U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

SCIENTIFIC NAME: *Eurycea naufragia*

COMMON NAME: Georgetown salamander

LEAD REGION: 2

INFORMATION CURRENT AS OF: April 2010

STATUS/ACTION:
___ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status
___ New candidate
_X_ Continuing candidate
___ Non-petitioned
_X_ Petitioned - Date petition received: May 11, 2004
__ 90-day positive - FR date:
__ 12-month warranted but precluded - FR date:
__ Did the petition request a reclassification of a listed species?
FOR PETITIONED CANDIDATE SPECIES:
a. Is listing warranted (if yes, see summary of threats below)? yes
b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? yes
c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

Higher priority listing actions, including court-approved settlements, court-ordered statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

___ Listing priority change
Former LP: ___
New LP: ___

Date when the species first became a Candidate (as currently defined): October 30, 2001

___ Candidate removal: Former LP: ___
___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
___ F – Range is no longer a U.S. territory.
___ I – Insufficient information exists on biological vulnerability and threats to support listing.
___ M – Taxon mistakenly included in past notice of review.
___ N – Taxon does not meet the Act's definition of "species."
___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Amphibian, Family Plethodontidae

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Texas

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Williamson County, Texas

LAND OWNERSHIP: All of the known locations for the Georgetown salamander are under private ownership.

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BIOLOGICAL INFORMATION:

Species Description: The Georgetown salamander is entirely aquatic and neotenic (does not metamorphose into a terrestrial adult). Adults are approximately 2 inches (5 centimeters) long. It 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 greyish 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 (*Eurycea tonkawae*), the Georgetown salamander has a distinct dark border along the lateral margins of the tail fin (Chippindale *et al.* 2000, p. 38).

Taxonomy: The Service has carefully reviewed the available taxonomic information to reach the conclusion that the species is a valid taxon. A description of the Georgetown salamander was published by Chippindale *et al.* (2000, pp. 37-39). The three known salamander species that occur in the Northern Segment of the Edwards Aquifer have very similar external morphology. Because of this, they were previously believed to be the same species; however, molecular evidence strongly indicates that there is a high level of divergence between the three groups (Chippindale *et al.* 2000, pp. 15-16). All three of these species, including the Georgetown

salamander belong to the genus *Eurycea* within the Tribe Hemidactyliini. Tribe Hemidactyliini are differentiated from other Tribes in Family Plethodontidae as having aquatic larvae. Plethodontid salamanders comprise the largest family of salamanders within the Order Caudata and are characterized by an absence of lungs (Petranka 1998, pp. 157, 158).

Habitat/Distribution: 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 and in one cave in the City of Georgetown, Williamson County, Texas. The recharge and contributing zones of the Northern Segment of the Edwards Aquifer supply the water that feeds these springs. These zones are found in portions of Travis, Williamson, Bell, Burnet, Lampasas, Mills, and Hamilton counties, Texas.

Population Estimates/Status: This species spends some of its time underground, which causes difficulty in estimating its population size. Although the technology to safely and reliably mark salamanders for individual recognition has recently been developed (O'Donnell *et al*. 2008, p.3), population estimates for this species have not been undertaken.

The Service is currently aware of 14 Georgetown salamander localities. This species has not been observed in recent years at two locations (San Gabriel Spring and Buford Hollow), despite a few survey efforts to find it. The population status is unknown for five sites (Cedar Breaks, Shadow Canyon, Avant Spring, Cimmaron Hills Cave, and Bat Well). Georgetown salamanders continue to be observed at six sites (Swinbank Spring, Knight Spring, Twin Springs Preserve, Hogg Hollow Spring, Cowan Creek Spring, and Cobbs Cavern Spring), but in relatively low numbers (Dr. Benjamin Pierce, Southwestern University, pers. comm. 2009). In December 2009, Georgetown salamanders were discovered for the first time at Cedar Hollow in Williamson County, Texas (Dr. Benjamin Pierce, Southwestern University, pers. comm. 2010).

THREATS

We have no new information as of April 2010 regarding threats to the species.

A. The present or threatened destruction, modification, or curtailment of its habitat or range. *Water quality degradation*: The range of the Georgetown salamander is limited to the San Gabriel River drainage within the vicinity of the City of Georgetown in Williamson County, Texas. This area is experiencing rapid human population growth. For example, the human population within the City of Georgetown, Texas was 9,468 in 1980, and has increased to 44,398 by 2007. The population is expected to reach 83,840 in 2015 (City of Georgetown 2010, p. 1). The Georgetown salamander's restricted range within a highly urbanized area makes it vulnerable to both acute and chronic groundwater contamination and potentially catastrophic hazardous materials spills.

