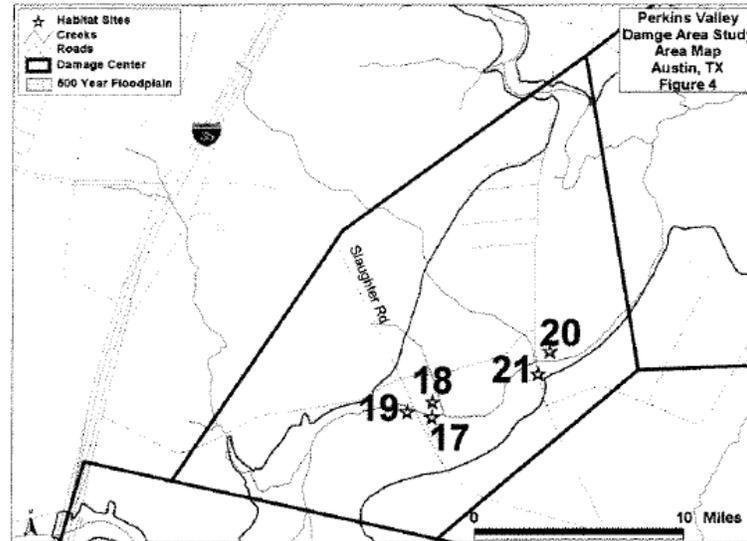
Urban/bare soil: 52 acres (16%)

This small stretch of Onion Creek is dominated by agriculture, rural residential, and some commercial land use (Figure 4). The riparian zone is continuous, but ranges from less than 30 meters to greater than 200 meters, with some areas that are mowed and/or cleared up to one bank of the stream. Since there is no dense residential development, the only activity within the riparian zone is row cropping, which directly contributes to erosion and sedimentation from the steep soil banks where riparian vegetation has been removed. In general the riparian zone in this area is poor to fair with many areas that are dominated (most of the lower section) by invasive species (chinaberry and ligustrum) with some higher quality older communities interspersed (primarily in the upper end).

The aquatic resources in the Perkins Valley Damage Area are limited by the intermittent nature of stream flow throughout the area. This area lies below the recharge zone of the Barton Springs segment of the Edwards Aquifer. The streams crossing the Edwards aquifer recharge zone tend to go dry during the summer months because much of the flow is infiltrated into the aquifer through recharge features in the streambeds. Throughout the damage area there are several deep pools that retain permanent water throughout most years. These pools act as refugia for fish and aquatic macroinvertebrates. These creeks have evolved with this flow regime. The deep pools and the creeks when flowing provide habitat for catfish, bass, sunfish, frogs, and water snakes.

Riparian woodlands - Perkins Valley Damage Area

Riparian woodland habitat was assessed at three sites along Onion Creek (17, 19, and 21). Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are



listed in Appendix D. The overall HSI value for the Perkins Valley Damage Area is 0.89 with 47 Habitat Units (Table 1) providing very good habitat. Raccoons and barred owls require large

diameter trees, which were fairly common throughout the woodlands. The trees in these riparian areas were large (many over 20 inches dbh), which increased the overall habitat rating for raccoon cover and reproduction and barred owl habitat. Mast producers greater than or equal to 6 inches dbh were fairly common throughout the woodlands producing good food value for fox squirrels. Downy woodpecker habitat also rated very high overall (0.97 HSI).

Grasslands - Perkins Valley Damage Area

The grasslands along the Onion Creek (Sites 18 and 29) in the Perkins Valley Damage Area are in fair condition with an overall HSI value of 0.71, with 250 habitat units. Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. The grasslands were adjacent to wooded riparian areas, providing good red-tailed hawk nesting and perching habitat. However, the lower herbaceous canopy and grass cover within the sample areas depresses red-tailed hawk nesting success. Therefore these areas only provide fair habitat for red-tailed hawks. Meadowlark habitat value was similarly lower (fair) because of the lower herbaceous cover of grass present in the areas. The lower herbaceous cover also impacted scissor-tailed flycatcher habitat. Habitat diversity in these areas could be improved by establishing a few native tall grassland areas along the floodway grassland boundary with scattered shrubs and scattered brush piles.

Shrublands - Perkins Valley Damage Area

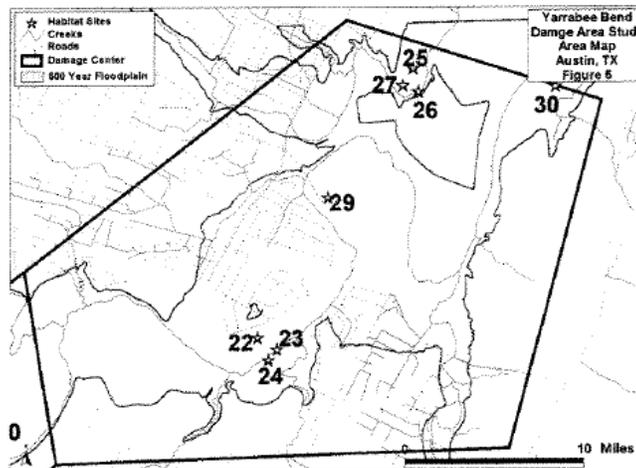
Only 17 acres of shrubland habitat were identified in this damage area. Due to the low number of acres and access issues, no shrubland habitat was sampled in this damage area.

Yarabee Bend Damage Area

The Yarabee Bend Damage Area covers about 1,414 acres, all within the 100 year floodplain and contains several habitat and non-habitat land use types as follows:

- Riparian Woodlands: 358 acres (25%)
- Grasslands: 738 acres (52%)
- Shrublands: 105 acres (7%)
- Wetlands: 3 acres (0.2%)
- Urban/bare soil: 210 acres (15%)

Spotty, but dense, residential and commercial developments characterize this section of Onion Creek (Figure 5). The riparian zone is relatively wide and healthy in some places (greater than 200 meters) and entirely absent in others. Again, due to the deep Blackland Prairie soils and clay banks in this lower section of Onion Creek, there are significant erosion problems in this reach where the riparian zone has been degraded. The canopy in the established riparian areas is dense, high and dominated by pecan, elm, and in some places cypress. In general, the riparian zone in this reach is in fair to moderate condition and relatively intact, with some exceptions on both ends of the spectrum. In the lower end of this reach there is a golf course and abandoned sludge tanks that have historically caused water quality problems on both Williamson and Onion creeks.



The aquatic resources in the Yarabee Bend Damage Area are limited by the intermittent nature of stream flow throughout the area. This area lies below the recharge zone of the Barton Springs segment of the Edwards Aquifer. The streams crossing the Edwards aquifer recharge zone tend to go dry during the summer months because much of the flow is infiltrated into the aquifer through recharge features in the streambeds. Throughout the damage area there are several deep pools that retain permanent water throughout most years. These pools act as refugia for fish and aquatic macroinvertebrates. These creeks have evolved with this flow regime. The deep pools and the creeks when flowing provide habitat for catfish, bass, sunfish, frogs, and water snakes.

Riparian woodlands - Yarabee Bend Damage Area

Riparian woodland habitat was assessed at four sites along Onion Creek (22, 23, 26, and 27). Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. The overall HSI value for the Yarabee Bend Damage Area is 0.80 with 286 Habitat Units (Table 1) providing good habitat. However, the majority of the trees in these riparian areas were less than ten inches in diameter and that lowered the overall habitat rating for raccoon cover and reproduction. Barred owl habitat was fair, and the relatively thick understory reduces cover and reproductive values. Similarly fox squirrel habitat value for cover and reproduction was reduced by the relatively thick understory. Barred owls and fox squirrels require a more open under story. Mast producers greater than or equal to 6 inches dbh were fairly common throughout the woodlands producing good food value for fox squirrels. Downy woodpecker habitat rated very good (1.00 HSI).

Grasslands - Yarabee Bend Damage Area

The grasslands along the creeks in the Yarabee Bend Damage Area (Sites 28, 29, and 30) are in good condition with an overall HSI value of 0.71, with 524 habitat units. Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. The grasslands were adjacent to wooded riparian areas providing good red-tailed hawk nesting and perching habitat. However, the lower herbaceous canopy and grass cover within the sample areas depresses red-tailed hawk nesting success. Therefore these areas only provide fair habitat for red-tailed hawks. Meadowlark habitat value was similarly lower (fair) because of the lower herbaceous cover of grass present in the areas. The lower herbaceous cover also impacted scissor-tailed flycatcher habitat. Habitat diversity in these areas could be improved by establishing a few native tall grassland areas along the floodway grassland boundary with scattered shrubs and scattered brush piles.

Shrublands - Yarabee Bend Damage Area

The shrubland sampled in the Yarabee Bend Damage Area (Site 22) had good habitat for raccoons, scissor-tailed flycatchers, and eastern cottontails. The overall HSI for the shrublands was 0.93 with 55 habitat units. There was good ground cover and a good mixture of forbs and grasses. There are also many suitable refuge sites for raccoons. Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D.

Wetlands - Yarabee Bend Damage Area

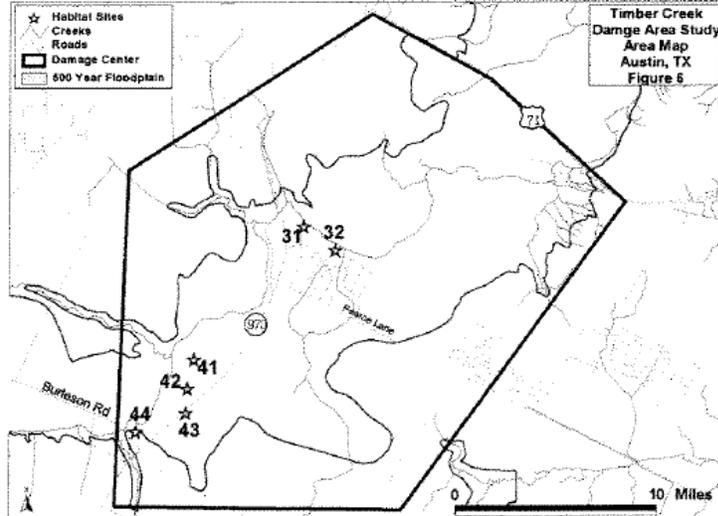
About 13 acres of wetland habitat were identified in this damage area. Due access issues, no wetland habitat was sampled in this damage area.

Timber Creek Damage Area

The Timber Creek Damage Area covers about 1,466 acres, all within the 100 year floodplain, and contains several habitat and non-habitat land use types as follows:

- Riparian Woodlands: 89 acres (6%)
- Grasslands: 1,042 acres (71%)
- Shrublands: 89 acres (6%)
- Wetlands: 5 acres (0.3%)
- Urban/bare soil: 241 acres (16%)

This area in the lower end of the Onion Creek watershed has been extensively farmed/grazed and has little forest cover except along the riparian zone of Onion Creek (Figure 6). This reach has high soil/clay banks typical of the blackland prairie ecoregion and a large deciduous canopy where it has been left alone. There are several sections of this stream where row-crops have been planted right up to the edge of the stream and there is virtually no riparian zone. In other areas the riparian zone is large (more than 200 meters), dense and intact. In general this reach is highly degraded from agricultural and grazing activities and appears to have many areas susceptible to erosion due to a non-continuous and low-quality riparian zone.



The aquatic resources in the Timber Creek Damage Area are limited by the intermittent nature of stream flow throughout the area. This area lies below the recharge zone of the Barton Springs segment of the Edwards Aquifer. The streams crossing the Edwards aquifer recharge zone tend to go dry during the summer months because much of the flow is infiltrated into the aquifer through recharge features in the streambeds. Throughout the damage area there are several deep pools that retain permanent water throughout most years. These pools act as refugia for fish and aquatic macroinvertebrates. These creeks have evolved with this flow regime. The deep pools and the creeks when flowing provide habitat for catfish, bass, sunfish, frogs, and water snakes.

Riparian woodlands - Timber Creek Damage Area

Riparian woodland habitat was assessed at two sites along Onion (31 and 32). Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. The overall HSI value for the Timber Creek Damage Area is 0.82 with 73 Habitat Units (Table 1) providing good habitat. The majority of the trees in these riparian areas were greater than twenty inches in diameter and that improved the overall habitat rating for raccoon cover and reproduction. Barred owl habitat was fair, though the relatively thick understory reduces cover and reproductive values. Similarly fox squirrel habitat value for cover and reproduction was reduced by the relatively thick understory. Barred owls and fox squirrels require a more open under story. Mast producers greater than or equal to 6 inches dbh were fairly common throughout the woodlands producing good food value for fox squirrels. Downy woodpecker habitat rated very good (0.92 HSI).

Grasslands - Timber Creek Damage Area

Grassland habitat was assessed at three sites along Onion Creek near Austin-Bergstrom Airport (41, 42, and 44). Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. Most of the grasslands along the creeks in the Timber Creek Damage Area are in fair condition with an overall HSI value of 0.80, with 834 habitat units. The grasslands generally had good ground cover however, there was a large amount of invasive species and these areas have been greatly modified. The grasslands were adjacent to wooded riparian areas, providing good red-tailed hawk nesting and perching. A pair of nesting red-tailed hawks were observed as were a nesting pair of red-shouldered hawks. Meadowlark habitat value was very good (0.82) because of the higher percentage of grass present in the areas. Scissor-tailed flycatcher habitat was excellent in all three sites. Habitat diversity in these areas are good, however, exotic plant species dominate the grassland area and limit the habitat potential of these sites.

