# *Draft Environmental Assessment*

## Endangered Species Act 4(d) Rule for Threatened Georgetown Salamander (*Eurycea naufragia*)

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# 1 Introduction

The U.S. Fish and Wildlife Service (Service) has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended, and its implementing regulations in the Code of Federal Regulations (CFR) at 40 CFR 1506.6 and section 4(d) of the Endangered Species Act (Act) of 1973, as amended. The Act does not specify particular prohibitions, or exceptions to those prohibitions, for threatened species. Instead, under section 4(d) of the Act, the Secretary of the Interior has the discretion to issue such regulations as [s]he deems "necessary and advisable to provide for the conservation of such species." The Secretary also has the discretion to prohibit by regulation with respect to any threatened species, any act prohibited under section 9(a)(1) of the Act. Exercising this discretion, the Service developed general prohibitions (50 CFR 17.31) and exceptions to those prohibitions (50 CFR 17.32) under the Act that apply to most threatened species. Alternately, for other threatened species, the Service may develop specific prohibitions and exceptions that are tailored to the specific conservation needs of the species. In such cases, some of the prohibitions and authorizations under 50 CFR 17.31 and 17.32 may be appropriate for the species and incorporated into a rule under section 4(d) of the Act.

Under section 4(d) of the Act, the Secretary may publish a rule that modifies the standard protections for threatened species with regulations [and exceptions] tailored to the conservation of the species that are determined to be necessary and advisable. One use of 4(d) rules is to relax normal restrictions in place under the Act to reduce conflicts between people and the protections provided to the threatened species. A 4(d) rule can be used in such a situation if those conflicts would adversely affect recovery and if the reduced protection would not slow the species' recovery. On February 24, 2014, the Service published a proposed 4(d) rule that would apply all of the prohibitions under 50 CFR 17.31 and 17.32 to the Georgetown salamander, except that take incidental to activities conducted consistent with the conservation measures contained in the City of Georgetown's Edwards Aquifer Recharge Zone Water Quality Ordinance (Ordinance) (Ordinance No. 2013-59) would not be prohibited under the Act. Since we published the proposed 4(d) rule, the City of Georgetown has incorporated, and expanded upon, the Ordinance in their Unified Development Code (UDC), which is the primary tool to regulate land development in Georgetown. In light of this, we are publishing a revised proposed 4(d) rule that would apply all of the prohibitions under 50 CFR 17.31 and 17.32 to the Georgetown salamander, except that take incidental to regulated activities that are conducted in accordance with the water quality regulations contained in Chapter 11.07 and recommendations in Appendix A of the City of Georgetown UDC would not be prohibited under the Act. The revised proposed 4(d) rule will not remove or alter in any way the consultation requirements under section 7 of the Act.

This document provides the required NEPA documentation for a Federal action (approval of a rule under section 4(d) of the Act) and provides baseline information and discussion of impacts to the human and natural environment that may occur as a result of implementing the 4(d) rule. This EA analyzes the environmental consequences of the Service's proposed alternative and of having no 4(d) rule in place (the "No Action" alternative). The draft EA is being released concurrently with

the revised proposed 4(d) rule so that the public can comment on both documents. The Service will consider all comments we receive, and the EA and final 4(d) rule will be revised accordingly.

## 1.1 Project History

On August 22, 2012, the Service published a proposed rule to list as endangered and designate critical habitat for the Austin blind salamander (*Eurycea waterlooensis*), Jollyville Plateau salamander (*Eurycea tonkawae*), Georgetown salamander (*Eurycea naufragia*), and Salado salamanders (*Eurycea chisholmensis*) under the Endangered Species Act of 1973 (Act), as amended (77 FR 50768). The public comments received by the Service indicated substantial disagreement regarding the sufficiency or accuracy of the available data relevant to a determination for the proposed listing of the Georgetown and Salado salamanders. In consideration of these disagreements, the Service published a 6-month extension of the final determination for the Georgetown and Salado salamanders on August 20, 2013 (78 FR 51129). On the same day, the Service made a final determination to list the Austin blind and Jollyville Plateau salamanders as an endangered and threatened species, respectively.

During the 6-month extension, the City of Georgetown, Texas, finalized and approved the Edwards Aquifer Recharge Zone Water Quality Ordinance (Ordinance). All 17 of the known Georgetown salamander sites are located within the City of Georgetown's jurisdiction for residential and commercial development (see Figure 1). The enacted Ordinance was directed at alleviating threats to the Georgetown salamander from urban development by requiring geologic assessments prior to construction, establishing occupied site protections through stream buffers, maintaining water quality through best management practices, developing a water quality management plan for the City of Georgetown, and monitoring occupied spring sites by the Georgetown salamander Adaptive Management Work Group (AMWG).

In order to consider the Ordinance in the final listing determination, on January 7, 2014, the Service reopened the comment period for 15 days on the proposed listing rule to allow the public an opportunity to provide input on the application of the Ordinance to the status determination under section 4(a)(1) of the Act (79 FR 800). After further review and analysis of the Ordinance and public comments received, the Service determined in February 2014 that both the Georgetown and Salado salamanders warranted being listed as "Threatened" under the Act (79 FR 10236). Concurrently, the Service published a proposal for a rule under the authority of section 4(d) of the Act for the Georgetown salamander (79 FR 10077). The comment period for this proposed 4(d) rule closed on April 25, 2014.

Since the proposed 4(d) rule published, the City of Georgetown incorporated, and expanded upon, the language from the Ordinance in their UDC, the primary tool to regulate development in the City. The revised water quality regulations in UDC 11.07 and Appendix A were finalized on February 24, 2015. The Service is publishing a revised proposed 4(d) rule that will not prohibit take of the Georgetown salamander that is incidental to regulated activities that are conducted consistent with the water quality protective measures contained in Chapter 11.07 and Appendix A of the City of

Georgetown's UDC. The comment period for the revised proposed 4(d) rule and this draft environmental assessment will be open for 30 days, closing on May 11, 2015.

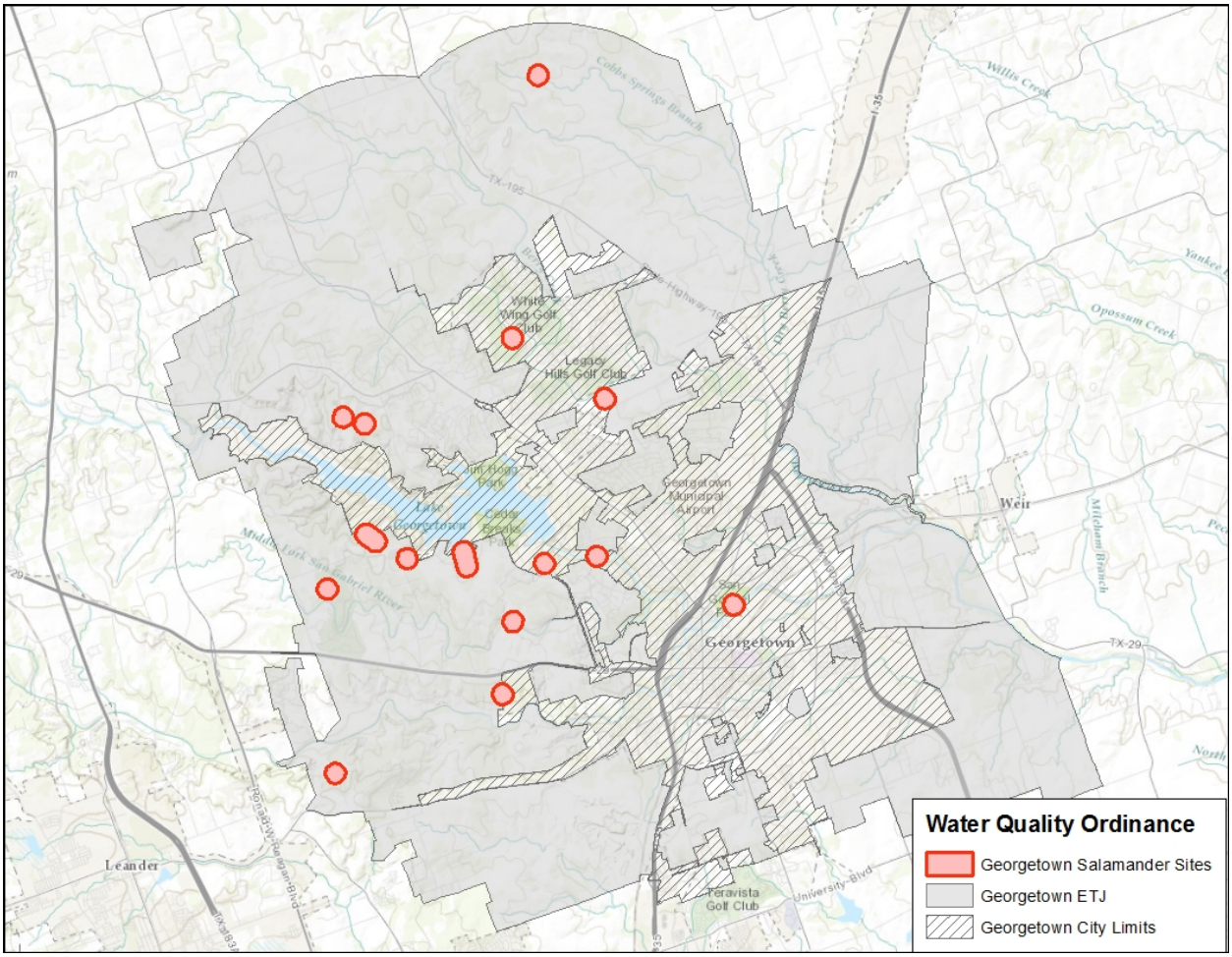


**Figure 1.** City of Georgetown City Limits, City of Georgetown Extraterritorial Jurisdiction, and Georgetown Salamander Sites

## 1.2 Purpose and Need for the Action

Rapid human population growth is occurring within the range of the Georgetown salamander. The Georgetown salamander's range is located within an increasingly urbanized area of Williamson County, Texas. In 2010, the human population within the City of Georgetown's extraterritorial jurisdiction was 68,821 (City of Georgetown 2013, p. 3). By one estimate, this population is expected to exceed 225,000 by 2033 (City of Georgetown 2008, p. 3.5), which would be a 227 percent increase over a 23-year period. Another model projects that the City of Georgetown population will increase to 135,005 by 2030, a 96 percent increase over the 20-year period. The Texas State Data Center (2012, pp. 166-167) estimates an increase in human population in Williamson County from 422,679 in 2010, to 2,015,294 in 2050, exceeding the human population

size of adjacent Travis County where the City of Austin metropolitan area is located. This would represent a 377 percent increase over a 40-year timeframe. By comparison, the national population is expected to increase from 310,233,000 in 2010 to 439,010,000 in 2050, which is about a 42 percent increase over the 40-year period (U.S. Census Bureau 2008, p. 1).

Growing human population sizes increase demand for residential and commercial development, drinking water supply, flood control, and other municipal foods and services that alter the environment, often degrading salamander habitat by changing hydrologic regimes and decreasing the quantity and quality of water resources (Coles et al. 2012, pp. 9–10). As development increases within the watersheds where the Georgetown salamander occurs, more opportunities exist for the detrimental effects of urbanization to impact salamander habitat. A comprehensive study by the U.S. Geological Survey found that, across the United States, contaminants, habitat destruction, and increasing streamflow flashiness (rapid response of large increases of streamflow to storm events) resulting from urban development have been associated with the disruption of biological communities, particularly the loss of sensitive aquatic species (Coles et al. 2012, p. 1).

Habitat modification, in the form of degraded water quality and quantity and disturbance of spring sites, was identified by the Service as the primary threat to the Georgetown salamander (79 FR 10236). Without additional protective measures, the projected human population growth and associated impacts to the natural environment in Williamson County have the potential to negatively affect the Georgetown salamander.

The purpose of the 4(d) rule is to reduce the principal threats to the Georgetown salamander within the City of Georgetown (Williamson County, Texas) and its extraterritorial jurisdiction (ETJ) through the protection of water quality near occupied sites, enhancement of water quality protection throughout the Edwards Aquifer Recharge Zone, and establishment of protective buffers around all springs and streams. The UDC is expected to reduce the threat of habitat degradation by reducing impacts to water quality and quantity and limiting disturbance of spring sites, and thereby will contribute to the conservation of the Georgetown salamander. The Service has determined there is a need to develop a rule under section 4(d) of the Act to implement conservation measures that are tailored to the life history requirements of the Georgetown salamander and provide additional protections from the threats associated with projected human population growth and development within Williamson County.

## 1.3 Public Involvement

In our February 24, 2014 (79 FR 10077) proposed 4(d) rule, we opened a 60-day public comment period for all interested parties to submit comments that might contribute to the development of a final determination on the 4(d) rule. The comment period closed on April 25, 2014. In response to the public comment period, the Service received 19 comments on our proposed 4(d) rule.

In order to provide opportunity for public involvement, the Service's revised proposed 4(d) rule for the Georgetown salamander, published concurrently with this draft EA, invites public comment on

both documents. Comments received during the concurrent public comment period will be analyzed, and either incorporated or responded to in the final EA and final 4(d) rule.

The Service is aware that this 4(d) rulemaking is of interest to a range of stakeholders, including the State of Texas, City of Georgetown, Williamson County, land developers, and the regulated public. A formal public scoping process is not required as part of an EA, in contrast to the Environmental Impact Statement Process. However, we previously received public comments on the Georgetown salamander proposed and final listing rules and the proposed 4(d) rule, and we are therefore familiar with the position of many key stakeholders and the issues to be considered in the development of this EA. Additional concerns may be raised and responded to during the 30-day public comment period.