As human population growth and urbanized development increases, more opportunities exist for the chronic, long-term introduction of non-point source pollutants into the environments. For example, the ongoing application of pesticides and fertilizers to lawns is a constant source of pollutants (Menzer and Nelson 1980, pp. 663, 637-652). Petroleum products are also inherent components of urban environments from automobile operation and maintenance (Van Metre *et*

al. 2000, p. 4069). During rain events, these chemical pollutants, which accumulate in soils and on impervious surfaces (such as roofs, parking lots, and roads) during dry periods, are transported by water downstream into areas where salamanders occur. This process can occur either through direct surface water runoff or through infiltration into groundwater that later discharges through springs (Schram 1995, p. 91). Acute short-term increases in pollutants, particularly sediments, can occur during construction of new development. When vegetation is removed and rain falls on unprotected soils, large discharges of suspended sediments result and can have immediate effects of increased sedimentation in downstream drainage channels (Schueler 1987, p. 1.4; COA 2003, p. 24).

Amphibians, especially their eggs and larvae (which are usually restricted to a small area within an aquatic environment), are sensitive to many different aquatic pollutants (Harfenist *et al.* 1989, pp. 4-57). Contaminants found in aquatic pollutants may interfere with a salamander's ability to develop, grow, or reproduce (Burton and Ingersoll 1994, pp. 120, 125). In addition, macroinvertebrates, such as small freshwater crustaceans, that aquatic salamanders feed on are especially sensitive to water pollution (Phipps *et al.* 1995, p. 282; Miller *et al.* 2007, p. 74). Studies in the Bull Creek watershed in Austin, Texas found a loss of some sensitive macroinvertebrate species, potentially due to nutrient enrichment and sediment accumulation (COA 2001, p. 15).

Increases in impervious cover resulting from urbanization have been shown to cause measurable water quality degradation (Klein 1979, p. 959; Bannerman *et al.* 1993, pp. 251-254, 256-258; Center for Watershed Protection 2003, p. 91). Impervious cover in a stream's watershed causes streamflow to shift from predominately baseflow, which is derived from natural filtration processes and discharges from local groundwater supplies, to predominately stormwater runoff. Stormflows carry pollutants and contaminants into stream systems (Bannerman *et al.* 1993, pp. 251-254, 256-258; Schueler 1994, p. 102; Barrett and Charbeneau 1996, p. 87; Center for Watershed Protection 2003, p. 91). With increasing stormflows, the amount of baseflow available to sustain water supplies during drought cycles is diminished and the frequency and severity of flooding increases. The increased quantity and velocity of runoff increases erosion and streambank destabilization, which in turn leads to increased sediment loadings, channel widening, and detrimental changes in the morphology and aquatic ecology of the affected stream system (Hammer 1972, pp. 1535-1536, 1540; Booth 1990, pp. 407-409, 412-414; Booth and Reinelt 1993, pp. 548-550; Schueler 1994, pp. 106-108; Pizzuto *et al.* 2000, p. 82; Center for Watershed Protection 2003,pp. 41-48).

Elevated mobilization of sediment (mixture of sand, silt, clay, and organic debris) also occurs as a result of increased velocity of water running off impervious surfaces in the urban environment (Schram 1995, p. 88; Arnold and Gibbons 1996, pp. 244-245). Increased rates of storm water runoff cause erosion by scouring in headwater areas and sediment deposition in downstream channels (Booth 1991, pp. 93, 102-105; Schram 1995, p. 88). Sediments are washed into streams or aquifers during storm events. Sediments are either deposited into layers or become suspended in the water column (Ford and Williams 1989, p. 537; Mahler and Lynch 1999, p. 13). Sediment derived from soil erosion has been cited by Menzer and Nelson (1980, p. 632) as the greatest single source of pollution of surface waters by volume. Due to high organic carbon content, sediments eroded from contaminated soil surfaces can concentrate and transport

contaminants (Mahler and Lynch 1999, p. 1). Sediment can affect aquatic organisms in a number of ways. Sediments suspended in water can clog gill structures, which impairs breathing of aquatic organisms, and can reduce their ability to avoid predators or locate food sources due to decreased visibility (Schueler 1987, p. 1.5).

Excessive deposition of sediment in streams can physically reduce the amount of available habitat and protective cover for aquatic organisms, by filling the interstitial spaces of larger substrates (such as gravel and rocks) surrounding the spring outlets that offer protective cover and an abundant supply of well-oxygenated water for respiration. As an example, a California study found that densities of two salamander species were significantly lower in streams that experienced a large infusion of sediment from road construction after a storm event (Welsh and Ollivier 1998, pp. 1,118-1,132). The vulnerability of the salamander species in this California study was attributed to their reliance on interstitial spaces in the streambed habitats (Welsh and Ollivier 1998, p. 1128). The loss of interstitial spaces in stream substrates can be measured as the percent embeddedness. Embeddedness reflects the degree to which rocks (which provide cover for salamanders) are surrounded or covered by fine sediment. Increased sedimentation from urban development is a water quality threat to the Georgetown salamander because it fills interstitial spaces and eliminates resting places and also reduces habitat of its prey base (small aquatic invertebrates) (COA 2006, p. 34).