Shrublands - Timber Creek Damage Area

The shrubland sampled in the Timber Creek Damage Area (Site 43) had very good habitat for scissor-tailed flycatchers and eastern cottontails. There was good ground cover and a good mixture of forbs and grasses. The overall HSI for the shrublands was 0.80 with 64 habitat units. Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. There was a paucity of suitable denning habitat for raccoons which lowered the habitat value for that species.

Wetlands - Timber Creek Damage Area

About 5 acres of wetland habitat were identified in this damage area. Due access issues, no wetland habitat was sampled in this damage area.

Williamson Creek Damage Area

The Williamson Creek Damage Area covers about 428 acres, all within the 100 year floodplain, and contains several habitat and non-habitat land use types as follows:

Riparian Woodlands: 145 acres (34%)

Grasslands: 38 acres (9%)

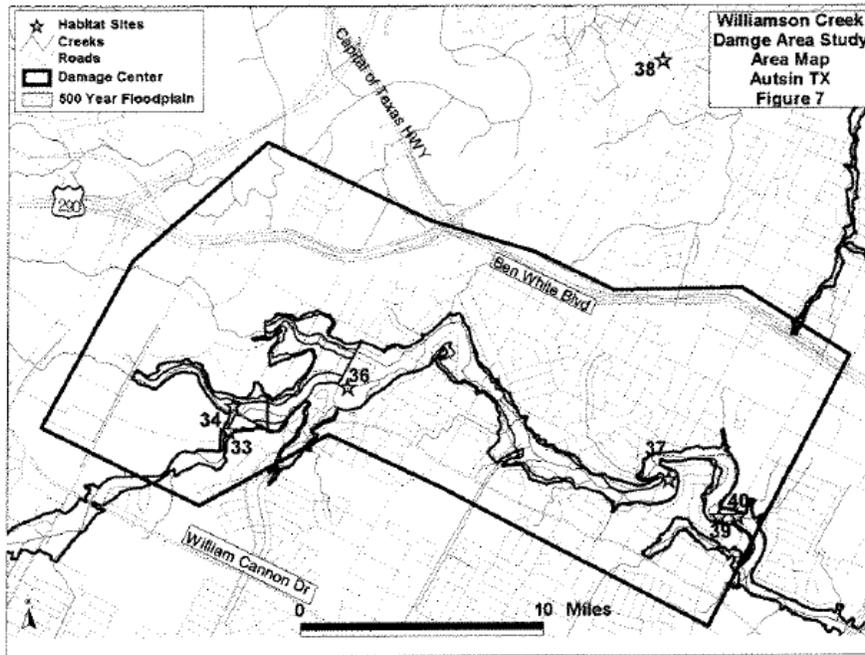
Shrublands: 73 acres (17%)

Urban/bare soil: 172 acres (40%)

This area is in the Williamson Creek watershed (Figure 7) and is densely developed with residential and commercial land uses (~20% impervious cover). The upper portion of the damage area is located in the recharge zone for the Barton Springs segment of the Edwards Aquifer. A small area downstream of the recharge zone is classified as a contributing zone because water flowing from this area actually flows into the recharge zone. The lower portion of the damage area is in the artesian zone and does not contribute water to the Edwards Aquifer.

Within the damage area, Williamson Creek is an intermittent stream that routinely goes dry in the summer months and is typical of a hill country recharge zone stream. The riparian habitat quality throughout this damage area is very poor. The riparian zone through Williamson Creek is narrow (less than 50 meters) and very disturbed. A sewer line runs through most of the damage area and is located in the bottom of the streambed. There are numerous streambank erosion problems through this channel. The majority of the erosion within the active channel is related to the sewer line. However, there are several large actively eroding streambanks that are not related to the sewer line. These larger erosion problems are most likely related to the relatively high impervious cover in the watershed and the lack of stormwater mitigation within the drainage.

Because of the intermittent nature of the stream, the aquatic wildlife is very ephemeral. Fish and aquatic insects are quick to populate the damage area when stream flows are present. These animals either move upstream from perennial water sources or move downstream from deep pools that may hold water throughout the year. The riparian zone along Williamson Creek is dominated by mostly young invasive species of low habitat quality. Chinaberry and ligustrum, two invasive species, were the dominant along the floodplain throughout the damage area. Other tree species present included willow, pecan, sycamore, cottonwood, juniper, and live oak. In addition, the exotic, invasive Chinese tallow was also observed within the Williamson Creek Damage Area.



Several of the smaller tributaries in this area have no riparian zone, while some of the headwaters are in fairly good shape with relatively large undisturbed and forested areas. In general, the riparian zone along this portion of Williamson Creek is of low quality and of minimal benefit to stream integrity. The habitat quality for wildlife resources is poor. There is potential for habitat restoration within this damage area, however, given the current density of urban development, restoration would be difficult. The area does provide habitat for typical urban riparian species. Signs of armadillos, raccoons, and opossum were fairly numerous throughout the damage area. Cricket frogs and leopard frogs were seen in the damage area. The area could provide some habitat for white tail deer. Bird species were typical of urban riparian areas.

The aquatic resources in the Williamson Creek Damage Area are limited by the intermittent nature of stream flow throughout the area. This area lies upon the recharge zone of the Barton Springs segment of the Edwards Aquifer. The streams crossing the Edwards Aquifer recharge zone tend to go dry during the summer months because much of the flow is infiltrated into the aquifer through recharge features in the streambeds. This stream section typically goes dry throughout the damage area and has little to no refuge habitat for aquatic resources. Frogs and toads are fairly common throughout this area, however, these species do not need permanent water throughout the year.

Riparian woodlands - Williamson Creek Damage Area

Riparian woodland habitat was assessed at five sites along Williamson Creek (33, 35, 36, 38, and 39). Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. The overall HSI value for the Williamson Creek Damage Area is 0.53 with 77 Habitat Units (Table 1) providing fair habitat. However, the majority of the trees in these riparian areas were less than ten inches in diameter and that lowered the overall habitat rating for raccoon cover and reproduction. Although the relatively thick understory reduces cover and reproductive values, barred owl habitat was fair. Similarly, fox squirrel habitat value for cover and reproduction was reduced by the relatively thick understory. Barred owls and fox squirrels require a more open understory. Mast producers greater than or equal to 6 inches dbh were fairly common throughout the woodlands producing good food value for fox squirrels. Downy woodpecker habitat rated very good (0.92 HSI).

Grasslands - Williamson Creek Damage Area

The grasslands along the creeks in the Williamson Creek Damage Area (Sites 37 and 40) are in fair condition with an overall HSI value of 0.57, with 22 habitat units. Photos of the sites can be found in Appendix C. Plant and animal species found in these sites are listed in Appendix D. The grasslands were adjacent to wooded riparian areas providing good red-tailed hawk nesting and perching habitat. However, the interspersed urban impacts severely depresses red-tailed nesting success and therefore these areas did not provide good habitat for red-tailed hawks. Meadowlark habitat value was similarly lower (fair) because of the lower herbaceous cover of grass present in the areas. The lower herbaceous cover also impacted scissor-tailed flycatcher habitat. Habitat diversity in these areas could be improved by establishing a few native tall grassland areas along the floodway grassland boundary with scattered shrubs and scattered brush piles.

Shrublands - Williamson Creek Damage Area

The shrubland sampled in the Williamson Creek Damage Area (Site 34) had good habitat for scissor-tailed flycatchers and eastern cottontails. There was good ground cover and a good mixture of forbs and grasses. The overall HSI for the shrublands was 0.78 with 57 habitat units. Photos of the site can be found in Appendix C. Plant and animal species found in these sites in Appendix D. There was a paucity of suitable denning habitat for raccoons which lowered the habitat value for that species.

ENDANGERED SPECIES

There are 17 listed endangered species and two threatened species that are known to occur within Travis and Hays County. There is no critical habitat designated in the Onion Creek watershed. A complete list of these species can be found in Appendix E. Most of these species are not found within any of the damage areas. However, Travis and Hays county both include habitat for the black-capped vireo and golden-cheeked warbler. The whooping crane has also

been seen migrating through Travis County. The Barton Springs salamander and Austin Blind salamander could also be impacted because one of the Williamson Creek Damage Area is located, in part, on the recharge zone of the Barton Springs segment of the Edwards Aquifer. Below is a discussion of the listed species that we believed may occur in the project area.

In addition to the 17 Federally endangered species and 2 Federally threatened species known to occur in these counties, the American Peregrine Falcon (*Falco peregrinus anatum*) is listed as a State endangered species for these counties. Six other species found in these counties are listed as State threatened: Blanco Blind Salamander (*Eurycea robusta*), Arctic Peregrine Falcon (*Falco peregrinus tundrius*), Zone-tailed Hawk (*Buteo albonotatus*), Blue Sucker (*Cycleptus elongates*), Cagle's Map Turtle (*Graptemys caglei*), and Texas Horned Lizard (*Phrynosoma cornutum*). The annotated listings also include 31 other rare species known to occur in Hays and Travis counties. The large number of rare, threatened, and endangered species potentially occurring in and near the project area illustrates the ecological importance in the area and the vulnerability of wildlife habitats to potential manmade impacts. The Texas Parks and Wildlife, Annotated County Lists of Rare Species for Hays and Travis counties is attached in Appendix E.

Black-capped vireo (*Vireo atricapillus*) – This strikingly beautiful endangered songbird is known to occur in Travis County and is considered a habitat specialist, nesting in mid-successional brushy areas (before areas develop into mature woodlands) where the dominant species are oaks, sumacs, persimmon, and other broad-leafed shrubs. Juniper may be common in vireo habitat, but juniper prominence is not essential or even preferred by the birds. Typical nesting habitat is composed of a shrub layer extending from the ground to about six feet covering about 35-55% of the total area, combined with a tree layer that may reach 30 feet or more. Open, sometimes grassy spaces separate clumps of trees and shrubs. The vireo depends upon broad-leafed shrubs and trees, especially oaks, which provide insects upon which it feeds. For the most part this species is found to the west of the study areas. No birds were recorded from the damage areas between 1995 and 2002. Due to the lack of suitable habitat and its relatively urbanized nature, it is unlikely that this species would utilize any of the study areas.

Golden-cheeked warbler (*Dendroica chrysoparia*) – This attractive endangered songbird nests during spring and summer in oak-juniper woodlands in central Texas, including Hays and Travis County. The warbler's entire breeding range is confined to a narrow band of counties in central Texas that is closely correlated to the distribution of Ashe juniper (also commonly referred to as "cedar"), a tree upon which the warbler depends for nesting material. The warblers feed on insects found on oaks, other hardwood trees, and junipers. The warbler's habitat is generally described as mature (at least 12 feet tall) oak-juniper woodlands, with 50% or greater canopy cover, although warblers have been found in habitat with as little as 30% canopy cover. Steep, narrow canyons with deciduous trees located along the drainage bottoms and juniper on the side slopes provide an ideal mix of vegetation for this species. However suitable habitat may also occur on hilltops or other relatively flat areas. Due to the lack of suitable habitat and its relatively urbanized nature, it is unlikely that this species would utilize any of the study areas except Williamson Creek. The Williamson Creek Damage Area may contain some potentially suitable warbler habitat within the 500 year floodplain. In this damage area we recommend that

proposed project areas be checked for the potentially suitable habitat during the formulation of alternatives.

Whooping Crane (*Grus americana*) - Endangered whooping cranes may be encountered in any county in central Texas during migration, including Hays and Travis counties. Autumn migration normally begins in mid-September, with most birds arriving on the wintering grounds at Aransas National Wildlife Refuge between late October and mid-November. Spring migration occurs during March and April. Whooping cranes prefer isolated areas away from human activity for feeding and roosting, with vegetated wetlands and wetlands adjacent to cropland being utilized along the migration route. Foods consumed usually include frogs, fish, plant tubers, crayfish, insects, and waste grains in harvested fields. Due to the lack of suitable habitat and its relatively urbanized nature, it is unlikely that this species would utilize any of the study areas.

Barton Springs salamander (*Eurycea sosorum*) and the Austin blind salamander (*Eurycea waterlooensis*) - The Barton Springs salamander (endangered species) and the Austin blind salamander (candidate species) are restricted to four spring outlets in Zilker Park within the City of Austin. The entire range of the salamanders is within the area affected by a portion of the discharges being permitted in this proposed action. The salamanders have a very restricted range. As an obligate aquatic organisms they are unable to escape the effects of stormwater discharge, which reach Barton Springs. The majority of pollutants that enter the Barton Springs Segment of the Edwards Aquifer must exit the aquifer by passing salamander habitat. Some pollutants could remain in the aquifer or be withdrawn from a well. A small portion of the recharge does discharge at Cold Springs on the Colorado River (Hauwert et al., 1998). Groundwater wells also account for a percentage of the total water within the aquifer. By far, the vast majority of water entering the aquifer is discharged at the four spring locations, known collectively as Barton Springs.