# 2 Alternatives

NEPA regulations require, among other things, the examination of a reasonable range of alternatives to the Proposed Action (Preferred Alternative), including taking no action (40 CFR § 1502.14). Specifically, Congress directed and authorized all agencies of the Federal government to interpret and administer their policies in accordance with NEPA, including the responsibility to "study, develop, and describe appropriate alternatives to recommended courses of action" (42 USC § 4332). With respect to this environmental assessment, the Service has analyzed in detail the Preferred Alternative, the No Action Alternative, and the consequences to the physical, biological, and socioeconomic environments that would result from each of these alternatives. The No Action alternative demonstrates the potential environmental consequences of not issuing a 4(d) rule for the Georgetown salamander.

## 2.1 Alternative A - No-Action Alternative

Under the no action alternative, no 4(d) rule would be promulgated for Georgetown salamander conservation under the Act. Thus, all prohibitions and exceptions for threatened wildlife provided under 50 CFR 17.31 and 17.32, which incorporate in large part the provisions of 50 CFR 17.21 and 50 CFR 17.22, would apply to the Georgetown salamander due to its "threatened" listing status. As a result, "take" of the Georgetown salamander would be prohibited under section 9 of the Act. Take, is defined in the Act as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

To be protected from violating section 9 of the Act, anyone conducting activities (for example, development, recreation, research, etc.) that may result in take of the Georgetown salamander would need to obtain authorization from the Service prior to initiating those activities. For Federal agencies, that authorization would be obtained through a section 7 consultation with the Service. For private interests and non-Federal government agencies, incidental take would need to be permitted through section 10 of the Act.

Under section 10(a)(1)(b) of the Act, take of Georgetown salamanders by private or non-Federal government agencies could be authorized by the Service if such taking occurs incidentally during otherwise legal activities. Applicants for an incidental take permit would be required to develop and submit a "habitat conservation plan" that specifies the impacts that are likely to result from the taking and the measures the permit applicant will undertake to minimize and mitigate such impacts. The following criteria will need to be satisfied before an incidental take permit could be issued: (1) taking will be incidental; (2) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of the taking; (3) the applicant will ensure that adequate funding for the plan will be provided; (4) taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and (5) other measures, as required by the Service, will be met. This entire process (that is, approval of habitat conservation plan and issuance of incidental take permit) can take anywhere from 6 to 12 months to complete, and sometimes can take longer.

Under section 7 of the Act, Federal agencies would be required to consult with the Service for any project that may affect the Georgetown salamander. This process typically takes up to 135 days to complete. The consulting agency will be required to show the Service that they have minimized the level of take associated with their project by avoiding or minimizing impacts to the species and its habitats.

Under the no action alternative, each project would likely need to be reviewed and approved by the Service on a case-by-case basis. This would result in a level of uncertainty regarding the mitigation or minimization requirements that the Service would require of the applicants. In addition, as described above, there would be a considerable amount of time needed by the Service to review and approve projects that may impact the Georgetown salamander. However, this alternative may result in benefits to the Georgetown salamander in the form of additional mitigation and minimization of impacts to the species. Because there is currently some uncertainty as to the impacts that various projects and activities may have on the Georgetown salamander, this alternative would allow the Service to adapt mitigation and minimization measures to specific projects according to the needs of the species and available science at the time an application for an incidental take permit is submitted or consultation with a Federal agency is initiated.

## 2.2 Alternative B – 4(d) Rule for the Georgetown Salamander (Proposed Action)

This 4(d) rule would result in the implementation of all of the conservation measures found in Chapter 11.07 and Appendix A of the UDC. Therefore, for private entities and non-Federal government agencies, any take that occurred incidental to regulated activities[1] that is consistent with the conservation measures contained in the Chapter 11.07 and Appendix A of the UDC would not be prohibited under the Act. Federal agencies would still be required to consult with the Service under section 7 of the Act to obtain incidental take coverage for any activities that may

[1] Refers to "Regulated activities" as defined in Title 30, Texas Administrative Code § 213.3(28) which are any construction-related or post-construction activities on the Recharge Zone of the Edwards Aquifer having the potential for polluting the Edwards Aquifer and hydrologically connected surface streams.

affect the Georgetown salamander. However, in many situations, the consultation with Federal agencies could be significantly streamlined and require considerably less time to complete if the agency incorporated the conservation measures found in the UDC into their proposed action. For any projects or activities that did not apply the conservation measures and would result in an act that would be otherwise prohibited under the general prohibitions under the Act for threatened species (50 CFR 17.31), the prohibitions at 50 CFR 17.31 would apply, and the Service would require separate authorization under either section 7 or 10 of the Act (see discussion above under the No Action Alternative).

The following conservation measures would be required for all regulated activities conducted by private entities occurring within the corporate limits of the City of Georgetown and its ETJ (that is, the action area) over the Edwards Aquifer Recharge Zone (Figure 2):

**Geological Assessments**

(1) No person would commence any regulated activity until a geologic assessment had been accepted by the development engineer or his designee.

(2) The geologic assessment would contain all of that information required by Title 30, Texas Administrative Code § 213.5. Additionally, the geologic assessment would:

(a) Identify all springs on the subject property, or certify that no springs or streams exist on the subject property;

(b) Describe any spring and/or stream on the subject property, including determining the location of any spring outlet or stream.

The geologic assessment must identify all occupied sites, Red Zones, and Orange Zones. Should the geologic assessment identify an occupied site, the occupied site and Red Zones and Orange Zones should be graphically delineated on all plats, site plan, and infrastructure construction plans.

**Occupied Site Protection**

*No-Disturbance Zone (Red Zone)*

(1) A no-disturbance zone (Red Zone) would be established in the stream or waterway that the spring drains directly into and extends 80 meters upstream and downstream from the approximate center of the spring outlet of an occupied site. The Red Zone would be bounded by the top of the bank and would not extend beyond any existing physical obstructions that prevent the surface movement of Georgetown salamanders, such as roadways, buildings, retaining walls, dams, and culverts.

(2) No regulated activities would be conducted within the Red Zone other than:

(a) Properly permitted maintenance of existing improvements;

(b) Scientific monitoring of water quality, population counts and related activities; and

(c) Fences above the normal high water mark of a stream if such fences complied with applicable floodplain regulations

*Minimal-Disturbance Zone (Orange Zone)*

(1) A minimal-disturbance zone (Orange Zone) would be established for the subsurface area that drains to the spring or springs at an occupied Site. Except as provided below, the Orange Zone would consist of that area within 300 meters of the approximate center of the spring outlet of an occupied site, except those areas within the Red Zone. The Orange Zone would not include pre-existing development or areas without the potential for containing Georgetown salamander habitat as determined by the geologic assessment based on site specific, hydro-geologic conditions, for instance, where the Edwards Aquifer is absent.

(2) No regulated activities would be conducted within the Orange Zone other than:

(a) Activities permitted in the Red Zone;

(b) Wastewater infrastructure installed roughly parallel to a stream provided that such infrastructure would be installed on the side of the stream opposite the occupied site and would be installed no closer than 7.62 meters (25 feet) from the bank of the stream;

(c) Subject to stream buffer limitations (see below) parks and open space development limited to trails, benches, trash cans and pet waste facilities; provided that trails would not be located within the ordinary high water mark of a stream and would be limited to trails for walking, jogging and non-motorized biking; and

(d) In addition to (a), (b), and (c) above, within the City limits, only single-family, detached (Residential Estate and Residential Low Density District) residential use, as defined in the City of Georgetown's UDC, would be allowed. No construction of said dwelling units would be conducted within 80 meters of an occupied site.

**Spring Buffer and Stream Buffer Protection**

*Spring Buffer*

(1) A spring buffer would be established within 50 meters (164 feet) of the approximate center of a spring outlet in the Edwards Aquifer Recharge Zone that is identified in a geologic assessment. The Spring Buffer would not include pre-existing development.

(2) No regulated activities would be conducted within the spring buffer except for the following and subject to the stated restrictions:

(a) Properly permitted maintenance of existing improvements;

(b) Scientific monitoring of water quality;

(c) Fences above the normal high water mark of a stream if such fences comply with applicable floodplain regulations;

(b) Subject to stream buffer limitations below, parks and open space development limited to trails, benches, trash cans and pet waste facilities; provided that trails would not be located within the ordinary high water mark of a stream and would be limited to trails for walking, jogging and non-motorized biking; and

(c) Wastewater infrastructure installed roughly parallel to a stream provided that such infrastructure would be installed on the side of the stream opposite the spring and would be installed no closer than 7.62 meters (25 feet) from the bank of the stream; provided that

wastewater infrastructure would not cross a stream associated with a spring within the spring buffer.

*Stream Buffer*

(1) A stream buffer would be established for all streams in the Edwards Aquifer Recharge Zone that is identified in a geologic assessment. The boundaries of the stream buffer are as follows:

(a) For streams draining more than 25.9 hectares (64 acres) and less than 129.5 hectares (320 acres), the boundaries of the stream buffer would coincide with the boundaries of the Federal Emergency Management Agency (FEMA) 1 percent floodplain or a calculated 1 percent floodplain, whichever is smaller. In the absence of a FEMA floodplain and a calculated floodplain, this stream buffer would be a minimum of 60.96 meters (200 feet) wide with at least 22.86 meters (75 feet) from the centerline of the stream. If a property owner only controls one side of a stream, then the minimum buffer would be 30.48 meters (100 feet) from the centerline of a stream, or along the FEMA 1 percent floodplain or a calculated 1 percent floodplain, if available.

(b) For streams draining more than 129.5 hectares (320 acres) but less than 259 hectares (640 acres), the boundaries of the stream buffer would coincide with the boundaries of the FEMA 1 percent floodplain or a calculated 1 percent floodplain, whichever is smaller. In the absence of a FEMA floodplain and a calculated floodplain, this stream buffer would be a minimum of 91.44 meters (300 feet) wide with at least 30.48 meters (100 feet) from the centerline of the stream. If a property owner only controls one side of a stream, then the minimum buffer would be 45.72 meters (150 feet), or along the FEMA 1 percent floodplain or a calculated 1 percent floodplain, if available.

(c) For streams draining 259 hectares (640 acres) or more, the boundaries of the stream buffer would coincide with the boundaries of the FEMA 1 percent floodplain or a calculated 1 percent floodplain, whichever is smaller. In the absence of a FEMA floodplain and a calculated floodplain, this stream buffer would be a minimum of 152.4 meters (500 feet) wide with at least 60.96 meters (200 feet) from the centerline of the stream. If a property owner only controls one side of a stream, then the minimum buffer would be 76.2 meters (250 feet), or along the FEMA 1 percent floodplain or a calculated 1 percent floodplain, if available.

(2) No regulated activities would be conducted within the stream buffer other than:

(a) Properly permitted maintenance of existing improvements;

(b) Scientific monitoring of water quality;

(c) Fences above the normal high water mark of a stream if such fences comply with applicable floodplain regulations; and

(d) The construction of the following improvements, subject to the stated restrictions:

(i) Wastewater facilities provided that wastewater utilities would not be located below the normal high water elevation within the channel of a stream except at crossings of a stream;

(II) Underground utilities other than wastewater facilities provided that such underground utilities would only be installed at stream crossings, or at intervals no closer than 121.92 meters (400 feet) apart;

(iii) Park and open space development limited to trails, benches, trash cans, and pet waste facilities; provided that trails shall not be located within the ordinary high water mark of a stream and shall be limited to trails for walking, jogging and non-motorized biking.

(iv) Water quality or flood control systems, provided that measures would be taken in the construction of such water quality or flood control systems to minimize the impact to the stream buffer;

(v) Public projects that enhance or recharge the Edwards Aquifer, provide flood prevention, and similar capital improvements;

(vi) Remediation of altered floodplain to its natural limits;

(vii) Arterial, collector and local residential streets crossing a stream provided that:

(A) A floodplain with a drainage area greater than 259 hectares (640 acres) would only be crossed by arterial streets;

(B) A floodplain with a drainage area between 129.5 hectares (320 acres) and 259 hectares (640 acres) would only be crossed by arterial and collector streets;

(C) A floodplain with a drainage area up to 129.5 hectares (320 acres) would be crossed by arterial, collector, or local residential streets; and

(D) A street required for a secondary access or as required by the currently adopted fire code regulations would be exempt from this subsection.

**Water Quality Protection**

*Water Quality Best Management Practices*

(1) For all regulated activities within the recharge zone, the following regulations would apply:

(a) Permanent structural water quality controls for a project would remove eighty-five percent (85 percent) of total suspended solids for the entire project and would be certified by a licensed professional engineer;

(b) No regulated activity could cause any increase in the developed flow rate for the 2-year, 3-hour storm;

(c) All development projects, including, but not limited to, individual home sites, would implement temporary best management practices (BMPs) to minimize sediment runoff;

(d) New roadways or expansions to existing roadways that provide a capacity of 25,000 vehicles per day that are located on the recharge zone would provide for spill containment as described in the Optional Enhanced Measures of the Edwards Aquifer Protection Program;

(e) All permanent BMPs with an overt physical presence would have signage that clearly identifies the purpose of the permanent BMP and the party responsible for maintenance; and

(f) Maintenance plans for permanent BMPs would be recorded in the official records of Williamson County.

*City Water Quality Management Plan*

The City would adopt a Water Quality Management Plan for all areas within the recharge zone. Such management practices would include, but not be limited to, public education and outreach, hazardous waste education, integrated pest management, illicit discharge detection and elimination, construction-site storm-water runoff control, post-construction storm-water management, and pollution prevention for municipal operations including City and County maintenance activities in the ETJ.

**Adaptive Management Working Group**

(1) An Adaptive Management Working Group (AMWG) would be established by the Williamson County Conservation Foundation (the "WCCF") to review data on a regular basis and make recommendations for specific changes in management directions related to Appendix A of the UDC. The City Manager would appoint two City employees with appropriate technical expertise in the fields of planning and development and system engineering as members to the AMWG. The efforts of the AMWG would be led by WCCF staff.

(2) The AMWG would be authorized to hear and make recommendations regarding requests for variances from the terms of the UDC Appendix A pertaining to occupied sites.

(a) The AMWG would recommend variances to the Service from the terms of the UDC pertaining to occupied sites only if the variance was not contrary to the objectives of the Appendix A. Any proposed variance to the Service should achieve the same level or greater level of water quality benefits and conservation objectives to the Georgetown salamander. Project proponents may always work directly with the Service to seek a permit under section 7 or section 10 of the Act for these areas.

The AMWG duties would include, but would not be limited to, development of an annual report regarding the preservation of the Georgetown salamander, continuous monitoring of the Georgetown salamander, assessment of research priorities, adaptive management of preservation of the Georgetown salamander and the effectiveness of achieving the above objectives.

Under this alternative, regulated activities conducted by private entities would be reviewed and approved at the local level, likely by City of Georgetown or Williamson County staff. Because conservation measures would be applied consistently to all regulated activities and would be known by project proponents ahead of time, less time would be required by City of Georgetown or Williamson County for the review process. In addition, this alternative would result in more certainty for the regulated community regarding conservation requirements for projects occurring within areas occupied by the Georgetown salamander. This would provide the regulated community the opportunity to incorporate the required conservation measures and costs into project designs early in the planning phase. In the event that a project proponent chose not to comply with the UDC, the City of Georgetown or Williamson County would either 1) deny the associated building or construction permit, or 2) require the project proponent to obtain approval directly from the Service before approving the permit.

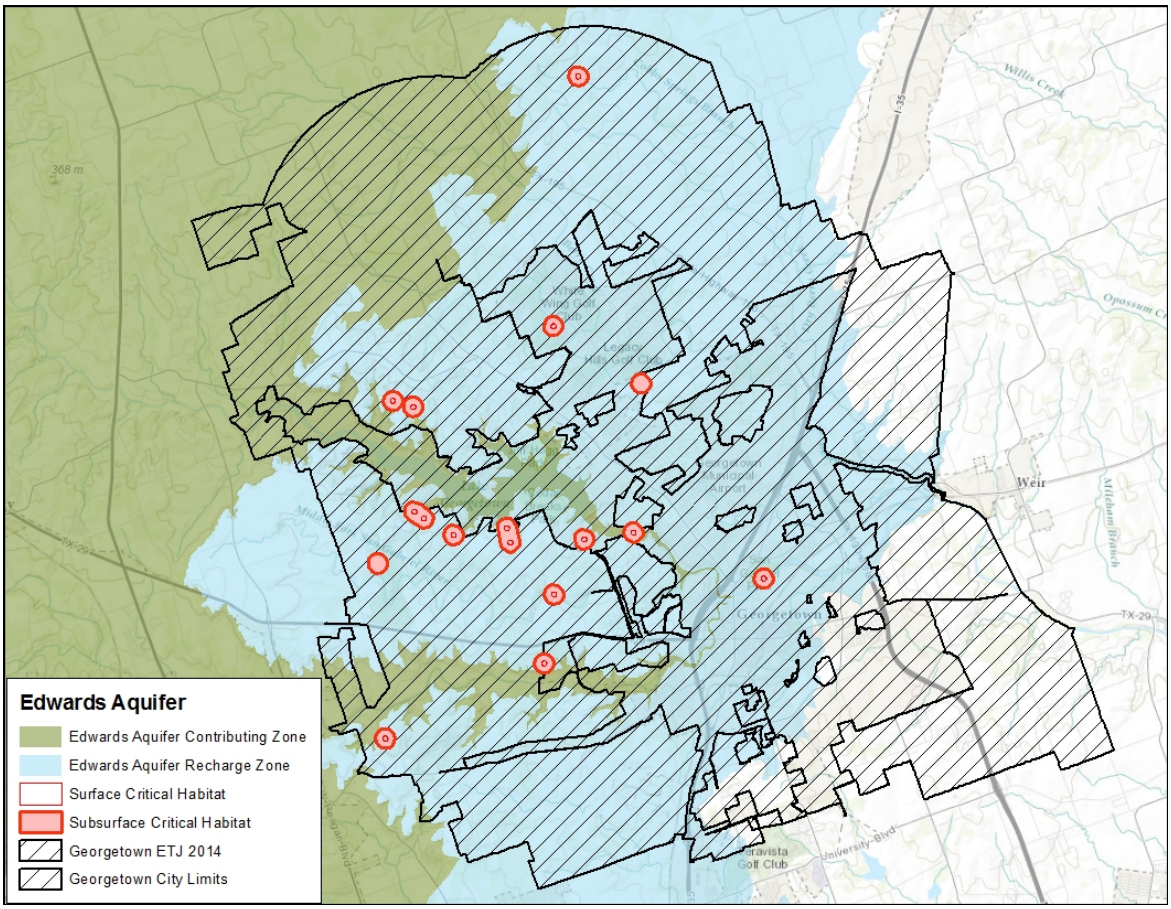


**Figure 2.** Edwards Aquifer Recharge Zone within the Action Area.

# 3 Affected Environment

Resources considered for analysis under this environmental assessment included soils, water quality, wildlife, threatened and endangered species, environmental justice, socioeconomics, and vegetation.

## 3.1 Soils

The Natural Resource Conservation Service classifies the soils within the action area as being generally classified into the Austin, Brackett, Eckrant, Georgetown, Houston Black, or Tinn Series (Soil Conservation Service 1983; Figure 3). These soils have a range of properties from deep, poorly drained, clayey soils in the floodplain (Tinn Series) to shallow, well drained, stony and clayey soils (Eckrant Series) in the uplands. The soil units described below make up the majority of the soils found in the action area (that is, each is greater than 10 percent of soils in the action area):

*Eckrant extremely stony clay (18 percent of action area), 0 to 3 percent slopes,* is a calcareous and moderately alkaline soil typically found on broad ridges and in shallow valleys on uplands. The surface layer of this series is approximately 11 inches (28 centimeters) thick and is composed of

extremely stony, very dark gray clay with about 25 percent of the surface covered with limestone fragments. The underlying layer is indurated limestone. This soil is well drained with moderately slow permeability and moderate shrink-swell potential.

*Eckrant-Rock outcrop complex (15 percent of action area), rolling,* consists of intricately mixed Eckrant soils and Rock outcrop found on hills, ridges, and on sides of drainage ways. The surface layer of this series is approximately eight inches (20 centimeters) thick composed of calcareous, moderately alkaline, extremely stony, dark grayish brown clay with about 35 percent of the surface covered with limestone fragments. The underlying layer is fractured indurated limestone. This soil has moderately slow permeability and moderate shrink-swell potential.

*Eckrant cobbly clay (13 percent of action area), 1 to 8 percent slopes,* is a calcareous and moderately alkaline soil typically found on undulating uplands. The surface layer of this series is approximately 13 inches (33 centimeter) thick composed of dark grayish brown cobbly clay. The underlying layer is composed of coarsely fractured limestone. This soil is well drained, with moderately slow permeability and moderate shrink-swell potential.

*Georgetown stony clay loam (11 percent of action area), 1 to 3 percent slopes,* is typically found in the higher parts of uplands. The surface layer of this series is approximately seven inches (18 centimeters) thick composed of slightly acidic, brown stony clay loam. The subsoil extends to a depth of 35 inches (89 centimeters) and is composed of neutral, reddish brown clay and cobbly clay. The underlying layer is indurated fractured limestone with clay loam imbedded in the crevices. This soil is well drained with slow permeability, slight erosion hazard, and moderate to high shrink-swell potential.

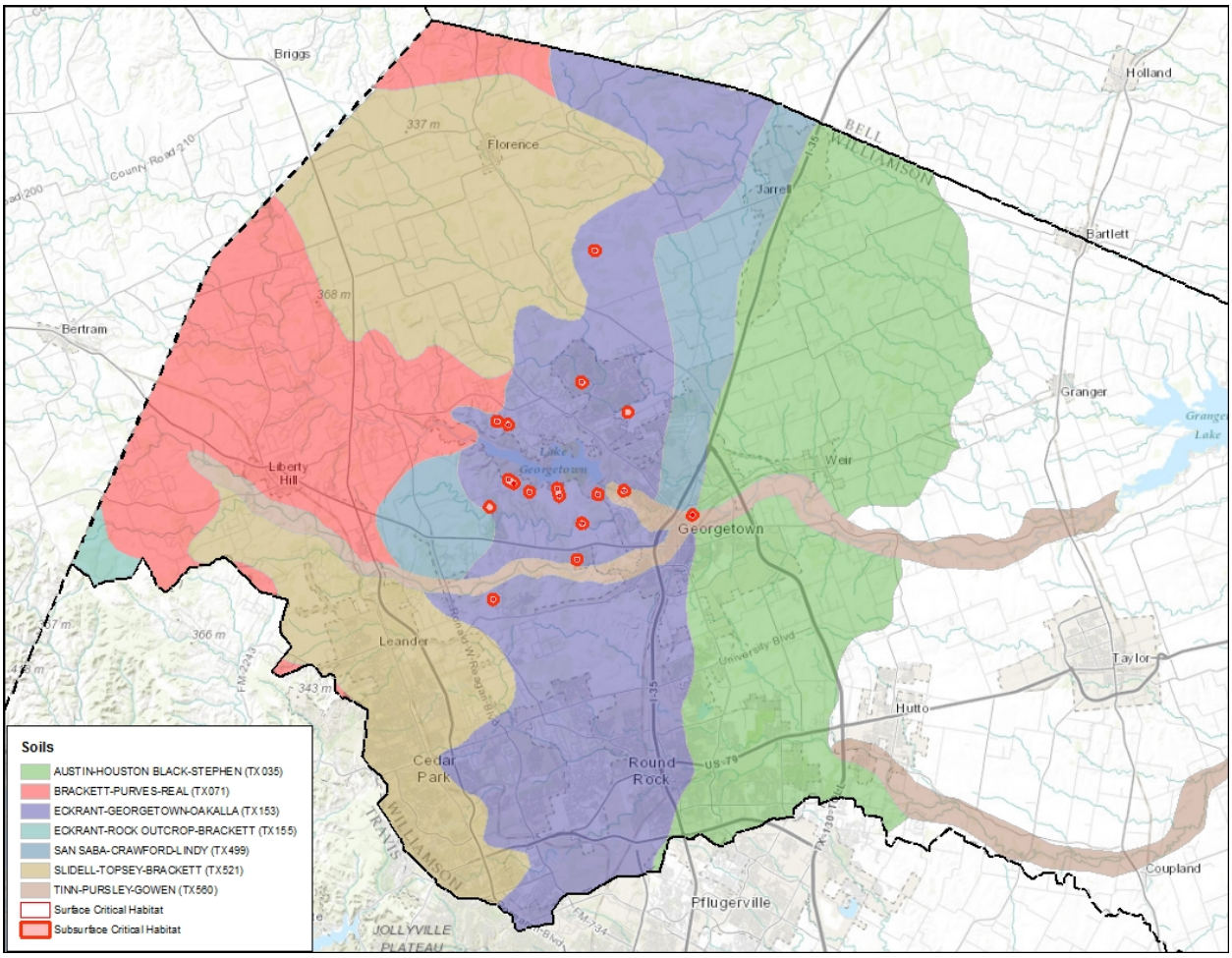


**Figure 3.** Map of General Soil Classification within the Action Area (CAPCOG 2014)

## 3.2 Water Quality

The City of Georgetown and Williamson County representatives, working with numerous stakeholder groups, developed a strategy to exceed current local, state, and federal standards for protecting the spring formations within the Edwards Aquifer recharge. The primary goal of the UDC was to provide adequate water quality controls to ensure that future growth and development would be unbridled by potential federal permitting requirements and oversight.

**Groundwater Quality**

Under authority of the T.A.C. (Title 30, Chapter 213), the TCEQ regulates activities having the potential for polluting the Edwards Aquifer and hydrologically connected surface streams through the Edwards Aquifer Protection Program or "Edwards Rules." In Williamson County, these rules apply to regulated activities occurring over the recharge, transition, and contributing zones of the Edwards Aquifer (see Figure 2, above). All of the sites occupied by the Georgetown salamander occur within the recharge or contributing zones; thus, the Edwards Rules apply to all known sites, in addition to most of the springs and streams within the Georgetown ETJ. The Edwards Rules were enacted to protect existing and potential uses of groundwater and maintain Texas Surface

Water Quality Standards. Specifically, a water pollution abatement plan (WPAP) must be submitted to the TCEQ in order to conduct any construction-related or post-construction activities on the recharge zone. The WPAP must include a description of the site and location maps, a geologic assessment conducted by a geologist, and a technical report describing, among other things, temporary and permanent BMPs designed to reduce pollution related impacts to nearby water bodies.

The permanent BMPs and measures identified in the WPAP are designed, constructed, operated, and maintained to remove at least 80 percent of the incremental increase in annual mass loading of total suspended solids from the site caused by the regulated activity (TCEQ 2005, p. 3–1). Separate Edwards Aquifer protection plans are required for organized sewage collection systems, underground storage tank facilities, and aboveground storage tank facilities. Regulated activities exempt from the requirements of the Edwards Rules include: (1) the installation of natural gas lines; (2) the installation of telephone lines; (3) the installation of electric lines; (4) the installation of water lines; and (5) the installation of other utility lines that are not designed to carry and will not carry pollutants, stormwater runoff, sewage effluent, or treated effluent from a wastewater treatment facility. In addition, under the Edwards Rules, temporary erosion and sedimentation controls are required to be installed and maintained during construction for any exempted activities located on the recharge zone. However, the Edwards Rules do not address land use, impervious cover limitations, some nonpoint-source pollution, or application of fertilizers and pesticides over the recharge zone (30 TAC 213.3). They also do not contain requirements for stream buffers, surface buffers around springs, or the protection of stream channels from erosion. There currently are not any State or Federal water quality regulations in Williamson County that are more restrictive and more protective of groundwater than the TCEQ's Edwards Rules.