The primary threats to the salamanders are degradation of the quality and quantity of water that feeds Barton Springs due to urban expansion over the Barton Springs watershed. As a karst aquifer, the potential of the Edwards aquifer to rapidly transmit large volumes of water with little filtration makes it highly susceptible to pollution (Slade et al. 1986, Hauwert et al., 1998). Major potential sources of groundwater contamination have been attributed to leaking underground storage tanks, pipelines, septic tanks, accidental spills, pesticide and fertilizer use, and construction activities (TWC 1989, EPA 1990). Due to its quantity, sediment from soil erosion is the singularly greatest pollutant of surface waters and can carry most pollutants found in water bodies (Menzer and Nelson 1980). Water quality impacts would be the main concern in the Williamson Creek Damage Area. Any opportunity to improve water quality through project implementation should be explored.

FUTURE WITHOUT PROJECT

Members from the U.S. Army Corps of Engineers, Texas Parks and Wildlife Department, Travis County, City of Austin, and the U.S. Fish and Wildlife Service discussed all of the potential variables that could affect the habitat and its value within the Onion Creek and Williamson Creek Watersheds. Several items were identified and they included, future development upstream and within the damage areas, non-native species invasion, zoning restrictions, and direct habitat destruction.

Arroyo Doble, Onion Creek Country Club, Timber Creek, and portions of Williamson Creek Damage Areas are currently outside the city limits of Austin and located within the jurisdiction of Travis County; therefore, these areas are expected to sustain an extensive amount of growth and development within the 100-year floodplain. Therefore, there is expected to be a decrease in habitat acres within the next 50 years. There is also expected to be a decrease in habitat values due to fragmentation and exotic species invasion.

Perkins Valley, Yarrabee Bend, and portions of Williamson Creek Damage Areas are within the City Limits of Austin and are under more restrictive zoning ordinances. In the City of Austin, there is a zoning ordinance that requires developers to maintain a 400-foot riparian buffer zone along Onion and Williamson creeks as well as other creeks in the city. This area is protected from clearing and development. However, there is still expected to be more development within the 100-year floodplain during the next 50 years. Therefore there will be a reduction in habitat acres. Likewise, there is also expected to be a decrease in the habitat value in the area due to fragmentation and exotic species invasion.

Overall, there should be a decrease in habitat quantity and quality. Therefore, it is essential that every attempt is made to implement nonstructural options to the extent practicable and if it is not practicable, then every attempt should be made to protect and restore valuable habitat.

If you have any questions or comments concerning this study, please contact Matthew Lechner at (512) 490-0057, extension 234. We look forward to continued coordination with your planning staff as this project investigation proceeds.

Sincerely,

William M. Seawell
Acting Field Supervisor

cc: Danny Allen, TPWD, Austin, Texas
George Oswald, City of Austin

Literature Cited

- Environmental Protection Agency, 1990. Groundwater volume 1: groundwater and contamination. EPA Report 625/6-0/01a. Prepared by Eastern Research Group, Inc. for EPA's Center for Environmental Research Information. Cincinnati, Ohio.
- Fentress, C.D., 1986. "Wildlife of Bottomlands: Species and Status," Bottomland Hardwoods in Texas: Proceedings of an Interagency Workshop on Status and Ecology, Craig A. McMahan and Roy G. Frye, editors., May 6-7, 1986. (Austin: Texas Parks and Wildlife Department, Wildlife Division, March 1987). 37.
- Gould, F.W. 1962. Texas Plants - A checklist and ecological summary. Texas Agricultural Experiment Station. Miscellaneous Publication 585:1-112.
- Hauwert, N.M., D.A. Johns, T.J. Aley. 1998. Preliminary report on groundwater tracing studies within the Barton Creek and Williamson Creek watersheds, Barton Springs/Edwards Aquifer. Report prepared by Barton Springs/ Edwards Aquifer Conservation District and the City of Austin. Austin, Texas.
- Menzer, R., and J. Nelson, 1980. Water and soil pollutants. In J. Doull, C. Klaassen, and M. Amdur (editors), Casarett and Doull's Toxicology: The Basic Science of Poisons. Macmillan Publishing Co., Inc. New York, New York. pp 632-657.
- Payne, N.F. and F.C. Bryant. 1994. Techniques for wildlife habitat management of uplands. McGraw-Hill, Inc., New York.
- Slade, R. M., Jr., Dorsey, M. E., and Stewart, S. L., 1986, Hydrology and water quality of Barton Springs and associated Edwards aquifer in the Austin area, Texas: U.S. Geological Survey Water-Resources Investigations Report 86-4036.
- Texas A&M University (TAMU). Bioformatics Working Group. Checklist of the Vascular Plants of Texas. Austin, Texas. May 1998.
- Texas Water Commission. 1989. Ground-water quality of Texas - An overview of natural and man-affected conditions. Compiled by the Ground Water Protection Unit Staff. Report 89-01. Austin, Texas.
- U.S. Fish and Wildlife Service. 1980. The habitat evaluation procedures. USDI Fish and Wildlife Service, Ecological Services Manual 102.

Appendix A.
Geographical Locations of the Habitat Evaluation Procedures sampling locations on Onion and Williamson Counties.

Site	Degrees (west)	Minutes	Seconds	Degrees (north)	Minutes	Seconds
1	30	7	37.5	97	49	14.5
2	30	7	33.5	97	49	18.2
3	30	7	32.6	97	49	16.5
4	30	7	4.8	97	49	2.2
5	30	5	38.5	97	50	21.2
6	30	5	37.3	97	50	20.4
7	30	8	22.9	97	50	23
8	N/A	N/A	N/A	N/A	N/A	N/A
9	30	8	0.4	97	48	28.2
10	30	8	2.2	97	47	31.9
11	30	8	1.3	97	47	32.3
12	30	8	12.1	97	46	58.1
13	30	8	19.2	97	47	3.3
14	30	8	17	97	47	5
15	30	8	37.4	97	46	44.9
16	30	8	37.5	97	46	5.5
17	30	9	24.8	97	46	27.3
18	30	9	27.1	97	46	27.2
19	30	9	25.7	97	46	31.5
20	30	9	34.2	97	46	7.4
21	30	9	30.9	97	46	9.4
22	30	10	0.7	97	44	56.3
23	30	9	57.7	97	44	50.9
24	30	9	55.2	97	44	53.5
25	30	8	54	97	47	3.4
29	30	10	34.2	97	44	35.8
30	30	10	59.8	97	43	32.7
31	30	11	5.1	97	38	37.5
32	30	10	57.9	97	38	27.3
33	30	13	4.9	97	48	57.7
34	30	13	12	97	48	55.9
36	30	13	16.5	97	48	19.2
37	30	12	48.2	97	46	37.5
38	30	14	46.5	97	46	36.3
39	30	12	37.3	97	46	21.7
40	30	12	37.2	97	46	15.9
41	30	10	27.2	97	39	14.5
42	30	10	18.8	97	39	17
43	30	10	11.8	97	39	17.6
44	30	10	6.6	97	39	34

A-1

Appendix B

Site Specific Habitat Evaluation Procedures

And

Habitat Suitability Index Data.

HABITAT SUITABILITY INDEX VALUES FOR THE ARROYO DOBLE DAMAGE AREA										
Habitat / Species	Site Number									
	1	2	3	4	5	6	7	8	9	45
Riparian Woodland										
Raccoon	0.95	0.60			0.60		0.60			
Barred Owl	0.75	0.75			0.75		0.75			
Fox Squirrel	0.77	0.77			0.77		0.77			
Downy Woodpecker	0.70	0.70			1.00		0.90			
Grassland										
Red-tailed Hawk			0.80	0.69		0.70			0.60	
Eastern Meadowlark			0.71	0.54		0.84			0.70	
Scissor-tailed Flycatcher			1.00	0.30		1.00			0.50	
Wetland										
Raccoon								0.97		
Wood Duck								0.87		
Green Heron								0.75		
Shrubland										
Raccoon										0.5
Scissor-tailed Flycatcher										1.00
Eastern Cottontail										1.00

B-1

HABITAT SUITABILITY INDEX VALUES FOR THE ONION CREEK COUNTRY CLUB DAMAGE AREA															
Habitat / Species	10	11	12	13	14	15	16	25							
	Riparian Woodland														
Raccoon	0.48	0.80	0.48		0.60	0.80		0.60							
Barred Owl	0.50	0.50	0.50		0.40	0.40		0.83							
Fox Squirrel	0.89	0.20	1.00		0.20	0.20		0.48							
Downy Woodpecker	0.50	0.50	0.00		1.00	0.70		0.70							
Grassland															
Red-tailed Hawk					0.20										
Eastern Meadowlark					0.77										
Scissor-tailed Flycatcher					1.00										
Shrubland															
Raccoon								0.55							
Scissor-tailed Flycatcher								1.00							
Eastern Cottontail								1.00							

B-2

HABITAT SUITABILITY INDEX VALUES FOR THE PERKINS VALLEY DAMAGE AREA					
Habitat / Species	Site Number				
	17	18	19	20	21
Riparian Woodland					
Raccoon	0.97		0.97		0.97
Barred Owl	0.65		1.00		0.95
Fox Squirrel	0.97		0.65		0.70
Downy Woodpecker	0.97		1.00		1.00
Grassland					
Red-tailed Hawk		0.60		0.80	
Eastern Meadowlark		0.60		0.60	
Scissor-tailed Flycatcher		0.90		0.80	
Shrubland					
Raccoon					
Scissor-tailed Flycatcher					
Eastern Cottontail					

HABITAT SUITABILITY INDEX VALUES FOR THE YARABEE BEND DAMAGE AREA										
Habitat / Species	Site Number									
	22	23	24	26	27	28	29	30		
Riparian Woodland										
Raccoon		0.80	0.80	0.60	0.97					
Barred Owl		0.89	0.83	0.75	0.72					
Fox Squirrel		0.65	0.84	0.43	0.89					
Downy Woodpecker		1.00	1.00	1.00	1.00					
Grassland										
Red-tailed Hawk						0.80	0.80	0.80	0.80	0.80
Eastern Meadowlark						0.57	0.60	0.60	0.62	0.62
Scissor-tailed Flycatcher						0.90	0.60	0.60	0.70	0.70
Shrubland										
Raccoon	0.80									
Scissor-tailed Flycatcher	1.00									
Eastern Cottontail	1.00									

HABITAT SUITABILITY INDEX VALUES FOR THE TIMBER CREEK DAMAGE AREA						
Habitat / Species	Site Number					
	31	32	41	42	43	44
Riparian Woodland						
Raccoon	0.97	0.97				
Barred Owl	0.79	0.50				
Fox Squirrel	0.74	0.67				
Downy Woodpecker	0.90	1.00				
Grassland						
Red-tailed Hawk			0.83	0.83		0.83
Eastern Meadowlark			0.95	0.73		0.77
Scissor-tailed Flycatcher			0.77	0.83		0.80
Shrubland						
Raccoon					0.50	
Scissor-tailed Flycatcher					0.90	
Eastern Cottontail					1.0	

B-5

HABITAT SUITABILITY INDEX VALUES FOR THE WILLIAMSON CREEK DAMAGE AREA										
Habitat / Species	Site Number									
	33	34	35	36	37	38	39	40		
Riparian Woodland										
Raccoon	0.71		0.71	0.60		0.60	0.60			
Barred Owl	0.28		0.71	0.22		0.45	0.00			
Fox Squirrel	0.00		1.00	0.00		0.00	0.00			
Downy Woodpecker	1.00		1.00	1.00		0.70	0.90			
Grassland										
Red-tailed Hawk					0.10					0.10
Eastern Meadowlark					0.16					0.80
Scissor-tailed Flycatcher					1.00					1.00
Shrubland										
Raccoon		0.55								
Scissor-tailed Flycatcher		0.80								
Eastern Cottontail		1.00								

Appendix D

**Plant and animal species found in the Damage Areas during
Habitat Evaluation Procedures analysis and other field visits.**

Habitat Type/ Species	Arroyo Doble	Onion Creek	Perkins Valley	Yarabee Bend	Timber Creek	Williamson Creek
Riparian Woodland						
water willow (<i>Justicia americana</i>)	X					
box elder (<i>Acer negundo</i>)	X	X	X	X	X	X
poison ivy (<i>Rhus toxicodendron</i>)	X	X	X	X	X	X
beggars tick (<i>Torilis arvensis</i>)	X	X	X	X	X	X
deciduous holly (<i>Ilex deciduas</i>)				X	X	
yaupon (<i>Ilex vomitoria</i>)	X	X			X	
daisy						X
giant ragweed (<i>Ambrosia trifida</i>)	X	X	X	X	X	X
prairie coneflower (<i>Ratibida columnaris</i>)						X
ice weed (<i>Verbesina virginica</i>)						X
cocklebur (<i>Xanthium strumarium</i>)	X					
agarita (<i>Berberis trifoliolata</i>)	X					X
nandina (<i>Nandina spp.</i>)	X					X
sugarberry (<i>Ehretia anacua</i>)		X				
elderberry (<i>Sambucus canadensis</i>)	X					
dogwood (<i>Cornus drummondii</i>)	X					
Ashe juniper (<i>Juniperus ashei</i>)	X					X
sedge (<i>Carex spp.</i>)		X				
persimmon (<i>Diospyros spp.</i>)		X				X