**Surface Water Quality**

Texas has an extensive program for the management and protection of water that operates under State statutes and the Federal Clean Water Act (CWA). It includes regulatory programs such as the following: Texas Pollutant Discharge Elimination System (TPDES) (to control point source pollution), Texas Surface Water Quality Standards (to protect designated uses like recreation or aquatic life), and Total Maximum Daily Load Program (under section 303(d) of the CWA) (to reduce pollution loading for impaired waters).

The TCEQ's TPDES program has regulatory authority over discharges of pollutants to Texas surface water, with the exception of agricultural activities and activities that are regulated by the Railroad Commission of Texas. The TCEQ issues two general permits that authorize the discharge of stormwater and non-stormwater to surface waters in the State associated with: (1) Small municipal separate storm sewer systems (MS4) (TPDES General Permit #TXR040000) and (2) construction sites (TPDES General Permit #TXR150000). The MS4 permit covers small municipal separate storm sewer systems that were fully or partially located within an urbanized area, as determined by the 2000 Decennial Census by the U.S. Bureau of Census, and the construction general permit covers discharges of stormwater runoff from small and large construction activities impacting greater than 1 acre of land. In addition, both of these permits require new discharges to meet the

requirements of the Edwards Rules. Williamson County is currently covered under the MS4 permit, but the City of Georgetown is not.

To be covered under the MS4 general permit, a municipality must submit a copy of their Storm Water Management Program (SWMP) to TCEQ. The SWMP must include a description of how that municipality is implementing the seven minimum control measures, which include the following: (1) Public education and outreach; (2) public involvement and participation; (3) detection and elimination of illicit discharges; (4) construction site stormwater runoff control (when greater than 1 ac (0.4 ha) is disturbed); (5) post-construction stormwater management; (6) pollution prevention and good housekeeping for municipal operations; and (7) authorization for municipal construction activities (optional). The City of Georgetown was not previously considered an urbanized area that would be covered under the MS4 general permit. However, the City of Georgetown is now considered a small MS4 under the new TPDES general permit and must develop and implement a Storm Water Management Program (SWMP) within five years (TCEQ 2013, p. 22).

To be covered under the construction general permit, an applicant must prepare a stormwater pollution and prevention plan (SWP3) that describes the implementation of practices that will be used to minimize, to the extent practicable, the discharge of pollutants in stormwater associated with construction activity and nonstormwater discharges. Despite the significant value the TPDES program has in regulating point-source pollution discharged to surface waters in Texas, it does not adequately address all sources of water quality degradation, including nonpoint-source pollution, that have the potential to negatively impact water quality in Williamson County and the City of Georgetown.

The Texas Integrated Report of Surface Water Quality describes the status of the state's waters, as required by sections 305(b) and 303(d) of the Clean Water Act. This report summarizes the condition of the state's surface waters (that is, monitored stream segments), including concerns for public health, fitness for use by aquatic species and other wildlife, and specific pollutants and their possible sources. The 2012 Integrated Report is the most recent report published by the TCEQ. Within the action area, there are five stream segments regularly monitored by the TCEQ or its cooperators. These include Berry Creek (1248A_01), North Fork of the San Gabriel River (1248_01), Middle Fork of the San Gabriel River (1248D_01), South Fork of the San Gabriel River (1250_01), and the North Fork of the San Gabriel West of Lake Georgetown (1251_01) (Figure 4). The 2012 Integrated Report identified screening level concerns (that is, where water samples exceeded screening level criteria) in two of these stream segments. For both segments, there were no screening level concerns reported in the 2010 Integrated Report. Water samples collected from the North Fork of the San Gabriel River between 2003 and 2010 contained nitrate levels that exceeded screening levels (1.95 mg/L) in 12 of 42 samples. During the same time period, samples collected in the South Fork of the San Gabriel River indicated the presence of an impaired macrobenthic community (TCEQ 2012). In addition, an environmental consulting firm working for Williamson County collected water quality grab samples (that is, samples collected at one point in time) during the summer of 2012 at four springs (Hogg Hollow, Swinbank, Cedar Breaks Hiking Trail, and Cobb Springs) occupied by the Georgetown salamander (SWCA 2012). Of these four

samples, one sample (collected from Swinbank Springs) had nitrate levels that exceeded the TCEQ screening level, and one sample (collected from Cedar Breaks Hiking Trail Spring) exceeded the TCEQ screening levels for E. coli and fecal coliform bacteria. The water quality data collected and analyzed for stream segments and springs in Williamson County indicates that, at least occasionally, measured parameters have exceeded TCEQ screening levels.

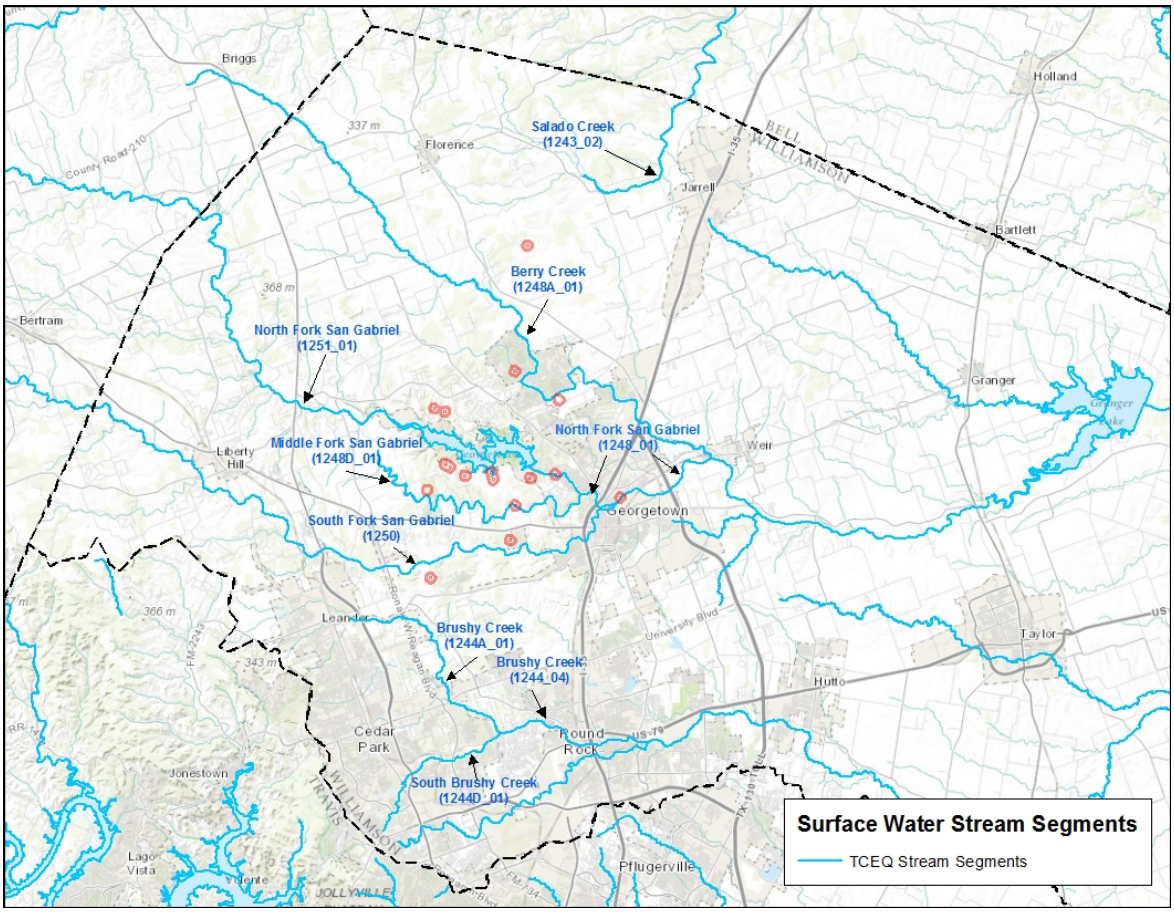


**Figure 4.** Stream Segments in Williamson County Monitored by TCEQ for Water Quality

## 3.3 Wildlife

The most common mammal species found in western Williamson County include fox squirrel (*Sciurus niger*), white-tailed deer (*Odocoileus virginiana*), nine-banded armadillo (*Dasypus novemcinctus*), eastern cotton-tail (*Sylvilagus jloridanus*), black-tailed jackrabbit (*Lepus californicus*), Texas mouse (*Peromyscus attwateri*), white-footed mouse (*P. leucopus*), white-ankled mouse (*P. pectoralis*), eastern woodrat (*Neotoma floridana*), woodland vole (*Microtus pinetorum*), Virginia opossum (*Didelphus virginiana*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), eastern spotted skunk (*Spilogale putorius*), striped skunk (*Mephitis mephitis*), and raccoon (*Procyon lotor*) (Soil Conservation Service 1983, Davis and Schmidly 1994).

Common resident bird species may include western scrub jay (*Aphelocoma californica*), turkey vulture (*Cathartes aura*), black vulture (*Coragyps atratus*), red-tailed hawk (*Buteo jamaicensis*), turkey (*Meleagris gallopavo*), mourning dove (*Zenaida macroura*), whitewinged dove (*Z. asiatica*), road runner (*Geococcyx californianus*), great horned owl (*Bubo virginianus*), eastern screech owl (*Megascops asia*), black-crested titmouse (*Baeolophus atricristatus*), Carolina chickadee (*Poecile carolinensis*), Bewick's wren (*Thryomanes bewickii*), canyon wren (*Catherpes mexicanus*), Carolina wren (*Thryothorus ludovicianus*), northern cardinal (*Cardinalis cardinalis*), ladder-backed woodpecker (*Picoidus scalaris*), American crow (*Corvus brachyrhynchos*), loggerhead shrike (*Lanius ludovicianu*s), northern mockingbird (*Mimus polyglottos*), brown-headed cowbird (*Molothrus ater*), common grackle (*Quiscalus quiscula*), house finch (*Carpodacus mexicanus*), bobwhite quail (*Colinus virginianus*), and rufous-crowned sparrow (*Aimophila ruficeps*).

In addition to resident species, there are a number of migratory birds that can be found migrating through central Texas during Spring and Fall migration. Some of these species include the sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*A. cooperii*), common nighthawk (*Chordeiles minor*), yellow-billed cuckoo (*Coccyzus americanus*), chuck-will's widow (*Caprimulgus carolinensis*), black-chinned hummingbird (*Archilochus alexandri*), downy woodpecker (*Picoides pubescens*), eastern wood pewee (*Contopus virens* ), eastern phoebe (*Sayornis phoebe*), ash-throated flycatcher (*Myiarchus cinerascens*), great crested flycatcher (*M crinitus*), western kingbird (*Tyrannus verticalis*), white-eyed vireo (*Vireo griseus*), red-eyed vireo (*V. olivaceus*), blue-gray gnatcatcher (*Polioptila caerulea*), golden-crowned kinglet (*Regulus satrapa*), ruby-crowned kinglet (*R. calendula*), eastern bluebird (*Sialia sialis*), American robin (*Turdus migratorius*), cedar waxwing (*Bombycilla cedrorum*), orange-crowned warbler (*Vermivora celata*), northern parula (*Parula americana*), yellow-rumped warbler (*Dendroica coronata*), black-and-white warbler (*Mniotilta varia*), summer tanager (*Piranga rubra*), spotted towhee (*Pipilo maculates*), dark-eyed junco (*Junco hyemalis*), and blue grosbeak (*Passerina caerulea*) (TPWD 1995, Lockwood and Freeman 2004).

Common reptiles and amphibians that could be expected to be found in Williamson County include: Gulf Coast toad (*Bufo valliceps*), Woodhouse's toad (*B. woodhouseii*), Texas toad (*B. speciosus*), cliff chirping frog (*Syrrhophus marnockii*), whitethroat slimy salamander (*Plethodon glutinosus albagula*), ornate box turtle (*Terrepene ornata ornata*), Texas alligator lizard (*Gerrhonotus liocephalus infernalis*), Texas earless lizard (*Cophosaurus texanus texanus*), eastern collared lizard (*Crotaphytus collaris collaris*), Texas spiny lizard (*Sceloporus olivaceus*), crevice spiny lizard (*S. poinsettia poinsettia*), eastern tree lizard (*Urosaurus ornatus ornatus*), short-lined skink (*Eumeces tetragrammus brevilineatus*), northern fence lizard (*Sceloperus undulatus*), ground skink (*Scincella lateralis*) (Garrett and Barker 1987); also plains blind snake (*Leptotyphlops dulcis dulcis*), prairie ringneck snake (*Diadophis punctatus arnyi*), ground snake (*Sonora semiannulata*), western smooth earth snake (*Virginia valeriae elegans*), Texas garter snake (*Thamnophis sirtalis annectans*), Texas rat snake (*Elaphe obsoleta lindheimeri*), rough green snake (*Opheodrys aestivus*), eastern hognose snake (*Heterodon platyrhinos*), western coachwhip (*Masticophis flagellum testaceus*), central Texas whipsnake (*M. taeniatus girardi*), Texas night snake (*Hypsiglena torquatajani*), Texas longnose snake (*Rhinocheilus lecontei tessellates*), Texas coral snake (*Micrurus fulvius tenere*), and western diamondback rattlesnake (*Crotalus atrox*) (Tennant 1985).

In addition to the above commons species, the Texas Parks and Wildlife Department lists the following species as being rare in Williamson County: Bandit cave spider (*Cicurina bandida*), American peregrine falcon (*Falco peregrinus anatum*), Arctic peregrine falcon (*Falco peregrinus tundrius*), bald eagle (*Haliaeetus leucocephalus*), mountain plover (*Charadrius montanus*), Sprague's pipit (*Anthus spragueii*), Western burrowing owl (*Athene cunicularia hypugaea*), an amphipod (*Stygobromus russelli*), bifurcated cave amphipod (*Stygobromus bifurcates*), Ezell's cave amphipod (*Stygobromus flagellates*), Guadalupe bass (*Micropterus treculii*), sharpnose shiner (*Notropis oxyrhynchus*), smalleye shiner (*Notropis buccula*), a mayfly (*Procloeon distinctum*), a mayfly (*Pseudocentroptiloides morihari*), Leonora's dancer damselfly (*Argia leonorae*), cave myotis bat (*Myotis velifer*), plains spotted skunk (*Spilogale putorius interrupta*), creeper squawfoot)(*Strophitus undulates*), false spike mussel (*Quadrula mitchelli*), smooth pimpleback (*Quadrula houstonensis*), Texas fawnsfoot (*Truncilla macrodon*), spot-tailed earless lizard (*Holbrookia lacerate*), Texas garter snake (*Thamnophis sirtalis annectens*), Texas horned lizard (*Phrynosoma cornutum*), and timber rattlesnake (*Crotalus horridus*).

## 3.4 Threatened and Endangered Species

Federally listed species occurring within Williamson County include three birds (black-capped vireo (*Vireo atricapilla*), golden-cheeked warbler (*Dendroica chrysoparia*), and whooping crane (*Grus americana*)), three karst invertebrates (Bone Cave harvestman (*Texella reyesi*), Coffin Cave mold beetle (*Batrisodes texana*), and Tooth Cave ground beetle (*Rhadine Persephone*)), and two amphibians (Georgetown salamander and Jollyville Plateau salamander). Some of these species, except for the whooping crane, Georgetown salamander, Jollyville Plateau salamander, and Tooth Cave ground beetle, are species covered by the Williamson County Regional Habitat Conservation Plan and the associated section 10(a)(1)(b) incidental take permit. In addition, even though these species are known to occur in Williamson County, the Tooth Cave ground beetle, Jollyville Plateau salamander, and whooping crane are not known to occur within the action area. Therefore, these species have been excluded from further consideration in this environmental assessment.

**Black-capped Vireo** - The black-capped vireo, federally listed as endangered October 6, 1987 [52 FR 37420], is a migratory bird present in Texas only during its breeding season from March through September. Habitat generally consists of shrub vegetation that extends from the ground to about 2 meters (6 feet) high, covering 30 to 60 percent or greater of the total area. Typical habitat in the Edwards Plateau Region consists of successional Texas (Spanish) oak, Lacey oak (Quercus glaucoides), shin oak, Texas mountain laurel (Sophora secundiflora), evergreen sumac (Rhus sempervirens), skunk-bush sumac (Rhus aromatica Ait. var.jlabelliformis), flameleaf sumac (Rhus lanceolata), redbud (Cercis canadensis var. texensis), Texas persimmon, mesquite, and agarita. Although Ashe juniper is often part of the plant composition in black-capped vireo habitat, preferred areas have a low density and cover of juniper (Campbell 1995, Service 1991).

**Golden-cheeked warbler** - The golden-cheeked warbler, federally listed as endangered May 4, 1990 [55 FR 18844], is a migratory songbird present in Texas during its breeding season of early

March through early August. Golden-cheeked warblers prefer mature oak/Ashe juniper woodlands that have a high percentage of tree canopy cover. Deciduous species common in golden-cheeked warbler habitat are black cherry (Prunus serotina), Texas black walnut (Juglans microcarpa), Texas oak, ash (Fraxinus sp.), and cedar elm. Arnold et al. (1996) found that golden-cheeked warblers do not consistently occupy and reproduce in patches of less than 23 hectares (56 acres). The areas most likely to be used by golden-cheeked warblers consist of nearly continuous canopy cover of trees with 50 to 100 percent closed canopy (Campbell l995; Service 1992, 1996; Alldredge et al. 2002).

**Endangered Karst Invertebrates** – As mentioned above, two endemic karst invertebrates occur in some of the caves within the action area: the Bone Cave harvestman and the Coffin Cave mold beetle, which were listed in September 1988 because of the threats of land development, pollution, vandalism, and predation by red imported fire ants (Solenopsis invicta) (fire ants) [53 FR 36029, 58 FR 43818]. The Bone Cave harvestman occurs only in Travis and Williamson counties while the Coffin Cave mold beetle occurs only in Williamson County. The Bone Cave harvestman is a long-legged, blind, pale-orange harvestman (Class Arachnida, Order Opiliones) with a body length of 0.00096 to 0.105 inches (0.024 to 2.67 millimeters) and leg length of 0.240 to 0.464 inches (6.10 to 11.79 millimeters). The Coffin Cave mold beetle (Class Insecta, Order Coleoptera) is a small, eyeless, long-legged beetle, with a typical body length 0.102 to 0.113 inches (2.60 to 2.88 millimeters) (Barr 1968, Howarth 1983, Elliott and Reddell 1989, Service 1994).

These species, found in the relatively shallow (3 to 12 meters [10 to 40 feet] deep) caves that formed along fractures and bedding planes primarily in the limestone of the Edwards Formation west of the Balcones Fault (Veni 1992) require high humidity, constant temperature levels, and a continual influx of nutrients from the surface. Very little is known about their ecology, but they are thought to be predators or scavengers. They likely obtain their nutrients from other invertebrates, such as cave crickets that feed on the surface and shelter and deposit their eggs in the caves, or other species that feed on cadavers or feces deposited in the cave (Howarth 1983, Elliott and Reddell 1989, Service 1994).

As of July 2004, the Bone Cave harvestman was known from five Karst Faunal Regions (KFRs)(that is, a region delineated based on geologic continuity, hydrology, and the distribution of 38 rare troglobitic species) in approximately 154 caves throughout its range, of which 138 caves are in Williamson County (Figure 3-3) (Ubick and Briggs 1992, 2004). Two of these KFRs, North Williamson County KFR and Georgetown KFR, are located within the action area. The Coffin Cave mold beetle is known to inhabit at least 18 caves in Williamson County. All but one of these caves is located within the action area in the North Williamson County KFR and Georgetown KFR (WCCF 2008).

**Georgetown Salamander** - The Georgetown salamander is characterized by a broad, relatively short head with three pairs of bright-red gills on each side behind the jaws, a rounded and short snout, and large eyes with a gold iris. The upper body is generally grayish with varying patterns of melanophores (cells containing brown or black pigments called melanin) and iridophores (cells

filled with iridescent pigments called guanine), while the underside is pale and translucent. The tail tends to be long with poorly developed dorsal and ventral fins that are golden-yellow at the base, cream-colored to translucent toward the outer margin, and mottled with melanophores and iridophores. Unlike the Jollyville Plateau salamander, the Georgetown salamander has a distinct dark border along the lateral margins of the tail fin (Chippindale et al. 2000, p. 38). As with the Jollyville Plateau salamander, the Georgetown salamander has recently discovered cave-adapted forms with reduced eyes and pale coloration (TPWD 2011a, p. 8).

The Georgetown salamander is known from springs along five tributaries (South, Middle, and North Forks; Cowan Creek; and Berry Creek) to the San Gabriel River (Pierce 2011a, p. 2) and from three caves (aquatic, subterranean locations) in Williamson County, Texas. A groundwater divide between the South Fork of the San Gabriel River and Brushy Creek to the south likely creates the division between the ranges of the Jollyville Plateau and Georgetown salamanders (Williamson County 2008, p. 3–34). The Service is currently aware of 18 Georgetown salamander localities. This species has not been observed in recent years at two locations (San Gabriel Spring and Buford Hollow), despite several visual survey efforts to find it (Pierce 2011b, c; Southwestern University, pers. comm.). The current population status is unknown for five sites due to restricted access (Cedar Breaks Hiking Trail Spring, Shadow Canyon Spring, Hogg Hollow Spring, Hogg Hollow II Spring, and Bat Well). Georgetown salamanders continue to be observed at 11 sites (Garey Ranch Spring, Avant Spring, Swinbank Spring, Knight Spring, Twin Springs, Cowan Creek Spring, Cedar Hollow Spring, Cobbs Spring, Cobbs Well, Walnut Spring, and Water Tank Cave) (Pierce 2011c, pers. comm.; Gluesenkamp 2011, TPWD, pers. comm.; White 2011, 2014, pers. comm.). Recent mark-recapture studies suggest a population size of 100 to 200 adult salamanders at Twin Springs, with a similar population estimate at Swinbank Spring (Pierce 2011a, p. 18). Population sizes at other sites are unknown, but visual surface counts result in comparatively low numbers (Williamson County 2008, pp. 3–35). There are numerous other springs in Williamson County that may support Georgetown salamander populations, but private land ownership prevents investigative surveys (Williamson County 2008, pp. 3–35).

Surface-dwelling Georgetown salamanders inhabit spring runs, riffles, and pools with gravel and cobble rock substrates (Pierce et al. 2010, pp. 295–296). This species prefers larger cobble and boulders to use as cover (Pierce et al. 2010, p. 295). Salamanders are found within 80 meters (262 feet) of a spring opening (Bendik 2013, pers. comm.), but they are most abundant within the first 5 meters (16.4 feet) (Pierce et al. 2010, p. 294). Individuals do not exhibit much movement throughout the year (Pierce et al. 2010, p. 294). The water chemistry of Georgetown salamander habitat is constant year-round in terms of temperature and dissolved oxygen (Pierce et al. 2010, p. 294, Biagas et al. 2012, pp. 163-164). Little is known about the ecology of Georgetown salamanders that occupy the cave sites (Cobbs Well, Bat Well, and Water Tank Cave) where this species is known to occur or the quality and extent of their subterranean habitats.

## 3.5 Socioeconomics

Williamson County encompasses a land area of approximately 2,895.6 square kilometers (1,118 square miles) in central Texas and borders Travis County to the south and Bell County to the north.

In 2012, the total population of Williamson County was estimated as 456,359, which was an 8 percent increase over 2010. This is equivalent to an estimated 378 persons per square mile. The median household income in Williamson County was $70,849, and approximately 6.8 percent of the population was considered to be living below the poverty level. There were a total of 151,352 households of which the median home value was $177,000 (U. S. Census Bureau 2014).

Located in the center of Williamson County along the I-35 corridor, the City of Georgetown encompasses a land area of approximately 124.06 square kilometers (47.9 square miles). In 2012, the total population of Georgetown was estimated as 52,303, which was an increase of 10.3 percent over 2010. This is equivalent to an estimated 990.4 persons per square mile. The median household income in Georgetown was $62,977, and approximately 9.1 percent of the population was considered to be living below the poverty level. There were a total of 18,821 households of which the median home value was $182,900 (U. S. Census Bureau 2014).

## 3.6 Vegetation

Williamson County lies within the transition region between the Cross Timbers, Blackland Prairie, and the Edwards Plateau ecoregions. Each of these regions contains their own unique assemblages of soils, vegetation, climate, geology, and physiography that set them apart from one another.

The Cross Timbers ecoregion is a transitional area between the once prairie, now winter wheat growing regions to the west, and the forested low mountains or hills of eastern Oklahoma and Texas. This ecoregion, in Texas, stretches from central Texas north to the border with Oklahoma, and contains irregular plains with some low hills and tablelands. It contains a mosaic of forest, woodland, savanna, and prairie. The transitional natural vegetation of little bluestem grassland with scattered blackjack oak and post oak trees is used mostly for rangeland and pastureland, with some areas of woody plant invasion and forest. The Limestone Cut Plains ecoregion (level IV ecoregion) extends into Williamson County from the northwest and meets the Northern Blackland Prairie and Balcones Canyonlands ecoregions at the location where the city of Georgetown now occurs. There are two dominant vegetative communities found in the Limestone Cut Plains within Williamson County. They are identified as Oak-Mesquite-Juniper Parks/Woodlands and Live Oak-Mesquite-Ashe Juniper Parks (Figure 5). Plants commonly associated with the Oak-Mesquite-Juniper Parks/Woodlands vegetation type include post oak, Ashe juniper (*Juniperus ashei*), shin oak (*Q. havardii*), Texas oak (*Q. texana*), blackjack oak (*Q. marilandica*), live oak, cedar elm (*Ulmus crassifolia*), agarita (*Berberis trifoliolata*), soapberry (*Sapindus saponaria L.* var. *drummondii*), sumac (*Rhus* sp.), hackberry (*Celtis laevigata* var. *texana*), Texas prickly pear (*Opuntia lindheimeri*), Texas persimmon (*Diospyros texana*), purple three-awn (*Aristida purpurea*), hairy grama, Texas grama, sideoats grama, mesquite, and Texas wintergrass. Plants associated with the Live Oak-Mesquite-Ashe Juniper Parks vegetation type include Texas oak, shin oak, cedar elm, netleaf hackberry, flameleaf sumac, agarito, Mexican persimmon, Texas prickly pear, kidneywood, saw greenbriar, Texas wintergrass, little bluestem, curly mesquite, Texas grama, Halls panicum, purple three-awn, hairy tridens, cedar sedge, two-leaved senna, mat euphorbia, and rabbit tobacco.

The Blackland Prairie ecological region sweeps north and south from Williamson County along and east of the I-35 corridor from San Antonio to the border with Oklahoma. Historically, vegetation was dominated by little bluestem (*Schizachyrium scoparium*), big bluestem (*Andropogon gerardii*), yellow Indiangrass, and tall dropseed. In some of the more mesic sites, additional grasses such as gramagrass and switchgrass dominated. Wooded stream bottoms typically consisted of bur oak, Shumard oak, sugar hackberry, elm, ash, eastern cottonwood, and pecan trees. Many of the areas historically considered prairie have been converted to agricultural crops, pastures, and more urban uses around Dallas, Waco, Austin, and San Antonio. Specifically, the Northern Blackland Prairie ecoregion (level IV ecoregion) makes up the eastern half of Williamson County. Within this ecoregion, the dominant vegetative community is identified as the Silver Bluestem-Texas Wintergrass Grassland (Figure 5). Plants commonly associated with Silver Bluestem-Texas Wintergrass Grassland are silver bluestem (*Bothriochloa laguroides*), Texas wintergrass (*Stipa leucotricha*), little bluestem, sideoats grama, Texas grama (*Bouteloua rigidiseta*), three-awn (*Aristida* sp.), hairy grama (*B. hirsute*), tall dropseed (*Sporobolus asper*), buffalo grass (*Buchloe dactyloides*), windmill grass (*Chloris verticillata*), hairy tridens (*Erioneuron pilosum*), tumble grass (*Schedonnardus paniculatus*), western ragweed (*Ambrosia psilostachya*), broom snakeweed (*Gutierrezia sarothrae*), Texas bluebonnet (*Lupinus subcarnosus*), live oak (*Quercus virginiana*), post oak (*Q. stellata*), and mesquite (*Prosopis glandulosa*) (McMahn et al. 1984).