D-1

bull nettle (<i>Cnidoscolus texanus</i>)		X				
Chinese tallow (<i>Sapium sebiferum</i>)	X					
honey locust (<i>Gleditsia triacanthos</i>)	X	X				
mesquite (<i>Prosopis glandulosa</i>)		X				X
clover (<i>Trifolium spp.</i>)						X
shin oak (<i>Quercus mohriana</i>)	X					
white oak (<i>Quercus alba</i>)	X					
Spanish oak (<i>Quercus buckleyi</i>)	X					
live oak (<i>Quercus fusiformis</i>)	X					X
buckeye (<i>Aesculus pavia</i>)		X				
hickory (<i>Carya spp.</i>)			X			
water hickory (<i>Carya aquatica</i>)		X				
pecan (<i>Carya illinoensis</i>)	X	X	X	X	X	X
mealy blue sage (<i>Salvia farinacea</i>)						X
green briar (<i>Smilax bona-nox</i>)	X	X	X	X	X	X
turks cap (<i>Malvaviscus drummondii</i>)					X	
Chinaberry (<i>Melia azedarach</i>)	X	X	X			X
mulberry (<i>Morus rubra</i>)				X		
elbow bush (<i>Forestiera pubescens</i>)	X					
green ash (<i>Fraxinus pennsylvanica</i>)	X					

D-2

ligustrum (<i>Ligustrum japonicum</i>)						X
white prickly poppy (<i>Argemone albiflora</i>)		X				
sycamore (<i>Platanus occidentalis</i>)	X	X	X	X	X	X
western wheatgrass (<i>Agropyron smithii</i>)	X	X	X		X	
Japanese brome (<i>Bromus japonicus</i>)		X				X
downy brome (<i>Bromus tectorum</i>)	X					
rescuegrass (<i>Bromus unioloides</i>)	X	X		X		X
Bermudagrass (<i>Cynodon dactylon</i>)	X	X	X	X	X	X
Canada wildrye (<i>Elymus canadensis</i>)	X	X	X	X	X	X
perennial ryegrass (<i>Lolium perenne</i>)	X					
rabbitfootgrass (<i>Polypogon monspeliensis</i>)	X	X				
Johnsongrass (<i>Sorghum halapense</i>)		X				
Texas wintergrass (<i>Stipa leucotricha</i>)						X
Mexican plum (<i>Prunus mexicana</i>)	X					
dewberry (<i>Rubus trivialis</i>)	X					
cottonwood (<i>Populus deltoides</i>)	X	X	X	X	X	X
willow (<i>Salix spp.</i>)		X				
black willow (<i>Salix nigra</i>)			X			
gum bumelia (<i>Bumelia lanuginose</i>)					X	X

D-3

tree of heaven (<i>Ailanthus altissima</i>)		X				
cypress (<i>Taxodium distichum</i>)	X	X	X	X	X	
hackberry (<i>Celtis laevigata</i>)	X	X	X	X		X
American elm (<i>Ulmus americana</i>)	X	X	X			
cedar elm (<i>Ulmus crassifolia</i>)	X	X	X	X		X
pepper vine (<i>Ampelopsis arborea</i>)		X			X	X
Virginia creeper (<i>Parthenocissus quinquefolia</i>)	X	X	X	X	X	
wild grapes (<i>Vitus spp.</i>)	X	X			X	X
cricket frog (<i>Acris crepitans</i>)	X	X			X	
snapping turtle (<i>Chelydra serpentina</i>)	X					
black-billed whistling duck (<i>Dendrocygna autumnalis</i>)		X				
great blue heron (<i>Ardea herodias</i>)		X				
green-backed heron (<i>Butorides striatus</i>)		X		X		
killdeer (<i>Charadrius vociferus</i>)		X				
mourning dove (<i>Zenaida macroura</i>)		X				
yellow billed cuckoo (<i>Coccyzus americanus</i>)	X					
cliff swallow (<i>Hirundo pyrrhonota</i>)		X				
purple martin (<i>Progne subis</i>)	X					

D-4

crow (<i>Corvus brachyrhynchos</i>)					X	
chickadee (<i>Parus spp.</i>)				X	X	
wren	X				X	
white-eyed vireo (<i>Vireo griseus</i>)	X	X	X	X	X	X
great-tailed grackle (<i>Quiscalus mexicanus</i>)	X	X				
summer tanager (<i>Piranga rubra</i>)	X					
northern cardinal (<i>Cardinalis cardinalis</i>)	X	X	X	X	X	X
squirrel		X				
skunk	X					
white-tailed deer (<i>Odocoileus virginianus</i>)	X	X				X
Grasslands						
poison ivy (<i>Rhus toxicodendron</i>)		X			X	
beggars tick (<i>Torilis arvensis</i>)	X	X		X		X
deciduous holly (<i>Ilex deciduas</i>)						X
yaupon (<i>Ilex vomitoria</i>)	X	X				
giant ragweed (<i>Ambrosia trifida</i>)	X	X	X			X
cutleaf daisy (<i>Engelmannia pinnatifida</i>)	X					
Indian blanket (<i>Gaillardia pulchella</i>)	X	X		X		X
maximilian sunflower (<i>Helianthus maximiliani</i>)				X		
prairie coneflower (<i>Ratibida columnaris</i>)	X	X	X	X		X

D-5

black-eyed susan (<i>Rudbeckia hirta</i>)				X		
goldenrod (<i>Solidago spp.</i>)					X	
cocklebur (<i>Xanthium strumarium</i>)		X				
agarita (<i>Berberis trifoliolata</i>)	X	X				
prickly pear cactus (<i>Opuntia lindheimeri</i>)	X					
day flower (<i>Commelina erecta</i>)	X	X			X	X
morning glory (<i>Ipomoea spp.</i>)		X	X		X	
buffalo gourd (<i>Cucurbita foetidissima</i>)		X				
yellow nutsedge (<i>Cyperus esculentus</i>)					X	
bull nettle (<i>Cnidocolus texanus</i>)	X	X	X			
prairie tea (<i>Croton monanthogynus</i>)					X	
honey locust (<i>Gleditsia triacanthos</i>)		X				
mesquite (<i>Prosopis glandulosa</i>)	X	X	X		X	X
live oak (<i>Quercus fusiformis</i>)					X	
pecan (<i>Carya illinoensis</i>)					X	
horsemint (<i>Monarda citriodora</i>)			X	X		X
bee balm (<i>Monarda punctata</i>)	X	X				
mealy blue sage (<i>Salvia farinacea</i>)		X	X			

green briar (<i>Smilax bona-nox</i>)		X				
Chinaberry (<i>Melia azedarach</i>)	X	X				
Carolina snailseed (<i>Cocculus carolinus</i>)			X			
elbow bush (<i>Forestiera pubescens</i>)	X					
Texas ash (<i>Fraxinus americana texensis</i>)					X	
white prickly poppy (<i>Argemone albiflora</i>)	X	X	X	X	X	
western wheatgrass (<i>Agropyron smithii</i>)	X	X		X		X
purple threeawn (<i>Aristida purpurea</i>)	X			X		
oats (<i>Avena fatua</i>)		X	X			X
Japanese brome (<i>Bromus japonicus</i>)	X	X		X		
rescuegrass (<i>Bromus unioloides</i>)	X		X	X		X
buffalograss (<i>Buchloe dactyloides</i>)	X					
Bermudagrass (<i>Cynodon dactylon</i>)	X		X		X	X
crabgrass (<i>Digitaria ciliaris</i>)						X
Canada wildrye (<i>Elymus canadensis</i>)	X		X			X
perennial ryegrass (<i>Lolium perenne</i>)	X					
Kliengrass (<i>Panicum coloratum</i>)				X		X
switchgrass (<i>Panicum virgatum</i>)	X					
dallisgrass (<i>Paspalum dilatatum</i>)	X					

D-7

Johnsongrass (<i>Sorghum halapense</i>)	X		X	X	X	X
Texas wintergrass (<i>Stipa leucotricha</i>)	X				X	X
sheep sorrel (<i>Rumex acetocella</i>)	X					
blackberry (<i>Rubus spp.</i>)	X	X				
dewberry (<i>Rubus trivialis</i>)						X
gum bumelia (<i>Bumelia lanuginosa</i>)	X					
silverleaf nightshade (<i>Solanum elaeagnifolium</i>)	X	X		X	X	X
hackberry (<i>Celtis laevigata</i>)					X	
winged elm (<i>Ulmus alata</i>)		X				
cedar elm (<i>Ulmus crassifolia</i>)		X				
verbena (<i>Verbena spp.</i>)				X		
pepper vine (<i>Ampelopsis arborea</i>)		X				
wild grapes (<i>Vitus spp.</i>)		X				
tawny emperor butterfly (<i>Asterocampa clyton</i>)	X					
swallowtail butterfly			X	X		
fire ants				X		
black vulture (<i>Coragyps atratus</i>)	X					
red-tailed hawk (<i>Buteo jamaicensis</i>)					X	
red-shouldered hawk (<i>Buteo lineatus</i>)					X	
scissor-tailed flycatcher (<i>Tyrannus forficatus</i>)					X	
kingbird (<i>Tyrannus spp.</i>)					X	

D-8

barn swallow (<i>Hirundo rustica</i>)			X	X		
great-tailed grackle (<i>Quiscalus mexicanus</i>)	X	X				
northern cardinal (<i>Cardinalis cardinalis</i>)	X	X	X		X	
white-tailed deer (<i>Odocoileus virginianus</i>)				X	X	
Shrublands						
yucca (<i>Yucca spp.</i>)						X
poison ivy (<i>Rhus toxicodendron</i>)		X				
beggars tick (<i>Torilis arvensis</i>)	X	X		X		
giant ragweed (<i>Ambrosia trifida</i>)	X	X		X		
Indian blanket (<i>Gaillardia pulchella</i>)		X		X		X
prairie coneflower (<i>Ratibida columnaris</i>)		X		X	X	X
prickly pear cactus (<i>Opuntia lindheimeri</i>)				X		X
day flower (<i>Commelina erecta</i>)		X				
morning glory (<i>Ipomoea spp.</i>)	X	X		X		
buffalo gourd (<i>Cucurbita foetidissima</i>)	X				X	
persimmon (<i>Diospyros spp.</i>)				X		
prairie tea (<i>Croton monanthogynus</i>)					X	
mesquite (<i>Prosopis glanulosa</i>)	X	X		X	X	X
buckeye (<i>Aesculus pavia</i>)				X		

D-9

pecan (<i>Carya illinoensis</i>)				X		
horsemint (<i>Monarda citriodora</i>)				X		
bee balm (<i>Monarda punctata</i>)		X				
mealy blue sage (<i>Salvia farinacea</i>)				X		
green briar (<i>Smilax bona-nox</i>)	X	X		X		X
Chinaberry (<i>Melia azedarach</i>)	X	X				X
western wheatgrass (<i>Agropyron smithii</i>)		X				
oats (<i>Avena fatua</i>)		X				
little bluestem (<i>Bothriochloa saccharoides</i>)					X	
rescuegrass (<i>Bromus unioloides</i>)		X		X		X
Bermudagrass (<i>Cynodon dactylon</i>)	X				X	
Canada wildrye (<i>Elymus canadensis</i>)				X		
Kliengrass (<i>Panicum coloratum</i>)						X
Johnsongrass (<i>Sorghum halapense</i>)	X	X			X	
gum bumelia (<i>Bumelia lanuginose</i>)	X					
silverleaf nightshade (<i>Solanum elaeagnifolium</i>)	X				X	X
buffalo bur (<i>Solanum rostratum</i>)					X	
hackberry (<i>Celtis laevigata</i>)	X				X	

D-10

winged elm (<i>Ulmus alata</i>)		X		X		
cedar elm (<i>Ulmus crassifolia</i>)				X		
pepper vine (<i>Ampelopsis arborea</i>)		X				
spiderling					X	
scissor-tailed flycatcher (<i>Tyrannus forficatus</i>)					X	

D-11

Appendix E

**A complete list of Federally listed endangered species
and threatened species that are known to occur within
Travis and Hays County.**

and

**Texas Parks and Wildlife Department
Annotated County Lists of Rare Species
for Hays and Travis Counties**

Federally Listed as Threatened and Endangered Species of Texas
October 7, 2002

This list represents species that may be found in counties throughout the Austin Ecological Services office's area of responsibility. Please contact the Austin ES office (U.S. Fish and Wildlife Service, 10711 Burnet Rd., Suite 200, Austin, Texas 78758, 512/490-0057) if additional information is needed. Please contact the appropriate USFWS field office in Arlington, Clear Lake, or Corpus Christi for projects occurring in counties not listed below.

DISCLAIMER

This County by County list is based on information available to the U.S. Fish and Wildlife Service at the time of preparation, date on page 1. This list is subject to change, without notice, as new biological information is gathered and should not be used as the sole source for identifying species that may be impacted by a project.