The Edwards Plateau ecoregion is located in west-central Texas and is bordered on the southeast by the Balcones Canyonlands ecoregion (level IV ecoregion). This hilly region is underlain by limestone and is marked by rivers, streams, and springs that flow through the area. Due to its karst topography (related to dissolution of limestone substrate) and resulting underground drainage, streams are relatively clear and cool in temperature compared to those of surrounding areas. Covered by juniper-oak savanna and mesquite-oak savanna, most of this region is used for grazing beef cattle, sheep, goats, exotic game mammals, and wildlife. The Balcones Canyonlands ecoregion makes up the southwestern section of Williamson County and contains 13 of 17 Georgetown salamander sites. Within this ecoregion, as in the Limestone Cut Plains ecoregion described above, the dominant vegetative communities are identified as Oak-Mesquite-Juniper Parks/Woodlands and Live Oak-Mesquite-Ashe Juniper Parks (Figure 5). However, a third vegetative community identified as Live Oak-Ashe Juniper Woods occurs within the Balcones Canyonlands ecoregion in Williamson County. Plants commonly associated with this ecoregion include Texas oak, shin oak, cedar elm, evergreen sumac, escarpment cherry, saw greenbriar, mescal bean, poison oak, twistleaf yucca, elbowbush, cedar sedge, little bluestem, Neally grama, Texas grama, meadow dropseed, Texas wintergrass, curly mesquite, pellitory, noseburn, spreading sida, woodsorrel, and mat euphorbia.

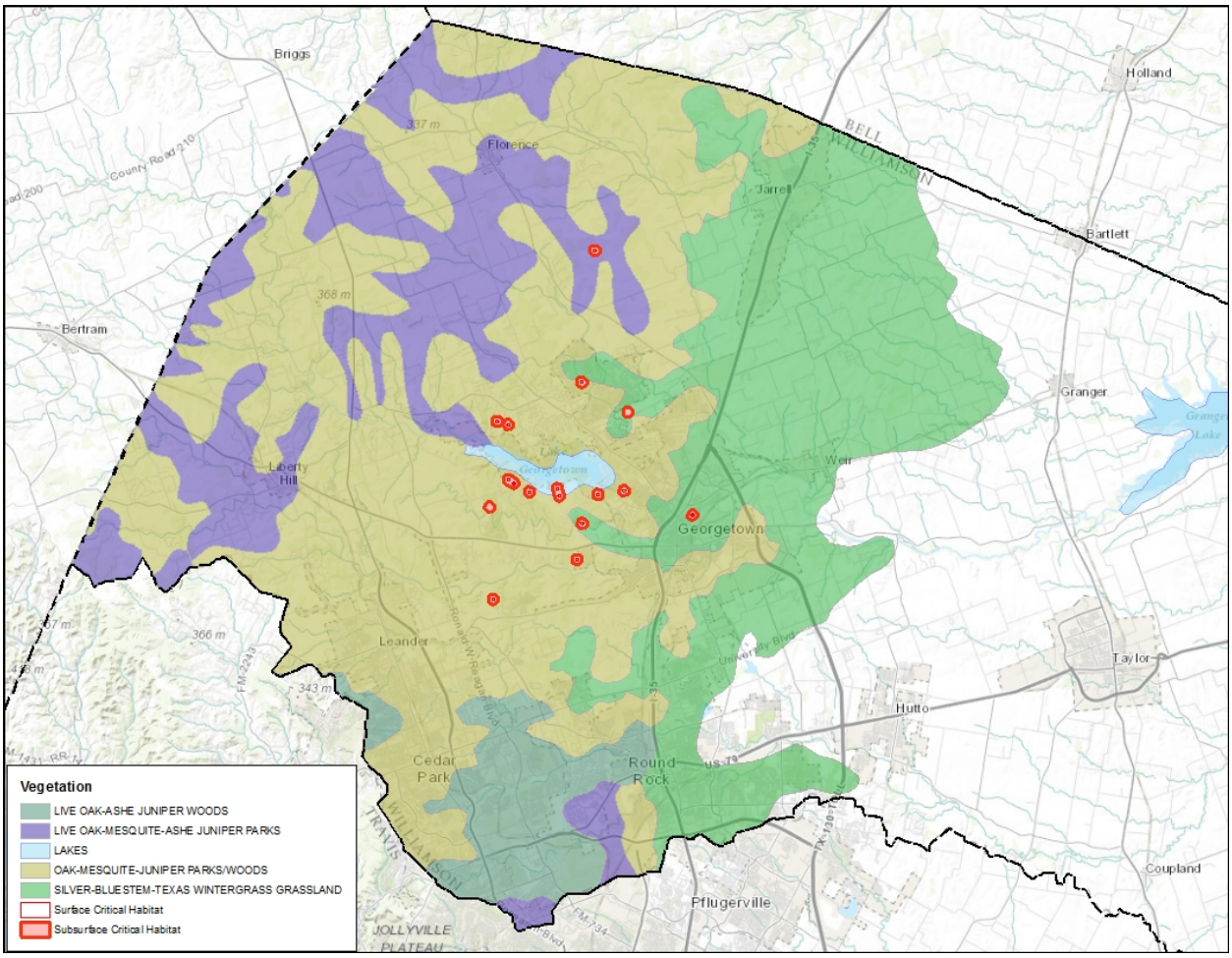


**Figure 5.** Vegetative Communities found within the Action Area.

# 4 Environmental Consequences

In this section, the beneficial and adverse effects of implementing the No Action and Preferred Alternatives are described. The Council on Environmental Quality (CEQ) regulations for NEPA directs agencies to use this section to form the "scientific and analytical basis for the comparisons of the alternatives" (40 CFR 1502.16). The discussion in this section typically focuses on the environmental impacts, both direct and indirect, of each of the alternatives and any adverse environmental effects which cannot be avoided. "Direct impacts" are those caused by the action and occur at the same time and place. "Indirect impacts" are those caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. A summary of the potential impacts from these two alternatives to the major resource areas chosen for analysis is included in Table 1 below.

**Table 1.** Summary of Environmental Consequences for Each Alternative; See various sections below for resource-specific definitions of "minor", "moderate", and "negligible".

| Resource Area | Alternative A - No Action | Alternative B – Proposed Action |
|---|---|---|
| Soils | The No Action alternative would result in a **moderate adverse** impact to soil resources within the action area | Alternative B will result in a **moderate beneficial** impact to soil resources |
| Water Quality | The No action alternative would result in **moderate adverse** impacts to surface and ground water quality within the action area | Alternative B would result in **minor adverse** impacts and **minor to moderate beneficial** impacts to surface and ground water quality within the action area |
| Wildlife | The No Action alternative would result in **moderate adverse** impacts to some wildlife species and **moderate beneficial** impacts to wildlife species that can adapt and thrive in a suburban environment | Alternative B would result in **minor beneficial** impacts to some wildlife species and **moderate beneficial** impacts to wildlife species that can adapt and thrive in a suburban environment |
| Threatened and Endangered Species | The No Action alternative would result in **minor adverse** impacts to the golden-cheeked warbler, black-capped vireo, Bone Cave harvestman, and Coffin Cave mold beetle and **minor to moderate adverse** impacts and **minor beneficial** impacts to the Georgetown salamander | Alternative B would result in **minor adverse** impacts to the golden-cheeked warbler, black-capped vireo, Bone Cave harvestman, and Coffin Cave mold beetle and **minor adverse** impacts and **minor to moderate beneficial** impacts to the Georgetown salamander |
| Socioeconomics | The No Action alternative is expected to have **minor adverse** impacts on socioeconomics within the action area | Alternative B is expected to have **negligible** impacts on socioeconomics within the action area |
| Vegetation | No Action alternative would result in **moderate adverse** impacts to vegetation | Alternative B would result in **minor adverse** impacts to vegetation |

## 4.1 Soils

The intensity of potential impacts to soils is defined as follows:

Negligible: Soils would not be affected or effects would be below or at the lower levels of detection. Any effects to soil resources would be slight and no long-term effects would occur.

Minor: The effects to soil resources would be detectable. Effects to soil erosion potential or productivity would be small, as would be the area affected. If mitigation were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.

Moderate: The effects on soil erosion potential or productivity would be readily apparent and likely long-term. The resulting change to soil character would cover a relatively wide area. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.

Major: The effect on soil productivity would be readily apparent, long-term, and substantially change the character of the soils at a landscape level (that is, occurring across the action area). Mitigation measures to offset adverse effects would be needed, extensive, and their success could not be guaranteed.

### 4.1.1 Alternative A – No Action

Under the No Action alternative, construction related activities would likely continue to increase in intensity within the action area. Impacts to soils would be managed and minimized through existing state (that is, TCEQ), Federal, and local (that is, City of Georgetown, Williamson County, etc.) regulations and guidance. Since soil erosion is caused by the disturbance of a land surface, which occurs as a result of regulated activities, soil will continue to be disturbed and transported by stormwater into surface water (for example, in streams, creeks, etc.) and increase in intensity in the future.

The Edwards Aquifer rules require that permanent stormwater BMPs must be designed, constructed, operated, and maintained to insure that 80 percent of the incremental increase in the annual mass loading of total suspended solids (TSS) from a site caused by the regulated activity is removed. TSS concentrations are directly related to the amount of soil particles carried in stormwater. Under the Edwards Rules, existing impervious cover and development on a project site are not currently included in the calculation for TSS removal, because the "incremental increase" is defined as the increase caused only by the new development. This results in a higher load of TSS passing through a development site in stormwater and entering creeks and streams than would be permitted if existing impervious cover were considered in the calculation of TSS removal efficiency. The lack of consideration for existing impervious cover and development on a project site would continue to result in a higher load of TSS leaving a project site than is intended under the 80 percent removal standard. The No Action alternative would result in a moderate adverse impact to soil resources within the action area.

### 4.1.2 Alternative B – Proposed Action

Construction related activities will likely continue to increase in intensity within the action area. Under Alternative B, due to the streamlining of the process for complying with the Act, it is likely that the intensity of construction related activities would increase at a greater rate than under the No Action alternative. Impacts to soils would be managed and minimized through conservation measures contained in the UDC in addition to existing state (that is, TCEQ), Federal, and local (that is, City of Georgetown, Williamson County, etc.) regulations and guidance. Since soil erosion is caused by the disturbance of a land surface, which occurs as a result of regulated activities, soil will be disturbed and transported by stormwater into surface water (for example, in streams, creeks, etc.) at increased rates and greater intensity than under the No Action alternative.

The UDC would require that permanent stormwater BMPs must be designed, constructed, operated, and maintained to insure that 85 percent of the incremental increase in the annual mass loading of total suspended solids (TSS) from a site caused by the regulated activity is removed. Under the UDC, unlike the No Action alternative, existing impervious cover and development on a project site would be included in the calculation for TSS removal. This would result in a much lower load of TSS passing through a development site in stormwater and entering creeks and streams than would be permitted under the No Action alternative. In addition, because of the increase in the amount of TSS that must be removed (85 percent), the volume of stormwater that must be treated is estimated to be 37 percent greater than that required to be treated under the Edwards Rules (Barrett 2014). The UDC would also put in place requirements for spring and stream buffers, which would result in an increase in the amount of vegetation available to filter stormwater from impacted sites. Due to the conservation measures adopted under the UDC, Alternative B will result in a moderate beneficial impact to soil resources within the action area.

## 4.2 Water Quality

The intensity of potential impacts to water quality (Groundwater and Surface Water) is defined as follows:

Negligible: Impacts would not be detectable. Water quality parameters would be well below TCEQ screening level criteria. Water quality would be within the historical ambient and variability conditions.

Minor: Impacts would be detectable, but water quality parameters would remain well below TCEQ screening level criteria. Water quality would be within the range of ambient conditions, but measurable changes from historical levels would occur and occur below TCEQ screening level criteria.

Moderate: Changes to water quality would be readily apparent, and water quality parameters would be measured at levels above TCEQ screening criteria. Water quality would exceed the historic baseline.

Major: Changes to water quality would be readily apparent, and some water quality parameters would exceed TCEQ screening level criteria. Water quality would be outside of the range of ambient conditions, and could include water quality impairment. Extensive mitigation would be needed to offset adverse effects, and its success would not be assured.

### 4.2.1 Alternative A – No Action

Under the No action alternative, construction related activities would continue within the action area and compliance with the Act for those activities would be accomplished through individual section 10(a)(1)(b) permits and section 7 consultations. Although it is difficult to predict the location or intensity of these activities, most of the activities would result in some level of vegetation removal, paving of roadways, building construction, and land clearing. All of these will ultimately result in an increase of impervious cover within the action area. Impervious cover is a known source of water quality degradation and is directly correlated with urbanization (Coles et al. 2012, p. 38). Impervious cover in a watershed is known to have the following effects: (1) it alters the hydrology or movement of water through a watershed, (2) it increases the inputs of contaminants to levels that greatly exceed those found naturally in streams, and (3) it alters habitats in and near streams that provide living spaces for aquatic species (Coles et al. 2012, p. 38).