Hays County (Edwards Aquifer County)

Black-capped vireo	(E)	<i>Vireo atricapillus</i>
Golden-cheeked warbler	(E)	<i>Dendroica chrysoparia</i>
Barton Springs salamander	(E)	<i>Eurycea sosorum</i> *
Texas blind salamander	(E)	<i>Typhlomolge rathbuni</i>
Fountain darter	(E w/CH)	<i>Etheostoma fonticola</i>
San Marcos gambusia	(E w/CH)	<i>Gambusia georgei</i>
Texas wild-rice	(E w/CH)	<i>Zizania texana</i>
Comal Springs riffle beetle	(E)	<i>Heterelmis comalensis</i>
Comal Springs dryopid beetle	(E)	<i>Stygoparnus comalensis</i>
San Marcos salamander	(T □w/CH)	<i>Eurycea nana</i>

Travis County

Black-capped vireo	(E)	<i>Vireo atricapillus</i>
Golden-cheeked warbler	(E)	<i>Dendroica chrysoparia</i>
Whooping crane	(E w/CH)	<i>Grus americana</i>
Barton Springs salamander	(E)	<i>Eurycea sosorum</i> *
Reddell harvestmen	(E)	<i>Texella reddelli</i>
Bone Cave harvestmen	(E)	<i>Texella reyesi</i>
Kretschmarr Cave mold beetle	(E)	<i>Texamaurops reddelli</i>
Tooth Cave pseudoscorpion	(E)	<i>Tartarocreagris texana</i>
Tooth Cave ground beetle	(E)	<i>Rhadine persephone</i>
Tooth Cave spider	(E)	<i>Neoleptoneta (=Leptoneta) myopica</i>
Mountain plover	(P/T)	<i>Charadrius montanus</i>
Austin blind salamander	(C)	<i>Eurycea waterlooensis</i>
Warton meshweaver	(C)	<i>Cicurina wartoni</i>

* The Barton Springs salamander is found in Travis County but may be affected by activities within the Barton Springs Segment of the Edwards Aquifer, which includes portions of Northern Hays County

Edwards Aquifer species: (Edwards Aquifer County) refers to those six counties within the Edwards Aquifer region. The Edwards Aquifer underlies portions of Kinney, Uvalde, Medina, Bexar, Hays, and Comal Counties (Texas). The Service has expressed concern that the combined current level of water withdrawal for all consumers from the Edwards Aquifer adversely affects aquifer-dependent species

located at Comal and San Marcos springs during low flows. Deterioration of water quality and/or water withdrawal from the Edwards Aquifer may adversely affect eight federally-listed species.

Comal Springs riffle beetle	(E)	<i>Heterelmis comalensis</i>
Comal Springs dryopid beetle	(E)	<i>Stygoparnus comalensis</i>
Fountain darter	(E w/CH)	<i>Etheostoma fonticola</i>
Peck's cave amphipod	(E)	<i>Stygobromus (=Stygonectes) pecki</i>
San Marcos gambusia	(E w/CH)	<i>Gambusia georgei</i>
Texas wild-rice	(E w/CH)	<i>Zizania texana</i>
Texas blind salamander	(E)	<i>Typhlomolge rathbuni</i>
San Marcos salamander	(T □w/CH)	<i>Eurycea nana</i>

Migratory Species Common to many or all Counties: Species listed specifically in a county have confirmed sightings. If a species is not listed they may occur as migrants in those counties.

INDEX

Statewide or areawide migrants are not included by county, except where they breed or occur in concentrations. The whooping crane is an exception; an attempt is made to include all confirmed sightings on this list.

- E = Species in danger of extinction throughout all or a significant portion of its range.
- T = Species which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
- C = Species for which the Service has on file enough substantial information to warrant listing as threatened or endangered.
- CH = Critical Habitat (in Texas unless annotated ‡)
- P/ = Proposed ...
- P/E = Species proposed to be listed as endangered.
- P/T = Species proposed to be listed as threatened.
- TSA = Threatened due to similarity of appearance.
- = with special rule
- ‡ = CH designated (or proposed) outside Texas
- ~ = protection restricted to populations found in the "interior" of the United States. In Texas, the least tern receives full protection, except within 50 miles (80 km) of the Gulf Coast.

Texas Parks & Wildlife Annotated County Lists of Rare Species		Last Revision: 09/27/01	
HAYS COUNTY			
*** AMPHIBIANS ***			
	Federal Status	State Status	
Blanco Blind Salamander (<i>Eurycea robusta</i>) - troglobitic; water-filled subterranean caverns; may inhabit deep levels of the Balcones aquifer to the north and east of the Blanco River			T
Blanco River Springs Salamander (<i>Eurycea pterophila</i>) - subaquatic; springs and caves in the Blanco River drainage in Blanco, Hays, and Kendall counties			
Edwards Plateau Spring Salamanders (<i>Eurycea</i> sp. 7) - troglobitic; springs, seeps, cave streams, and creek headwaters; often hides under rocks and leaves in water; Edwards Plateau, from near Austin to Val Verde County			
San Marcos Salamander (<i>Eurycea nana</i>) - headwaters of the San Marcos River downstream to ca. ½ mile past IH-35; water over gravelly substrate characterized by dense mats of algae (<i>Lyngbya</i>) and aquatic moss (<i>Leptodictyum riparium</i>), and water temperatures of 21-22 °C; diet includes amphipods, midge larve, and aquatic snails	LT		T
Texas Blind Salamander (<i>Eurycea rathbuni</i>) - troglobitic; water-filled subterranean caverns along a six mile stretch of the San Marcos Spring Fault, in the vicinity of San Marcos; eats small invertebrates, including snails, copepods, amphipods, and shrimp	LE		E
*** BIRDS ***			
American Peregrine Falcon (<i>Falco peregrinus anatum</i>) - potential migrant; nests in west Texas	DL		E
Arctic Peregrine Falcon (<i>Falco peregrinus tundrius</i>) - potential migrant	DL		T
Black-capped Vireo (<i>Vireo atricapillus</i>) - oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous & broad-leaved shrubs & trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, & required structure; nests mid April-late summer	LE		E
Golden-checked Warbler (<i>Dendroica chrysoparia</i>) juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees & shrubs; nests late March-early summer	LE		E
Henslow's Sparrow (<i>Ammodramus henslowii</i>) - wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking			
Whooping Crane (<i>Grus americana</i>) - potential migrant	LE		E
Zone-tailed Hawk (<i>Buteo albonotatus</i>) - arid open country, including open deciduous or pine-oak woodland, mesa or mountain county, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains; nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions			T
*** CRUSTACEANS ***			
Ezell's Cave Amphipod (<i>Stygobromus flagellatus</i>) - known only from artesian wells			
Texas Cave Shrimp (<i>Palaeomonetes antrorum</i>) - subterranean sluggish streams and pools			

Texas Parks & Wildlife Annotated County Lists of Rare Species HAYS COUNTY, cont'd		Last Revision: 09/27/01	
	Federal Status	State Status	
*** FISHES ***			
Blue Sucker (<i>Cycleptus elongatus</i>) – usually inhabits channels and flowing pools with a moderate current; bottom type usually consists of exposed bedrock, perhaps in combination with hard clay, sand, and gravel; adults winter in deep pools and move upstream in spring to spawn on riffles		T	
Fountain Darter (<i>Etheostoma fonticola</i>) – known only from the San Marcos and Comal rivers; springs and spring-fed streams in dense beds of aquatic plants growing close to bottom, which is normally mucky; feeding mostly diurnal; spawns year-round with August and late winter to early spring peaks	LE	E	
Guadalupe Bass (<i>Micropterus treculi</i>) – endemic; headwater, perennial streams of the Edwards Plateau			
San Marcos Gambusia (<i>Gambusia georgei</i>) (extirpated) – endemic; formerly known from upper San Marcos River; restricted to shallow, quiet, mud-bottomed shoreline areas without dense vegetation in thermally constant main channel	LE	E	
*** INSECTS ***			
Comal Springs Dryopid Beetle (<i>Stygoparnus comalensis</i>) - dryopids usually cling to objects in a stream; dryopids are sometimes found crawling on stream bottoms or along shores; adults may leave the stream and fly about, especially at night; most dryopid larvae are vermiform and live in soil or decaying wood	LE		
Comal Springs Riffle Beetle (<i>Heterelmis comalensis</i>) - Comal and San Marcos Springs	LE		
Edwards Aquifer Diving Beetle (<i>Haideoporus texanus</i>) - habitat poorly known; known from an artesian well in Hays County			
Flint's Net-spinning Caddisfly (<i>Cheumatopsyche flinti</i>) - very poorly known species with habitat description limited to "a spring"			
San Marcos Saddle-case Caddisfly (<i>Protoptila arca</i>) - known from an artesian well in Hays County; locally very abundant; swift, well-oxygenated warm water about 1-2 m deep; larvae and pupal cases abundant on rocks			
*** MAMMALS ***			
Cave Myotis Bat (<i>Myotis velifer</i>) – colonial and cave-dwelling; also roosts in rock crevices, old buildings, carports, under bridges, and even in abandoned Cliff Swallow (<i>Hirundo pyrrhonota</i>) nests; roosts in clusters of up to thousands of individuals; hibernates in limestone caves of Edwards Plateau and gypsum cave of Panhandle during winter; opportunistic insectivore			
Plains Spotted Skunk (<i>Spilogale putorius interrupta</i>) - catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie			
*** REPTILES ***			
Cagle's Map Turtle (<i>Graptemys caglei</i>) – endemic; Guadalupe River System; short stretches of shallow water with swift to moderate flow and gravel or cobble bottom, connected by deeper pools with a slower flow rate and a silt or mud bottom; gravel bar riffles and transition areas between riffles and pools especially important in providing insect prey items; nest on gently sloping sand banks within ca. 30 feet of water's edge	C1	T	
Keeled Earless Lizard (<i>Holbrookia propinqua</i>) - coastal dunes, barrier islands, and other sandy areas; eats insects and likely other small invertebrates; eggs laid underground March-September (most May-August)			

Texas Parks & Wildlife		Last Revision: 09/27/01	
Annotated County Lists of Rare Species			
HAYS COUNTY, cont'd			
		Federal Status	State Status
Spot-tailed Earless Lizard (<i>Holbrookia lacerata</i>) - central & southern Texas and Adjacent Mexico; oak-juniper woodlands & mesquite-prickly pear associations; eggs laid underground; eats small invertebrates			
Texas Garter Snake (<i>Thamnophis sirtalis annectens</i>) - wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August			
Texas Horned Lizard (<i>Phrynosoma cornutum</i>) - open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September			T
*** VASCULAR PLANTS ***			
Canyon mock-orange (<i>Philadelphus ernestii</i>) - solution-pitted outcrops of Cretaceous limestone on caprock along mesic canyons, usually in shade of mixed evergreen-deciduous canyon woodland; flowering April-May, fruit maturing in September			
Hill Country wild-mercury (<i>Argythamnia aphoroides</i>) - shallow to moderately deep clays and clay loams over limestone, in grasslands associated with plateau live oak woodlands, mostly on rolling uplands; flowering April-May; fruit persisting until midsummer			
Texas wild-rice (<i>Zizania texana</i>) - perennial, emergent, aquatic grass known only from the upper 2.5 km of the San Marcos River in Hays County		LE	E
Warnock's coral root (<i>Hexalectris warnockii</i>) - leaf litter and humus in oak-juniper woodlands in mountain canyons in the Trans Pecos but at lower elevations to the east, often on narrow terraces along creekbeds			
<p>LE,LT - Federally Listed Endangered/Threatened PE,PT - Federally Proposed Endangered/Threatened E/SA,T/SA - Federally Endangered/Threatened by Similarity of Appearance C1 - Federal Candidate, Category 1; information supports proposing to list as endangered/threatened DL,PDL - Federally Delisted/Proposed Delisted E,T - State Endangered/Threatened "blank" - Rare, but with no regulatory listing status</p>			
<p><i>Species appearing on these lists do not all share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.</i></p>			
E-5			