Existing regulatory mechanisms currently provide a limited amount of water quality protection from these types of activities. However, surface waters and some springs within the action area are currently exhibiting signs of water quality impacts (see Surface Water Quality discussion above) that may be associated with local trends in land development, agricultural activities upstream of the action area, non-point source pollution from a combination of sources, or other unidentified sources. Given that the human population in Williamson County is expected to increase by 377 percent in the next 40 years, the associated increase in impervious cover will cause additional adverse impacts to water quality unless those impacts can be mitigated. Urbanization leads to various stressors on spring systems, including increased frequency and magnitude of high flows in streams, increased sedimentation, increased contamination and toxicity, and changes in stream morphology and water chemistry (Coles et al. 2012, pp. 1–3, 24, 38, 50–51). Urbanization also increases the sources and risks of an acute or catastrophic contamination event, such as a leak from an underground storage tank or a hazardous materials spill on a highway.

Any regulated activities occurring within Williamson County will be required to comply with local, state, and Federal water quality regulations. Despite these regulations, increased urbanization over the Recharge Zone of the Edwards Aquifer within the action area is likely to result in an increase in the amount of contaminants and pollutants entering surface and ground water from stormwater. However, because water quality is one of the primary threats to the Georgetown salamander, individual section 10(a)(1)(b) permits and section 7 consultations would likely result in conservation measures, such as buffers or setbacks, to minimize construction related impacts to water quality at occupied sites. Development is likely to occur at springs and streams that are not known to be occupied by the Georgetown salamander, and this urbanization may adversely affect

the overall water quality of the watersheds. As a result, it is expected that the No action alternative would result in moderate adverse impacts to surface and ground water quality within the action area.

### 4.2.2 Alternative B – Proposed Action

Regulated activities are expected to increase in intensity within the action area and, under Alternative B, compliance with the Act for those activities would be accomplished by following the conservation measures found in the UDC. Most regulated activities would result in some level of vegetation removal, paving of roadways, building construction, and land clearing. All of these will ultimately result in an increase of impervious cover within the action area, similar to that of Alternative A.

The UDC is expected to provide additional water quality protection above and beyond the existing local, state, and Federal regulations. Under Alternative B, vegetated surface buffers around springs and along streams will provide additional filtering of stormwater and sheet flow (that is, an overland flow of water taking the form of a thin, continuous film) from developed sites. This will remove some additional pollutants and contaminants from stormwater that would not be removed under the No Action alternative. It is difficult to quantify the exact removal efficiency of these vegetated buffers for all parameters of concern, but TCEQ estimates that up to 85 percent of TSS can be removed by vegetative filter strips that are at least 15.24 meters (50 feet) in diameter (Barrett 2005). In addition, regulated activities occurring within watersheds occupied by the Georgetown salamander, but at distances much farther from a spring than the 80 or 300 meter (262 or 984 feet) surface buffers around occupied springs, are likely to cause some degradation of water quality at those springs. The "true" protective buffer needed around springs to protect them from the adverse effects of impervious cover and urbanization is neither known nor is it easily identifiable. However, the Adaptive Management Working Group formed as a result of Alternative B will review water quality and monitoring data on a regular basis and make recommendations for specific changes in management direction to ensure the preservation of the Georgetown salamander.

Under Alternative B, surface buffers of 50 meters (164 feet) will be required around all springs located within the action area not known to be occupied by the Georgetown salamander. These vegetated buffers will provide additional filtering of stormwater from developed sites and prevent the direct destruction of springs.

Any regulated activities occurring within the action area will be required to comply with the conservation measures found in the UDC. The water quality protection measures in both Chapter 11 and Appendix A of the UDC will minimize the effects of urbanization on water quality that are discussed under Alternative A, above. Urbanization is still likely to occur due to population growth in the action area; therefore, Alternative B may result in minor adverse effects to water quality resulting from development activities that increase impervious cover. However, implementation of Alternative B is likely to provide minor to moderate beneficial effects to water quality through the protective measures that go above and beyond what is currently required by local, state, and

Federal laws. These water quality protective measures in the UDC will reduce pollutants and contaminants and increase the removal of total suspended solids throughout the watersheds in the action area, thereby alleviating the water quality impacts likely to occur as a result of development.

## 4.3 Wildlife

The intensity of potential impacts to wildlife (other than federally listed species) is defined as follows:

Negligible: Wildlife would not be affected or the effects would be at or below the level of detection, would be short-term, and the changes would be so slight that they would not be of any measurable or perceptible consequence to the population.

Minor: Impacts to wildlife would be measurable and perceptible but would be localized.

Moderate: Impacts to wildlife would occur throughout the action area and would result in population level impacts to individual species.

Major: Impacts to wildlife would occur across the action area and would result in a change in species composition.

### 4.3.1 Alternative A – No Action

Under the No Action alternative, wildlife within areas planned for development would largely be displaced to adjacent areas during and after the construction process. Following construction, landscape vegetation and preserved trees would potentially provide some habitat for those species tolerant of suburban development such as the blue jay (*Cyanocitta cristata*), common grackle (*Quiscalus quiscula*), European starling (*Sturnus vulgaris*), Northern cardinal (*Cardinalis cardinalis*), house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), fox squirrel, white-tailed deer, Texas mouse, Virginia opossum, and raccoon. According to the City of Georgetown's 2030 Comprehensive Plan, approximately 6,617.82 hectares (16,353 acres) of land within the City and its ETJ are designated as parks, recreation, or open space lands that will remain relatively undisturbed into the future (City of Georgetown 2008). This land will continue to support wildlife species that are tolerant of human activity and disturbance. Therefore, the effects of the No Action alternative on wildlife will result in moderate adverse impacts to some wildlife species while moderate beneficial impacts may be experienced by some wildlife species that can adapt and thrive in a suburban environment.

### 4.3.2 Alternative B – Proposed Action

Wildlife within areas planned for development in the action area would largely be displaced to adjacent areas during and after the construction process. Under Alternative B, the surface buffers around both occupied and unoccupied springs and stream buffers would provide additional habitat for wildlife. In particular, riparian zones (for example, habitat within stream buffers) comprise only a small proportion of the total habitat available to wildlife in Texas, but they are some of the most productive for native wildlife. An estimated 80 percent of all vertebrate species in the desert southwest depend on riparian areas for at least some part of their life cycle (TPWD 2004). Therefore, protection of these areas under Alternative B will result in beneficial effects to wildlife in the action area.

Under Alternative B, surface buffers protecting occupied and unoccupied springs throughout the action area will allow stormwater to be filtered by vegetation before entering the spring sites. The additional filtering action of the vegetative buffer will benefit many fish, invertebrates, amphibians, and reptiles that may occupy springs at various times throughout their life. This filtering action also benefits wildlife such as birds and mammals that may depend directly on the springs as a source of drinking water. Alternative B is expected to result in a minor beneficial impact to some wildlife as a result of the preservation of riparian vegetation and vegetative buffers around springs and a moderate beneficial impact to some wildlife species that can adapt and thrive in a suburban environment.

## 4.4 Threatened and Endangered Species

The intensity of potential impacts to threatened and endangered species is defined as follows:

Negligible: Listed species would not be affected or the change would be so small as to not be of any measurable or perceptible consequence to the population.

Minor: There would be a measurable effect on one or more listed species or their habitats, but the change would be small and relatively localized.

Moderate: A noticeable effect to a population of a listed species. The effect would be of consequence to populations or habitats. Moderate effect would have resulted in a “may affect, likely to adversely affect” determination under the ESA.

Major: Noticeable effect with severe adverse impacts or beneficial impacts to populations or habitats of listed species. Major adverse effect would equate with a “may affect, likely to adversely affect” or jeopardy determination under the ESA.

### 4.4.1 Alternative A – No Action

Of the five federally endangered species known to occur within the action area, only the Georgetown salamander is not considered a covered species under the Williamson County Regional Habitat Conservation Plan (RHCP). For the covered species, the RHCP and associated section 10(a)(1)(b) incidental take permit cover direct and indirect impacts due to otherwise lawful activities such as public and private development, and they provide mitigation and avoidance measures to offset those impacts to the species. As a result, impacts to the golden-cheeked warbler, black-capped vireo, Bone Cave harvestman, and Coffin Cave mold beetle from the No Action alternative will be minor adverse and "will not appreciably reduce the likelihood of the survival and recovery of the species in the wild" (U.S. Fish and Wildlife Service 2009).

The Georgetown salamander is not a covered species under the RHCP but potentially benefits from some of the conservation measures identified in the RHCP including ongoing research and monitoring and the purchase and management of preserve lands. However, under the No Action alternative, development and other activities associated with urbanization will continue to occur and increase in intensity as the human population in the action area expands. These activities will likely have direct and indirect adverse impacts to the Georgetown salamander through degradation of water quality, decreases in water quantity, and the alteration of occupied habitat. It will be difficult to quantify some of these impacts to the Georgetown salamander. Therefore, adverse effects to the Georgetown salamander may not immediately be apparent. This species is only known to occur at 17 spring sites within the action area, and the loss of even a few of these populations could impact the survival of the species.

Under the No Action alternative, any regulated activities or other activities that may result in the "take" of Georgetown salamanders would be required to avoid, minimize, and/or mitigate that "take" through an individual consultation under section 7 or 10 of the Act to obtain authorization from the Service. We note that Section 10 of the Act is voluntary. Therefore, there is no guarantee that any particular non-Federal project that could result in "take" of the species would choose to apply for a Section 10 permit that would require mitigation for the effects of that non-Federal project to the maximum extent practicable. Each project would be reviewed and conservation measures would be applied on a case-by-case basis. In light of scientific uncertainty, the Service would be required to err on the side of the conservation of the species. In addition, based on new science collected in the future on the status of the species and threats to the species, the Service could adjust accordingly the conservation measures that would be applied to individual projects. However, it will be difficult to quantify the impacts to the Georgetown salamander from these projects, because there is uncertainty regarding which conservation measures the Service may apply. In addition, there is uncertainty related to the impact of development on water quality and the relationship of those impacts to the Georgetown salamander. Thus, it is difficult to measure the potential beneficial impacts that may result from conservation measures that may be required by the Service under section 7 or 10 of the Act. Because consultations would occur on a case-by-case basis at specific sites, the No Action alternative is likely to result in minor beneficial impacts to the species.

Under the No Action alternative, some level of development remains likely to occur within the watershed at unoccupied sites where authorization from the Service may not be necessary. There is the potential that these actions may impact water quality throughout the watershed, and there remains substantial uncertainty on how water quality degradation throughout the watershed may adversely impact the Georgetown salamander. It is also likely that some non-Federal project proponents will decide not to apply for a Section 10 permit from the Service and instead take the chance that their activities will not result in impacts to the Georgetown salamander. Additionally, some project proponents may not be aware that their project has the potential to impact water quality and, thus, the potential to impact the Georgetown salamander; therefore, some project proponents may not consult with the Service on these projects.

Overall, the No Action alternative may result in minor beneficial impacts resulting from individual consultations. In addition, the No Action alternative may result in minor to moderate adverse impacts to the species due to water quality degradation that may occur as a result of development actions throughout the watershed and resulting from project proponents that do not coordinate with the Service.

### 4.4.2 Alternative B – Proposed Action

Under Alternative B, the impacts to the golden-cheeked warbler, black-capped vireo, Bone Cave harvestman, and Coffin Cave mold beetle are expected to be similar to the impacts under the No Action alternative as these species would still be covered by the RHCP. The protection of habitat around springs and along streams as a result of the required buffers will provide additional habitat for some of these species. However, it is not expected to provide a measurable benefit to these four covered species, and overall the impacts to the covered species will be the same as under the No Action alternative. As a result, impacts to the golden-cheeked warbler, black-capped vireo, Bone Cave harvestman, and Coffin Cave mold beetle from Alternative B will be minor adverse.

Of the threatened and endangered species found in the action area, the Georgetown salamander is expected to benefit the most from Alternative B. Under Alternative B, just as under the No Action alternative, development and other activities associated with urbanization will continue to occur and increase in intensity as the human population in the action area expands. These activities may have direct or indirect adverse impacts to the Georgetown salamander through degradation of water quality, decreases in water quantity, and the alteration of occupied habitat. However, Alternative B will also have beneficial impacts for the Georgetown salamander from the suite of water quality protection measures required under the UDC. Alternative B is expected to protect water quality by minimizing the increase of impervious cover resulting from development activities due to the buffer requirements of the UDC, minimizing sediment runoff, increasing the removal or total suspended solids, preventing an increase in flow rates, and ensuring spill containment for new or expanded roadways. By reducing further water quality degradation that may result from development, Alternative B is also expected to benefit the Georgetown salamander because the UDC will minimize habitat degradation to the species. It will be difficult to quantify some of these beneficial impacts to the Georgetown salamander, because there is still some uncertainty regarding the effectiveness of many of these measures. However, these conservation measures would be

implemented throughout the entire watershed, rather than just within occupied sites as would be the case under the No Action alternative. Thus, under Alternative B, there is the potential for watershed-scale water quality protections that are likely to also benefit the Georgetown salamander at a larger scale than in the No Action alternative. Therefore, both adverse and beneficial effects to the Georgetown salamander are likely to occur but may not immediately be apparent.

Under Alternative B, proponents of projects involving regulated activities (as defined in Title 30, Texas Administrative Code § 213.3(28)) would be required to implement all of the standard conservation measures found in the UDC. Each project would be reviewed and conservation measures would be applied consistently from project to project. If there is a Federal nexus, the project proponent would still be required to enter into section 7 consultation with the Service as the 4(d) rule in no way alters the section 7 requirements of the Act. The Adaptive Management Working Group would be responsible for monitoring water quality data and the status of the Georgetown salamander throughout the action area to ensure that the existing conservation measures are adequate to protect the species. In the event that adverse effects to the species are detected, the Adaptive Management Working Group would have the ability to revise the conservation measures as appropriate. As long as populations were large enough and resilient enough to survive these adverse impacts in the short-term, it is expected that revised conservation measures would provide a long-term moderate beneficial impact to the Georgetown salamander due to the watershed-scale water quality protections in place under Alternative B.

Under Alternative B, unlike the No Action alternative where project proponents may choose not to coordinate with the Service, project proponents will be required to follow the conservation measures found in the UDC to obtain a development permit from the City of Georgetown. Minor adverse impacts to the Georgetown salamander are expected due to development actions that may occur. Alternative B is expected to result in minor to moderate long-term beneficial impacts to the Georgetown salamander due to implementation of conservation measures outlined in the UDC that will occur at the watershed-scale due to development actions.

## 4.5 Socioeconomics

The intensity of potential impacts to socioeconomic resources is defined as follows:

Negligible: No change in economic or government agency activities would occur or the magnitude of change would not be measurable.

Minor: Changes in economic or government agency activities would be measurable but would not alter the structure, composition, or function of socioeconomic resources in the County and would be limited in context.

Moderate: Changes in economic or government agency activities would be measurable and may somewhat influence the structure, composition, or function of socioeconomic resources in the County but would be limited in context.

Major: Changes in economic or government agency activities would be measurable, would alter the structure, composition or function of socioeconomic resources in the County and may be extensive in context.

### 4.5.1 Alternative A – No Action

Under the No Action alternative, economic and demographic growth would continue within the action area. The City of Georgetown and Williamson County would become more urbanized with an associated increase in human population, property values, tax revenues, and a demand for local services. For proposed projects requiring incidental take coverage for construction or other associated activities, the existing RHCP would continue to streamline compliance with the Act for covered species. For projects that may affect the Georgetown salamander, the RHCP would not obviate the consultation requirements under section 7 and 10 of the Act.

Given the estimated amount of growth expected to occur within the action area over the next 40 years (see *Purpose and Need* discussion above), it is likely that the number of section 7 and 10 consultations with the Service related to impacts to the Georgetown salamander would be substantial. For those projects requiring consultation, there may be some project delays due to uncertainty of project impacts to the Georgetown salamander and the length of time required to complete coordination with the Service. If project proponents do not plan appropriately for these time requirements, delays are expected to take anywhere from a few months to more than a year. The cost to the project proponent for these types of delays is difficult to predict, but they are not expected to be major. Additionally, there would be a financial cost to the Service for the staff time to review and process these consultations. This cost would be associated with an increase in the amount of staff time needed to complete these consultations in addition to the existing consultation workload being managed by staff for projects impacting other listed species. Therefore, the No Action alternative is expected to have minor adverse impacts on socioeconomics within the action area.

### 4.5.2 Alternative B – Proposed Action

Under Alternative B, economic and demographic growth would continue within the action area and may intensify given the certainty regarding conservation measures for the Georgetown salamander. The City of Georgetown and Williamson County would become more urbanized with an associated increase in human population, property values, tax revenues, and a demand for local services. For proposed projects requiring incidental take coverage for construction or other associated activities, the existing RHCP would continue to streamline compliance with the Act for covered species. For projects that may affect the Georgetown salamander and are being proposed by private interests or non-Federal government agencies, the conservation measures in the UDC would streamline compliance with the Act. For projects that may affect the Georgetown salamander and are being proposed by Federal agencies, the project proponent would be required to consult with the Service under section 7 of the Act in order to obtain incidental take coverage.

Under Alternative B, it would be difficult to predict the number of section 7 consultations that would take place with Federal agencies seeking incidental take coverage for the Georgetown salamander in the action area. However, given the number of informal and formal consultations with Federal agencies that occurred in 2013 for projects in Williamson County (that is, one formal, seven informal) it is likely that there will be less than ten additional section 7 consultations each year within the action area. For those projects requiring consultation, the conservation measures found in the UDC will provide the baseline for conditions that may be required for Federal agencies. Although these conservation measures will be known by Federal agencies, there may be additional minimization requirements that develop during coordination with the Service. The time required by a Federal agency to consult with the Service on potential impacts to the Georgetown salamander is expected to be no different than during consultations on other listed species. Therefore, there would not be any additional financial cost to Federal agencies or the Service as a result of Alternative B.

Under Alternative B, there would be negligible financial impacts to private interests and non-Federal agencies. The loss of small portions of developable lands due to the implementation of spring and stream buffers would cause some adverse economic impacts to private interests and non-Federal agencies. However, due to the locations (that is, in or near floodplains or immediately adjacent to springs) and small size of these areas the inability to develop the lands within these buffers is expected to cause a negligible cost to project proponents. Since compliance with the Act will be streamlined through the UDC, the economic benefit to these same project proponents in saved time and a lack of additional mitigation requirements will make up for any costs associated with the implementation of buffers. Therefore, Alternative B is expected to have negligible impacts on socioeconomics within the action area.

## 4.6 Vegetation

The intensity of potential impacts to vegetation is defined as follows:

Negligible: Impacts would have perceptible but small changes in the size, integrity, or continuity of vegetation within the action area.

Minor: Impacts to vegetation would be measurable or perceptible but limited in size. The overall viability of plant communities would not be affected and would recover.

Moderate: Impacts to vegetation would occur over a relatively wide area. Impacts would cause a change in plant communities (for example, abundance, distribution, quantity, or quality), but the impacts would remain localized.

Major: Impacts to vegetation would occur across the action area. An observable change to plant communities would occur and would be difficult to mitigate.

### 4.6.1 Alternative A – No Action

Under the No Action alternative, vegetation within areas planned for development would largely be removed or impacted to some degree during and after the construction process. Following construction, landscape vegetation and preserved trees would potentially remain in the project areas. According to the City of Georgetown's 2030 Comprehensive Plan, approximately 6,617.82 hectares (16,353 acres) of land within the City and its ETJ are designated as parks, recreation, or open space lands that will remain relatively undisturbed into the future (City of Georgetown 2008). This land will continue to support native vegetation and other vegetation that is more tolerant of human activity and disturbance. Given the estimated amount of human population growth and development that is expected to occur within the action area over the next 40 years (see *Purpose and Need* discussion above), the No Action alternative would result in moderate adverse impacts to vegetation.

### 4.6.2 Alternative B – Proposed Action

Under Alternative B, just as in the No Action alternative, vegetation within areas planned for development would largely be removed or impacted to some degree during and after the construction process. However, under this alternative, landscape vegetation, preserved trees, stream buffers, and spring buffers would provide additional vegetation within the action area. The riparian vegetation in stream buffers will serve as an energy source for aquatic organisms while also providing habitat for numerous species of terrestrial wildlife. Maintaining trees along streams and adjacent to springs will provide shade and help to prevent wide fluctuations in water temperature, indirectly protecting aquatic wildlife from the negative effects of climatic extremes. In addition, the stems and roots of riparian vegetation will help to stabilize soils by reducing water velocity and minimizing erosion (TPWD 2004). Under Alternative B, there would be no change to the amount of lands within the City and its ETJ that would be designated as parks, recreation, or open space. Due to the amount of vegetation that will be preserved in stream and spring buffers, Alternative B would result in minor adverse impacts to vegetation.

## 4.7 Cumulative Impacts

A Cumulative impact is the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7). The purpose of the cumulative impacts analysis is to ensure that Federal decisions consider the range of consequences that could result from an action and incorporating this information into the decision making process.

The cumulative impacts that will occur within the action area under either the No Action alternative or Alternative B are primarily associated with the projected human population growth and increase in developed lands. Over time, the projected growth pattern will adversely affect soils, wildlife,

threatened and endangered species, water quality, socioeconomics, and vegetation. Under the No Action alternative, cumulative impacts to the Georgetown salamander would be minimized as a result of individual section 7 and potentially section 10 consultations with the Service that would use the best available science to adjust avoidance and mitigation requirements. Under Alternative B, these individual section 7 consultations would continue to minimize impacts, and the Adaptive Management Working Group would also use the best available science as a tool to manage the conservation requirements of the Georgetown salamander. However, it is possible that the cumulative effects of implementing standardized conservation measures under Alternative B in light of scientific uncertainty about their effectiveness may result in impacts at the species level before those effects can be quantified. These impacts may be beneficial or adverse.

# 5 Analysis of Significance

The primary purpose of preparing an environmental assessment under NEPA is to determine whether a proposed action would have significant impacts on the human environment. If significant impacts may result from a proposed action, then an environmental impact statement is required (40 CFR § 1502.3). Whether a proposed action exceeds a threshold of significance is determined by analyzing the *context* and the *intensity* of the proposed action (40 CFR § 1508.27).

Context refers to the setting of the proposed action and potential impacts of that action. The context of a significance determination may be society as a whole (human, national), the affected region, the affected interests, or the locality. Intensity refers to the severity of the impacts.

Under regulations of the Council of Environmental Quality (CEQ), which is responsible for ensuring compliance with NEPA, intensity is determined by considering 10 criteria (CFR 40 § 1508.27[b]): (1) beneficial and adverse impacts; (2) the degree of impacts on health and safety; (3) impacts on the unique characteristics of the area; (4) the degree to which the impacts would likely be highly controversial; (5) the degree to which the proposed action would impose unique, unknown, or uncertain risks; (6) the degree to which the proposed action might establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration; (7) whether the proposed action is related to other actions, which cumulatively could produce significant impacts; (8) the degree to which the proposed action might adversely affect locales, objects, or structures eligible for listing in the National Register of Historic Places; (9) the degree to which the proposed action might adversely affect an endangered or threatened species or its habitat, as determined to be critical under the ESA of 1973; and (10) whether the proposed action threatens a violation of Federal, state, or local law.

The context of short- and long-term impacts of the proposed 4(d) rule includes the springs and streams within the City of Georgetown in Williamson County, Texas, and its extraterritorial jurisdiction (ETJ). This includes all springs and streams in the watersheds within Georgetown and is not limited to the 17 known Georgetown salamander occupied sites. Impacts of the proposed 4(d) rule at these scales would be minor to moderate, at most.

1. *Potential impacts to environmental resources, both beneficial and adverse, would be minor or moderate in all cases.* Analyses of impacts of the proposed 4(d) rule on resources within the affected environment were conducted and discussed in Chapter 4 of this EA, and it was determined that the proposed 4(d) rule would have both adverse

and/or beneficial impacts on those resources. All of the potential adverse and beneficial impacts from the proposed action are expected to be minor to moderate, at most. Thus, these analyses in Chapter 4 concluded that the adverse impacts of the proposed 4(d) rule would not be significant.

2. *There would be no or negligible impacts to public health or safety from the proposed 4(d) rule.* As described in Chapter 4 above, the proposed action is likely to result in minor to moderate beneficial impacts to water quality as a result of the implementation of the water quality protection measures described in the UDC. Due to these measures that minimize water quality degradation, there would be negligible or minor beneficial impacts to public health resulting from the proposed action. There would be no adverse or beneficial impacts to safety as a result of the proposed action or the no action alternative.

3. *There would be no or negligible impacts to unique characteristics of the area.* Through the proposed 4(d) rule, stream and spring buffers would contribute to a watershed-scale reduction in water quality degradation. The action area where these water quality protective measures associated with the 4(d) rule would be implemented includes portions of the Edwards Aquifer Recharge Zone, and the measures would serve to prevent further degradation of the unique characteristics of the area.

4. *Potential impacts to the quality of the environment are not likely to be highly controversial.* Impacts are not likely to be highly controversial because, as the analyses of impacts of the 4(d) rule has concluded, the quality of the environment would not be significantly modified from current conditions. This analysis was based on the likely future impacts from implementation of the 4(d) rule and the corresponding water quality protective measures in the UDC.

5. *The impacts do not pose any uncertain, unique, or unknown risks*. The revised proposed 4(d) rule is regulatory in nature; as such, the nature of the potential impacts are negligible to minor in most cases. Implementation of the proposed action is expected to result in primarily beneficial impacts to the environment through the water quality protective measures it provides.

6. *The proposed 4(d) rule is not a precedent-setting action with significant effects.* The agency has finalized 4(d) rules for numerous other threatened species, and this action is consistent with the requirements of the Endangered Species Act. Therefore, this action is not precedent setting.

7. *There would not be any significant cumulative impacts* because it is not related to other actions which could cumulatively result in impacts to the quality of the human environment.

8. *This 4(d) rule is not likely to affect sites, objects, or structures of historical, scientific, or cultural significance* because any such potential impacts would be addressed by Federal and State laws enacted to protect and preserve these resources.

9. *The proposed 4(d) rule would have beneficial impacts to the Georgetown salamander.* As described in Chapter 4, some short-term minor adverse effects may result from the proposed action due to the continuation of development activities; however, the 4(d)

rule will contribute to the conservation of the species through the water quality protective measures it provides.

10. *The proposed 4(d) rule would not violate any Federal, state, or local laws.* This action is consistent with the provisions of the Endangered Species Act and other relevant laws.

# 6 Consultation and Coordination

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**Agencies, Organizations, and Persons Contacted:**
When we proposed the 4(d) rule in February 2014, we contacted the following Federal and State of Texas offices or agencies, non-governmental organizations, and relevant parties to inform them about the publication, invite their review and comment on the draft documents, and offer our availability to discuss the drafts upon request. We are also contacting these parties to provide the revised proposed 4(d) rule and associated documents for their review and comment.

U.S. Senators from Texas
U.S. House Representatives from Texas
Governor, State of Texas
Texas State Senators
Texas State House of Representatives

United States Geological Survey
Natural Resources Conservation Service
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency

Texas Parks and Wildlife Department
Texas Department of Agriculture
Texas Comptroller of Public Accounts
Texas Commission on Environmental Quality
Texas Department of Transportation
Texas Water Development Board

City of Austin
City of Georgetown
City of Leander
City of Round Rock
Travis County
Williamson County

Barton Springs Edwards Aquifer Conservation District
Brazos River Authority
Lower Colorado River Authority
Williamson County Conservation Foundation
Center for Biological Diversity
Wild Earth Guardians
Travis Audubon Society
Clearwater Underground Water Conservation District
Environmental Defense Fund
National Cave and Karst Research Institute
Texas Cave Management Association
Texas Salamander Coalition
Texas Cave Conservancy

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