Texas Parks & Wildlife Annotated County Lists of Rare Species		Last Revision: 11/28/01	
TRAVIS COUNTY			
	Federal Status	State Status	
AMPHIBIANS			
Austin Blind Salamander (<i>Eurycea waterlooensis</i>) – mostly restricted to subterranean cavities of the Edwards Aquifer; dependent upon water flow/quality from the Barton Springs segment of the Edwards Aquifer; only known from the outlets of Barton Springs (Sunken Gardens (Old Mill) Spring, Eliza Spring, and Parthenia (Main) Spring which forms Barton Springs Pool); feeds on amphipods, ostracods, copepods, plant material, and (in captivity) a wide variety of small aquatic invertebrates			
Barton Springs Salamander (<i>Eurycea sosorum</i>) - dependent upon water flow/quality from the Barton Springs segment of the Edwards Aquifer; only known from the outlets of Barton Springs; spring dweller, but ranges into subterranean water-filled caverns; found under rocks, in gravel, or among aquatic vascular plants & algae, as available; feeds primarily on amphipods	LE	E	
Edwards Plateau Spring Salamanders (<i>Eurycea</i> sp. 7) - endemic; springs and waters of some caves of this region			
Jollyville Plateau Salamander (<i>Eurycea</i> sp. 1) - known from springs and waters of some caves of Travis and Williamson counties north of the Colorado River			
Pedernales River Springs Salamander (<i>Eurycea</i> sp. 6) - endemic; known only from springs			
ARACHNIDS			
A Cave Spider (<i>Cicurina cueva</i>) - very small, cave-adapted spider			
Bandit Cave Spider (<i>Cicurina bandida</i>) - very small, cave-adapted spider			
Bee Creek Cave Harvestman (<i>Texella reddelli</i>) - small, blind, cave-adapted harvestman endemic to a few caves in Travis and Williamson counties	LE		
Bone Cave Harvestman (<i>Texella reyesi</i>) - small, blind, cave-adapted harvestman endemic to a few caves in Travis and Williamson counties; weakly differentiated from <i>Texella reddelli</i>	LE		
Tooth Cave Pseudoscorpion (<i>Tartarocreagris texana</i>) - small, cave-adapted pseudoscorpion known from small limestone caves of the Edwards Plateau	LE		
Tooth Cave Spider (<i>Neoleptoneta myopica</i>) - very small, cave-adapted, sedentary spider	LE		
Warton's Cave Spider (<i>Cicurina wartonii</i>) - very small, cave-adapted spider	C1		
*** BIRDS ***			
American Peregrine Falcon (<i>Falco peregrinus anatum</i>) - potential migrant; nests in west Texas	DL	E	
Arctic Peregrine Falcon (<i>Falco peregrinus tundrius</i>) - due to similar field characteristics, treat all Peregrine Falcons as federal listed Endangered; potential migrant	DL	T	
Bald Eagle (<i>Haliaeetus leucocephalus</i>) - found primarily near seacoasts, rivers, and large lakes; nests in tall trees or on cliffs near water; communally roosts, especially in winter; hunts live prey, scavenges, and pirates food from other birds	LT-PDL	T	
Black-capped Vireo (<i>Vireo atricapillus</i>) - oak-juniper woodlands with distinctive patchy, two-layered aspect; shrub and tree layer with open, grassy spaces; requires foliage reaching to ground level for nesting cover; return to same territory, or one nearby, year after year; deciduous and broad-leaved shrubs and trees provide insects for feeding; species composition less important than presence of adequate broad-leaved shrubs, foliage to ground level, and required structure; nesting season March-late summer	LE	E	

Texas Parks & Wildlife Annotated County Lists of Rare Species TRAVIS COUNTY, cont'd		Last Revision: 11/28/01	
	Federal Status	State Status	
Golden-cheeked Warbler (<i>Dendroica chrysoparia</i>) - juniper-oak woodlands; dependent on Ashe juniper (also known as cedar) for long fine bark strips, only available from mature trees, used in nest construction; nests are placed in various trees other than Ashe juniper; only a few mature junipers or nearby cedar brakes can provide the necessary nest material; forage for insects in broad-leaved trees and shrubs; nesting late March-early summer	LE	E	
Henslow's Sparrow (<i>Ammodramus henslowii</i>) - wintering individuals (not flocks) found in weedy fields or cut-over areas where lots of bunch grasses occur along with vines and brambles; a key component is bare ground for running/walking; likely to occur, but few records within this county			
Mountain Plover (<i>Charadrius montanus</i>) - shortgrass plains and plowed fields (bare, dirt fields); primarily insectivorous; winter resident in this area	PT		
Whooping Crane (<i>Grus americana</i>) - potential migrant	LE	E	
CRUSTACEANS			
An Amphipod (<i>Stygobromus russelli</i>) - subterranean waters, usually in caves & limestone aquifers; resident of numerous caves in ca. 10 counties of the Edwards Plateau			
Bifurcated Cave Amphipod (<i>Stygobromus bifurcatus</i>) - found in cave pools			
FISHES			
Guadalupe Bass (<i>Micropterus treculi</i>) - endemic; known from headwater, perennial streams of the Edward's Plateau region			
Smalleye shiner (<i>Notropis buccula</i>) - endemic to upper Brazos River system and its tributaries; apparently introduced into adjacent Colorado River drainage; medium to large prairie streams with sandy substrate and turbid to clear warm water; presumably eats small aquatic invertebrates			
INSECTS			
Kretschmarr Cave Mold Beetle (<i>Texamaurops reddelli</i>) - small, cave-adapted beetle found under rocks buried in silt; small, Edwards Limestone caves in of the Jollyville Plateau, a division of the Edwards Plateau	LE		
Tooth Cave Blind Rove Beetle (<i>Cylindropsis</i> sp. 1) - one specimen collected from Tooth Cave; only known North American collection of this genus			
Tooth Cave Ground Beetle (<i>Rhadine persephone</i>) - resident, small, cave-adapted beetle found in small Edwards Limestone caves in Travis and Williamson counties	LE		
*** MAMMALS ***			
Cave Myotis (<i>Myotis velifer</i>) - colonial, cave dwelling; may also roost in man-made structures or in abandoned Cliff Swallow (<i>Hirundo pyrrhonota</i>) nests; usually roost in clusters that may number in the thousands; hibernates in caves during winter; opportunistic insectivores			
Plains Spotted Skunk (<i>Spilogale putorius interrupta</i>) - catholic; open fields, prairies, croplands, fence rows, farmyards, forest edges, and woodlands; prefers wooded, brushy areas and tallgrass prairie			

Texas Parks & Wildlife		Last Revision: 11/28/01	
Annotated County Lists of Rare Species			
TRAVIS COUNTY, cont'd			
		Federal Status	State Status
*** REPTILES ***			
Spot-tailed Earless Lizard (<i>Holbrookia lacerata</i>) - central & southern Texas & adjacent Mexico; moderately open prairie-brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas; eats small invertebrates; eggs laid underground			
Texas Garter Snake (<i>Thamnophis sirtalis annectens</i>) - wet or moist microhabitats are conducive to the species occurrence, but is not necessarily restricted to them; hibernates underground or in or under surface cover; breeds March-August			
Texas Horned Lizard (<i>Phrynosoma cornutum</i>) - open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees; soil may vary in texture from sandy to rocky; burrows into soil, enters rodent burrows, or hides under rock when inactive; breeds March-September			T
*** VASCULAR PLANTS ***			
Basin bellflower (<i>Campanula reverchonii</i>) - endemic; dry gravels and very shallow sandy soils derived from Precambrian igneous and metamorphic rocks, on open slopes and rock outcrops; flowering May-July, September-October			
Bracted twistflower (<i>Streptanthus bracteatus</i>) - endemic; shallow clay soils over limestone, mostly on rocky slopes, in openings in juniper-oak woodlands; flowering April-May			
Canyon mock-orange (<i>Philadelphus ernestii</i>) - endemic; solution-pitted outcrops of Cretaceous limestone in mesic canyons, usually in shade of mostly deciduous slope forest; flowering April-May			
Correll's false dragon-head (<i>Physostegia correllii</i>) - wet soils including roadside ditches and irrigation channels; flowering June-July			
Texabama croton (<i>Croton alabamensis</i> var. <i>texensis</i>) - mostly deciduous or evergreen deciduous woodlands in duff-covered loamy clay soils on rocky slopes in comparatively mesic limestone ravines, often locally abundant on deeper soils on small terraces in canyon bottoms; flowering late February-March; fruit maturing and dehiscing by early June			
LE, LT - Federally Listed Endangered/Threatened PE, PT - Federally Proposed Endangered/Threatened E/SA, T/SA - Federally Endangered/Threatened by Similarity of Appearance C1 - Federal Candidate, Category 1; information supports proposing to list as endangered/threatened DL, PDL - Federally Delisted/Proposed Delisted E, T - State Endangered/Threatened "blank" - Rare, but with no regulatory listing status			
<i>Species appearing on these lists do not share the same probability of occurrence. Some species are migrants or wintering residents only, or may be historic or considered extirpated.</i>			
E-8			



United States Department of the Interior



FISH AND WILDLIFE SERVICE
10711 Burnet Road, Suite 200
Austin, Texas 78758
(512) 490-0057
MAY 22 2006

William Fickel, Division Chief
Planning, Environmental,
and Regulatory Division
U.S. Army Corps of Engineers
P. O. Box 17300
Fort Worth, Texas 76102-0300

Dear Mr. Fickel:

This provides the U.S. Fish and Wildlife Service's (Service) comments and recommendations on the proposed Onion Creek Project in Travis County, Texas. We have reviewed the proposed plan addressing the flood damage reduction and ecosystem restoration for various reaches of Onion and Williamson creeks and offer the following comments on the currently proposed actions:

- 1) Onion Creek - Timber Creek Damage Center: buyout with ecosystem restoration and recreation;
- 2) Onion Creek - Forest / Yarrabee Bend: buyout of 25-year floodplain with ecosystem restoration and high intensity recreation;
- 3) Onion Creek Bear/Onion Confluence: buyout of four structures and ecosystem restoration and no recreation;
- 4) Williamson Creek - Heartwood Reach: optimal plan with ecosystem restoration and no recreation;
- 5) Williamson Creek - Radam Reach: optimal plan with ecosystem restoration and no recreation;
- 6) Williamson Creek - Broken Bow Reach: optimal plan with no ecosystem restoration and no recreation;
- 7) Williamson Creek - Bayton Loop Reach: optimal plan with ecosystem restoration upstream of the project in Sunset Valley and in between Jones and Westgate, but not upstream of Westgate on the city of Austin side of the creek in the immediate vicinity of the project.



Mr. Fickel

2

As mentioned in our October 11, 2002, letter, we recommend that non-structural options be used to greatest practicable extent. The proposed project includes a number of buyouts (actions 1, 2, and 3), which we fully support. It also includes channel modifications to improve flood conveyance and on-site ecosystem restoration measures (action 4 and 5), which we can support.

Two of the proposed actions (6 and 7) involve floodway modifications that will impact adjacent woodlands. It is our view that these woodlands vary from reach to reach but would likely fall into resource category 2 pursuant to the Service's mitigation policy. That is, generally, their value would lead to a recommendation that advocates avoidance and minimizing losses. Losses in resource category 2, when unavoidable, can be compensated by replacement of the same kind of habitat so there would be no net loss of in-kind habitat values.

A tree survey of the Bayton Loop area was conducted on May 3, 2006. We believe that the vegetation of the Broken Bow and Bayton Loop areas are frequently found among regional waterways and even upland areas of central Texas and thus would not be considered unique or irreplaceable (attributes of resource category 1). These woodlands (associated with creeks) in the Travis County area are less common today due to land use changes and we would recommend that the flood protection efforts minimize impacts to these woodlands where possible and plan a commensurate restoration of similar woodlands nearby as compensation.

We believe that this project's environmental effects can be adequately described and addressed through an environmental assessment. This is based on our understanding of the scope of the project and its impacts and planned benefits to fish and wildlife resources of central Texas.

Thank you for the opportunity to provide input. If you have any questions or comments or need further information, please contact Patrick Connor at (512) 490-0057, extension 227.

Sincerely,



Robert T. Pine
Supervisor

cc: Tom Heger, TPWD, Austin, TX



United States Department of the Interior

FISH AND WILDLIFE SERVICE
10711 Burnet Road, Suite 200
Austin, Texas 78758
512 490-0057
FAX 490-0974



AUG 23 2006

William Fickel, Division Chief
Planning, Environmental, and Regulatory Division
U.S. Army Corps of Engineers
P. O. Box 17300
Fort Worth, Texas 76102-0300

Dear Mr. Fickel:

This letter provides an updated set of planning recommendations and a draft Fish and Wildlife Coordination Act Report to the U.S. Army Corps of Engineers (USACE) for the proposed flood damage reduction and ecological restoration actions of the Onion Creek Project in Travis County, Texas. We have reviewed the August 2006 draft Interim Feasibility Report and Integrated Environmental Assessment (EA). We previously provided a Planning Aid Letter on this project on October 11, 2002, however, some of the previously designated areas of interest were dropped from further investigation. This planning assistance is provided, in part, pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.) and is intended to assist in the development of your draft feasibility report. It does not represent a final report of the Secretary of the Interior within the meaning of Section 2(b) of the Act. A final Fish and Wildlife Coordination Act report will be prepared after we have reviewed comments on the draft and all available pertinent information during the planning process.

Onion Creek Interim Feasibility Study

The Onion Creek Interim Feasibility Study is a multipurpose flood damage reduction, ecosystem restoration, and recreation study focusing on solving the flooding problems on Williamson and Onion creeks in and around the City of Austin (COA). The non-Federal sponsors are the Lower Colorado River Authority (LCRA), cities of Austin and Sunset Valley, and Travis County with financial support from the Texas Water Development Board (TWDB) (USACE 2005, Lower Colorado River PEIS).

The Onion Creek project is part of the Lower Colorado Basinwide Studies that has the LCRA as the official non-Federal sponsor. The LCRA has made agreements with the COA, City of Sunset Valley, and Travis County to fund part of the study costs.

Description of the Study Area and Project

The EA provides good descriptions of the Onion and Williamson creek watersheds. The Williamson Creek is a sub-watershed of the Onion Creek watershed. For ease of reference, the various areas of interest for the Interim Feasibility Study are labeled Table 1 and Figure 2.



Mr. Fickel

2

Table 1 (Table 2-1 From EA) Onion Creek Interim Feasibility Study Areas of Interest	
Listed from Downstream to Upstream:	
1.	Timber Creek
2.	Onion Creek Forest – Yarrabee Bend
3.	Bluff Springs Road/Perkins Valley
4.	Onion Creek Subdivision
5.	Bear/Onion Confluence
6.	Middle Williamson Creek
a.	Heartwood
b.	Radam/Salem Walk
c.	Broken Bow/Buckskin Pass
d.	Westgate Boulevard/Bayton Loop (includes Sunset Valley and Cherry Creek)

The physiographic and climatic settings are provided by the EA (Chapter 2) and our planning aid letter dated October 11, 2002. Additional information on hydrology and flooding is described in the Watershed Protection Master Plan Phase 1 Watersheds Report (City of Austin, web accessed August 17, 2006). Segments 1, 2, 3, and 4 are respectively known as Heartwood, Radam, Broken Bow, and Bayton Loop. Figure 3 shows the middle Williamson Creek Damage Centers and the cities of Sunset Valley and Austin.

Fish and Wildlife Resources Impacts

Federally Listed Threatened and Endangered Species

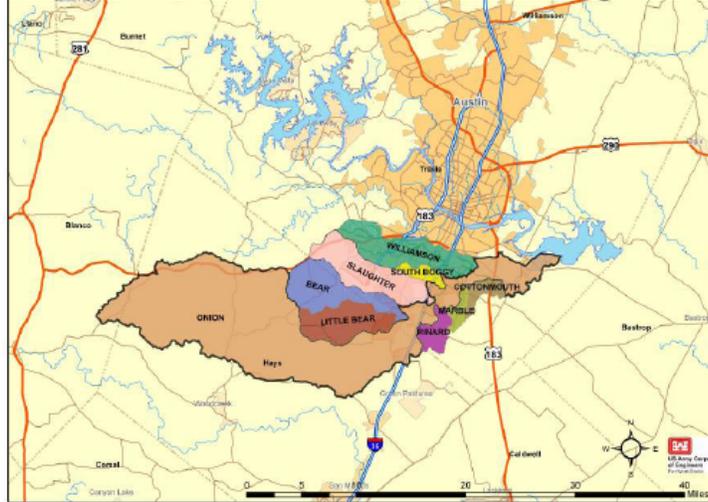
Several listed species occur in Travis County, notably the endangered golden-cheeked warbler (*Dendroica chrysoparia*), black-capped vireo (*Vireo atricapilla*), and Barton Springs salamander (*Eurycea sosorum*). The areas affected by the project do not have habitat for these songbirds. The Barton Springs salamander is a strict endemic of the Barton Springs group. While a small part of the proposed project in the Bayton Loop damage center is in, or near, the recharge zone for the Edwards aquifer, the projected work is primarily in areas adjacent to the waterway. In addition, dye tracing research indicates that at least some of the recharge from Williamson Creek travels to Cold Springs rather than Barton Springs. Construction best management practices are planned to avoid and minimize storm water related impacts throughout the project. We concur that the Onion Creek project is not likely to adversely affect any federally listed threatened or endangered species.

Mr. Fickel

3

Figure 1 (Figure 2.1 from EA)

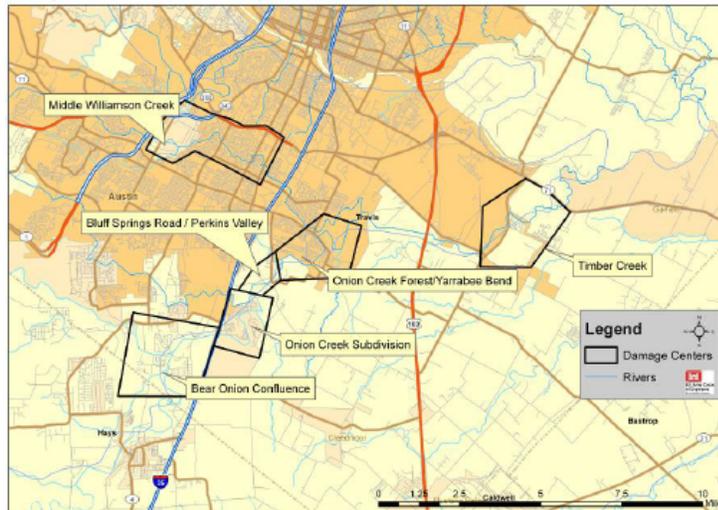
Onion Creek Watershed Location Map Figure 2.1



Areas of interest in the Williamson Creek segment are shown in the following figure from the EA:

Figure 2 (Figure 2.2 from the EA)

Designated Areas of Interest Figure 2.2



Mr. Fickel

4

Williamson Creek Segments Figure E



Grassland Habitats

The project would result in the conversion of areas dominated by grasses to woodlands. Typical habitat pre-development likely consisted of mature woodlands associated with creeks. Land use changes brought by urbanization led to removal of woodland habitats along Onion and Williamson Creek. The overall effect of the project would be restoration of woodlands by replacing areas currently providing minimal ecological value.

Aquatic Habitats

The project would change the channel geometry in the Williamson Creek reaches. In general, this part of Williamson Creek is usually dry except for several pools. The fish found in the handful of semi-permanent pools are species (e.g., *Gambusia* sp.) adept at colonizing stream habitats and tolerant of wide water temperature and dissolved oxygen variation. One issue that has been raised is whether the benching would affect the stability of bed and banks of Williamson Creek. We do not know with certainty whether substrates will be deposited in the constructed benches. Once the geotechnical data are collected, we will have a better understanding of the likelihood of erosion where the channel is widened. In general, we do not expect the project to significantly alter existing aquatic habitats.

Woodland Habitats

The EA provides both the detailed and summary accounting of woodland habitat values gained and lost in various subsets of the project. The primary impact to woodland habitats would be in the Williamson Creek riparian areas on the side where channel modifications (benching) are proposed.

Mr. Fickel

5

We accept the updated information currently in Appendix B Environmental Resources of the EA, which contains the methods (Habitat Suitability) and results of the team effort made by the Service, Texas Parks and Wildlife Department, and USACE – Fort Worth District. The existing habitat values for the named damage centers are provided in Table B-1. Currently, the combined total of all areas of interest (damage centers) provides 825 habitat units (HU) of riparian woodlands, 2061 HU of grassland, 250 HU of shrubland, and 3.4 HU of wetland.

Woodland habitat is the primary wildlife resource at issue in the project. Table 2 shows the annualized average habitat units of woodlands expected in the future with, and without, the project. The total recommended plan with ecological restoration provides 106.38 AAHU more than the future with out the project.

During the 50 year span modeled, the recommended plan would provide an increase of about 100 annualized average habitat units of riparian woodlands for the planting densities described in the EA.

Table 2 Future With and Without Project AAHU's for The Recommended Plan			
Habitat Types	Future W/O AAHU's	Future With AAHU's	Difference Between With and W/O
Riparian Woodlands Timber Creek – ER	6.98	12.84	5.86
Riparian Woodlands OCF/YB - ER	99.38	156.14	56.76
Total Onion Creek – ER	106.36	168.98	62.62
Riparian Woodlands Heartwood - ER	3.43	9.76	6.33
Riparian Woodlands Radam – ER	6.96	22.31	15.35
Riparian Woodlands Bayton Loop – ER	36.68	58.76	22.08
Total Williamson Creek – ER	47.07	90.83	43.76
Total Recommended Plan – ER	153.43	259.81	106.38
Riparian Woodlands Heartwood - FDR	0.69	0	-0.69*
Riparian Woodlands Radam – FDR	0.46	0	-0.46*
Riparian Woodlands Broken Bow – FDR	1.31	0	-1.31*
Riparian Woodlands Bayton Loop – FDR	3.56	0	-3.56*
Total Recommended Plan – FDR	6.02	0	-6.02
NOTE: ER = Ecosystem Restoration; FDR = Flood Damage Reduction * These negative differences are losses and would result in required mitigation.			

Mr. Fickel

6

Summary

The proposed plan would reduce flood damages and provide for ecosystem restoration for various reaches of Onion and Williamson creeks. Some short term adverse effects are expected for downstream aquatic habitat due to unavoidable impacts on water quality from construction work to modify parts of the Williamson Creek channel. We believe that post-construction impacts (after year 1) to water quality will not be discernable.

Woodlands (associated with creeks) in the Travis County area are less common today due to land use changes, and we recommend that the flood protection efforts minimize impacts to these woodlands where possible and that commensurate restoration of similar woodlands nearby be implemented as compensation. We recommend exploring nearby tributaries of Williamson Creek, particularly in the Edwards aquifer recharge zone, as potential mitigation sites for impacts resulting from flood damage reduction.

We believe that this project's environmental effects have been adequately described and addressed through the integrated environmental assessment. This is based on our understanding of the scope of the project and its impacts and planned benefits to fish and wildlife resources of central Texas.

Project Recommendations for Fish and Wildlife Enhancement

The Onion / Williamson Creek project as described in the EA provides several opportunities to maintain or enhance fish and wildlife resources in Timber Creek, Onion Creek Forest, and Williamson Creek damage centers. The project will provide improved protection from flooding in the Williamson Creek reaches and will result in loss of some woodland habitats. The issue of losing mature trees near a waterway is generally not desirable. However, the Williamson Creek waterway in the study area is generally dry. There are a few pools that appear to persist through the summer months. If the waterway had more permanent water, loss of nearby trees would mean loss of shade and higher water temperatures. Some of the channel modifications will be on the northern side of the creek, so changes in shading of the waterway would not be an issue.

The proposed protection of additional habitats in the vicinity coupled with ecological restoration measures at three of the four Williamson Creek sites will address many of the fish and wildlife habitat issues of concern.

We recommend that native tree planting measures in and near the benched areas be carefully planned and monitored. Local geology and soil limitations may impact site suitability and tree survival in some areas.

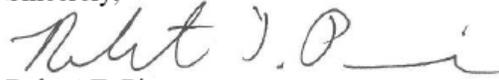
We also recommend increased efforts to manage invasive non-native trees throughout the Onion Creek watershed, including local elimination of privet (*Ligustrum sinense*), Chinaberry (*Melia azedarach*), and Chinese tallow (*Sapium seberiferum*).

Mr. Fickel

7

Thank you for the opportunity to provide input. If you have any questions or comments or need further information, please contact Patrick Connor at (512) 490-0057, extension 227.

Sincerely,

A handwritten signature in cursive script, appearing to read "Robert T. Pine".

Robert T. Pine
Supervisor

cc: Tom Heger, TPWD, Austin, TX
Nancy McClintock, City of Austin, TX

Mr. Fickel

8

References Cited

City of Austin. 1998. Preliminary Report on Groundwater Tracing Studies within the Barton and Williamson Creek Watersheds, Barton Springs/Edwards Aquifer. 64 pages.

U.S. Army Corps of Engineers. 2005. Final Programmatic Environmental Impact Statement Flood Damage Reduction and Ecosystem Restoration Lower Colorado River Basin, Colorado River, Texas. Fort Worth District. August.

U.S. Army Corps of Engineers. 2006. Draft Interim Feasibility Report and Integrated Environmental Assessment. Fort Worth District. August.



DEPARTMENT OF THE ARMY
FORT WORTH DISTRICT, CORPS OF ENGINEERS
P. O. BOX 17300
FORT WORTH, TEXAS 76102-0300

REPLY TO
ATTENTION OF:

Sept. 19, 2006

Planning, Environmental, and Regulatory Division

Mr. Bill Seawell
U.S. Fish and Wildlife Service
Ecological Services
10711 Burnet Road, Suite 200
Austin, TX 78758

Dear Mr. Seawell:

This letter is in response to your draft Fish and Wildlife Coordination Act Report (CAR) dated August 23, 2006 on the Lower Colorado River Basin Phase I, Texas Project, Onion Creek Component. The U.S. Army Corps of Engineers (Corps) has only minor comments on the draft. These comments are as follows:

- 1) The draft CAR states on page five that there is a total of 2061 HU of grassland in all areas of interest. The total for grasslands is actually 2207 HU in all areas of interest (Page 3-13 draft project report).
- 2) The final CAR should state the views of the Texas Parks and Wildlife Department.

The final Project Report is due to be transmitted to the Corps Headquarters and the Office of the Assistant Secretary of the Army (Civil Works) on October 12, 2006, and we are therefore requesting a final CAR by October 6, 2006, if possible. Thanks for your consideration in this matter and if you have any questions or comments please contact Mr. Rob Newman at 817-886-1762 or by email at rob.newman@swf02.usace.army.mil.

Sincerely,

A handwritten signature in black ink, appearing to read "William Fickel, Jr.", is written over the typed name.

William Fickel, Jr.
Chief, Planning, Environmental, and
Regulatory Division



United States Department of the Interior

FISH AND WILDLIFE SERVICE
10711 Burnet Road, Suite 200
Austin, Texas 78758
512 490-0057
FAX 490-0974



6 OCT 2006

William Fickel, Division Chief
Planning, Environmental, and Regulatory Division
U.S. Army Corps of Engineers
P. O. Box 17300
Fort Worth, Texas 76102-0300

Dear Mr. Fickel:

Thank you for your September 19, 2006, letter commenting on our draft Fish and Wildlife Coordination Act Report (CAR). We consulted with Texas Parks and Wildlife Department (TPWD) and received their comments in a letter dated, October 3, 2006. This provides our final Fish and Wildlife Coordination Act Report to the U.S. Army Corps of Engineers (USACE) for the proposed flood damage reduction and ecological restoration actions of the Onion Creek Project in Travis County, Texas. We have reviewed the August 2006 draft Interim Feasibility Report and Integrated Environmental Assessment (EA). We previously provided a Planning Aid Letter on this project on October 11, 2002, however, some of the previously designated areas of interest were dropped from further investigation. This planning assistance is provided, in part, pursuant to the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

We have been notified that the USACE has decided to delay implementation of the Williamson Creek portion of the Onion Creek Project, per USACE policy related to limits on land costs as part of restoration. It is our understanding that the Williamson Creek portion is no longer part of the recommended plan. TPWD has expressed concerns about the impacts to fish and wildlife resources in certain reaches of the Williamson Creek portion of the project. Thus, the analyses and estimated habitat impacts provided below would require changes pending further coordination/review with TPWD and the local sponsors if alteration of Williamson Creek returns to your plans.

In general, the U.S. Fish and Wildlife Service (Service) and TPWD agree that the recommended plan for the Onion Creek segment of the project adequately considers fish and wildlife resources.

Onion Creek Interim Feasibility Study

The Onion Creek Interim Feasibility Study is a multipurpose flood damage reduction, ecosystem restoration, and recreation study focusing on solving the flooding problems on Williamson and Onion creeks in and around the City of Austin (COA). The non-Federal sponsors are the Lower Colorado River Authority (LCRA), cities of Austin and Sunset Valley, and Travis County with

Mr. Fickel

2

financial support from the Texas Water Development Board (TWDB) (USACE 2005, Lower Colorado River PEIS).

The Onion Creek project is part of the Lower Colorado Basinwide Studies that has the LCRA as the official non-Federal sponsor. The LCRA has made agreements with the COA, City of Sunset Valley, and Travis County to fund part of the study costs.

Description of the Study Area and Project

The EA provides good descriptions of the Onion and Williamson creek watersheds. The Williamson Creek is a sub-watershed of the Onion Creek watershed. For ease of reference, the various areas of interest for the Interim Feasibility Study are labeled Table 1 and Figure 2.

Table 1 (Table 2-1 From EA) Onion Creek Interim Feasibility Study Areas of Interest	
Listed from Downstream to Upstream:	
1.	Timber Creek
2.	Onion Creek Forest – Yarrabee Bend
3.	Bluff Springs Road/Perkins Valley
4.	Onion Creek Subdivision
5.	Bear/Onion Confluence
6.	Middle Williamson Creek
a.	Heartwood
b.	Radam/Salem Walk
c.	Broken Bow/Buckskin Pass
d.	Westgate Boulevard/Bayton Loop (includes Sunset Valley and Cherry Creek)

The physiographic and climatic settings are provided by the EA (Chapter 2) and our planning aid letter dated October 11, 2002. Additional information on hydrology and flooding is described in the Watershed Protection Master Plan Phase 1 Watersheds Report (City of Austin, web accessed August 17, 2006). Segments 1, 2, 3, and 4 are respectively known as Heartwood, Radam, Broken Bow, and Bayton Loop. Figure 3 shows the middle Williamson Creek Damage Centers and the cities of Sunset Valley and Austin.

Fish and Wildlife Resources Impacts

Federally Listed Threatened and Endangered Species

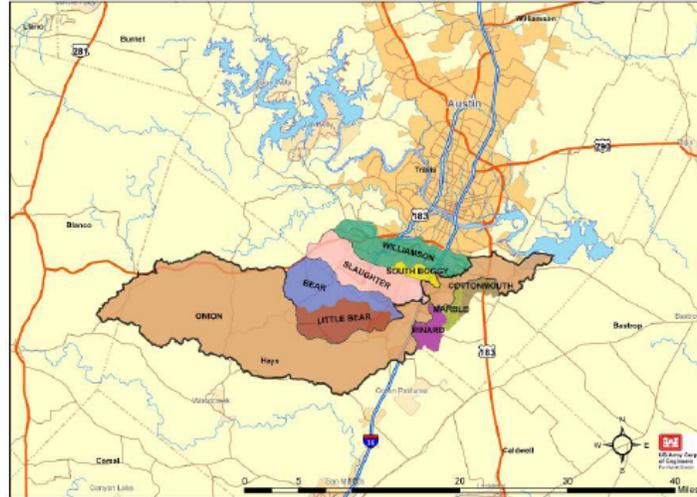
Several listed species occur in Travis County, notably the endangered golden-cheeked warbler (*Dendroica chrysoparia*), black-capped vireo (*Vireo atricapilla*), and Barton Springs salamander (*Eurycea sosorum*). The areas affected by the project do not have habitat for these songbirds. The Barton Springs salamander is a strict endemic of the Barton Springs, which is fed by the Edwards aquifer. While a small part of the proposed project in the Bayton Loop damage center is in, or near, the recharge zone for the Edwards aquifer, the projected work is primarily in areas adjacent to the waterway. In addition, dye tracing research indicates that at least some of the recharge from Williamson Creek travels to Cold Springs rather than Barton Springs. Construction best management practices are planned to avoid and minimize storm water related impacts throughout the project. We concur that the Onion Creek project is not likely to adversely affect any federally listed threatened or endangered species.

Mr. Fickel

3

Figure 1 (Figure 2.1 from EA)

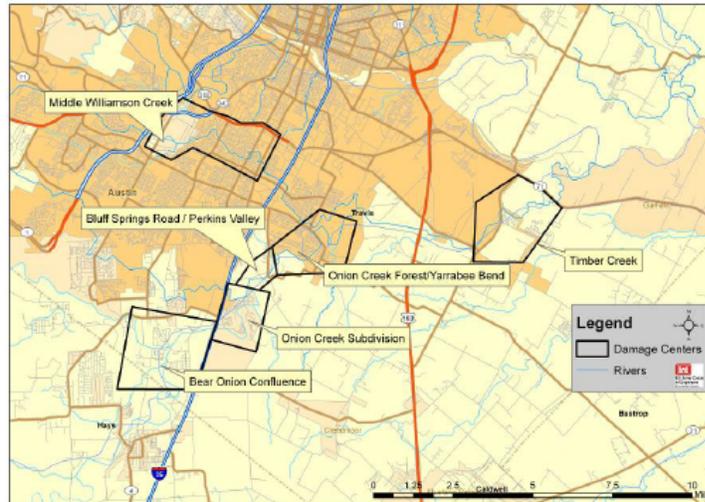
Onion Creek Watershed Location Map Figure 2.1



Areas of interest in the Williamson Creek segment are shown in the following figure from the EA:

Figure 2 (Figure 2.2 from the EA)

Designated Areas of Interest Figure 2.2



Mr. Fickel

4

Williamson Creek Segments Figure E



Grassland Habitats

The project would result in the conversion of areas dominated by grasses to woodlands. Typical habitat pre-development likely consisted of mature woodlands associated with creeks. Land use changes brought by urbanization led to removal of woodland habitats along Onion and Williamson Creek. The overall effect of the project would be restoration of woodlands by replacing areas currently providing minimal ecological value.

Aquatic Habitats

The project would change the channel geometry in the Williamson Creek reaches. In general, this part of Williamson Creek is usually dry except for several pools. The fish found in the handful of semi-permanent pools are species (e.g., *Gambusia* sp.) adept at colonizing stream habitats and tolerant of wide water temperature and dissolved oxygen variation. One issue that has been raised is whether the benching would affect the stability of bed and banks of Williamson Creek. We do not know with certainty whether substrates will be deposited in the constructed benches. Once the geotechnical data are collected, we will have a better understanding of the likelihood of erosion where the channel is widened. In general, we do not expect the project to significantly alter existing aquatic habitats.

Woodland Habitats

The EA provides both the detailed and summary accounting of woodland habitat values gained and lost in various subsets of the project. The primary impact to woodland habitats would be in the Williamson Creek riparian areas on the side where channel modifications (benching) are proposed.

Mr. Fickel

5

We accept the updated information currently in Appendix B Environmental Resources of the EA, which contains the methods (Habitat Suitability) and results of the team effort made by the Service, Texas Parks and Wildlife Department, and USACE – Fort Worth District. The existing habitat values for the named damage centers are provided in Table B-1. Currently, the combined total of all areas of interest (damage centers) provides 825 habitat units (HU) of riparian woodlands, 2,207 HU of grassland, 250 HU of shrubland, and 3.4 HU of wetland.

Woodland habitat is the primary wildlife resource at issue in the project. Table 2 shows the annualized average habitat units of woodlands expected in the future with, and without, the project. The total recommended plan with ecological restoration provides 106.38 AAHU more than the future without the project.

During the 50 year span modeled, the recommended plan would provide an increase of about 100 annualized average habitat units of riparian woodlands for the planting densities described in the EA.

Table 2 Future With and Without Project AAHU's for The Recommended Plan			
Habitat Types	Future W/O AAHU's	Future With AAHU's	Difference Between With and W/O
Riparian Woodlands Timber Creek – ER	6.98	12.84	5.86
Riparian Woodlands OCF/YB - ER	99.38	156.14	56.76
Total Onion Creek – ER	106.36	168.98	62.62
Riparian Woodlands Heartwood - ER	3.43	9.76	6.33
Riparian Woodlands Radam – ER	6.96	22.31	15.35
Riparian Woodlands Bayton Loop – ER	36.68	58.76	22.08
Total Williamson Creek – ER	47.07	90.83	43.76
Total Recommended Plan – ER	153.43	259.81	106.38
Riparian Woodlands Heartwood - FDR	0.69	0	-0.69*
Riparian Woodlands Radam – FDR	0.46	0	-0.46*
Riparian Woodlands Broken Bow – FDR	1.31	0	-1.31*
Riparian Woodlands Bayton Loop – FDR	3.56	0	-3.56*
Total Recommended Plan – FDR	6.02	0	-6.02
NOTE: ER = Ecosystem Restoration; FDR = Flood Damage Reduction * These negative differences are losses and would result in required mitigation.			

Mr. Fickel

6

Summary

The proposed plan would reduce flood damages and provide for ecosystem restoration for various reaches of Onion and Williamson creeks. Some short term adverse effects are expected for downstream aquatic habitat due to unavoidable impacts on water quality from construction work to modify parts of the Williamson Creek channel. We believe that post-construction impacts (after year 1) to water quality will not be discernable.

Woodlands (associated with creeks) in the Travis County area are less common today due to land use changes, and we recommend that the flood protection efforts minimize impacts to these woodlands where possible and that commensurate restoration of similar woodlands nearby be implemented as compensation. We recommend exploring nearby tributaries of Williamson Creek, particularly in the Edwards aquifer recharge zone, as potential mitigation sites for impacts resulting from flood damage reduction.

We believe that this project's environmental effects have been adequately described and addressed through the integrated environmental assessment. This is based on our understanding of the scope of the project and its impacts and planned benefits to fish and wildlife resources of central Texas.

Project Recommendations for Fish and Wildlife Enhancement

The Onion / Williamson Creek project as described in the EA provides several opportunities to maintain or enhance fish and wildlife resources in Timber Creek, Onion Creek Forest, and Williamson Creek damage centers. The project will provide improved protection from flooding in the Williamson Creek reaches and will result in loss of some woodland habitats. The issue of losing mature trees near a waterway is generally not desirable. However, the Williamson Creek waterway in the study area is generally dry. There are a few pools that appear to persist through the summer months. If the waterway had more permanent water, loss of nearby trees would mean loss of shade and higher water temperatures. Some of the channel modifications will be on the northern side of the creek, so changes in shading of the waterway would not be an issue.

The proposed protection of additional habitats in the vicinity coupled with ecological restoration measures at three of the four Williamson Creek sites will address many of the fish and wildlife habitat issues of concern.

We recommend that native tree planting measures in and near the benched areas be carefully planned and monitored. Local geology and soil limitations may impact site suitability and tree survival in some areas.

We also recommend increased efforts to manage invasive non-native trees throughout the Onion Creek watershed, including local elimination of privet (*Ligustrum sinense*), Chinaberry (*Melia azedarach*), and Chinese tallow (*Sapium seberiferum*).

Mr. Fickel

7

Thank you for the opportunity to provide input. Should the Williamson Creek portion of the project be reconsidered, we look forward to updating our review with further coordination with TPWD. If you have any questions or comments or need further information, please contact Patrick Connor at (512) 490-0057, extension 227.

Sincerely,

/s/ Bill Seawell Acting for

Robert T. Pine
Supervisor

cc: Tom Heger, TPWD, Austin, TX
Glen Taffinder, City of Austin, TX
Katy Phillips, City of Sunset Valley, TX

Mr. Fickel

8

References Cited

City of Austin. 1998. Preliminary Report on Groundwater Tracing Studies within the Barton and Williamson Creek Watersheds, Barton Springs/Edwards Aquifer. 64 pages.

U.S. Army Corps of Engineers. 2005. Final Programmatic Environmental Impact Statement Flood Damage Reduction and Ecosystem Restoration Lower Colorado River Basin, Colorado River, Texas. Fort Worth District. August.

U.S. Army Corps of Engineers. 2006. Draft Interim Feasibility Report and Integrated Environmental Assessment. Fort Worth District. August.