Excessive nutrient input to watershed drainages is another form of pollution that occurs in highly urbanized areas. Sources of excessive nutrients (elements or compounds, such as phosphorus or nitrogen, that fuel abnormally high organic growth in aquatic ecosystems) in water include human and animal wastes, municipal sewage treatment systems, decaying plant material, and fertilizers used on croplands (Garner and Mahler 2007, p. 29). Excessive nutrient levels typically cause algal blooms that ultimately die back and cause progressive decreases in dissolved oxygen concentration in the water from decomposition (Schueler 1987, pp. 1.5-1.6). Increased nitrate levels, which are often associated with fertilizer use, have been known to affect amphibians by altering feeding activity and by causing disequilibrium and physical abnormalities (Marco *et al.* 1999, p. 2837).

Polycyclic aromatic hydrocarbons (PAHs) are another form of aquatic pollution in urbanized areas that could potentially affect Georgetown salamanders, their habitat, or their prey. PAHs can originate from petroleum products, such as oil or grease, or from atmospheric deposition from the byproducts of combustion (for example, vehicular combustion). These pollutants are widespread and can contaminate water supplies through sewage effluents, urban and highway runoff, and chronic leakage or acute spills of petroleum and petroleum products from pipelines (Van Metre *et al.* 2000, p. 4067, Albers 2003, pp. 345-346). Petroleum and petroleum byproducts can adversely affect living organisms by causing direct toxic action, altering water chemistry, reducing light, and decreasing food availability (Albers 2003, p. 349). PAH exposure can cause impaired reproduction, reduced growth and development, and tumors or cancer in species of amphibians, reptiles, and other organisms (Albers 2003, p. 354). PAHs are also known to cause death, reduced survival, altered physiological function, inhibited reproduction, and changes in Georgetown salamander populations and community composition of freshwater invertebrates (Albers 2003, p. 352).

The Northern Segment of the Edwards Aquifer is at risk for spillage of hazardous materials in transport. Numerous highways, such as Interstate Highway 35 and State Highway 29, are major arteries that serve as hazardous materials transport routes. These arteries cross the watersheds that contribute groundwater to spring sites known to be occupied by the Georgetown salamander. A catastrophic spill could occur if a transport truck overturned and its contents entered the recharge zone of the Northern Segment of the Edwards Aquifer. Transportation accidents involving hazardous materials spills at bridge crossings are of particular concern because recharge areas in creek beds can transport contaminants directly into the aquifer. Any hazardous materials spill within the San Gabriel River drainage could have the potential to threaten the long-term survival and sustainability of the Georgetown salamander.

Human population growth and urbanization within the vicinity of the City of Georgetown continue to increase rapidly. Urbanization can dramatically alter the hydrologic regime and water quality of watershed drainages (Klein 1979, p. 959; Bannerman *et al.* 1993, pp. 251-254, 256-258; Center for Watershed Protection 2003, p. 91). The known range of the Georgetown salamander is entirely located within the San Gabriel River drainage in and around the City of Georgetown. Therefore, we consider the destruction or modification of habitat due to acute or chronic water quality degradation or hazardous materials spills in the Northern Segment of the Edwards Aquifer to be a threat to the Georgetown salamander now and in the foreseeable future.

Water quantity and spring flow declines: Future climate change could affect water quantity and spring flow for this aquatic species. According to the Intergovernmental Panel on Climate Change (IPCC 2007, p. 1), "warming of the climate system is unequivocal, as is now evident from observations of increases in global averages of air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level." Localized projections suggest the southwest United States may experience the greatest temperature increase of any area in the lower 48 states (IPCC 2007, p. 8), with warming increases in southwestern states greatest in the summer. The IPCC also predicts hot extremes, heat waves, and heavy precipitation will increase in frequency (IPCC 2007, p.8).

Effects from climate change on aquifer-dependant species can be difficult to assess. This is because (1) there is little data available to correlate groundwater trends and climate change and (2) groundwater typically represents an integration of past climatic conditions over many years due to its time within an aquifer system (Mace and Wade 2008, p. 657). Although recharge, pumping, natural discharge, and saline intrusion of groundwater systems could be affected by climate change (Mace and Wade 2008, p. 657), we lack sufficient information to know how climate change will affect spring flows within Georgetown salamander habitat. The Service will continue to investigate this matter as new information becomes available in future years.

B. Overutilization for commercial, recreational, scientific, or educational purposes.
We are not aware of any information regarding overutilization of Georgetown salamanders for commercial, recreational, scientific, or educational purposes and do not consider this a significant factor threatening this species now or in the foreseeable future.

C. Disease or predation.
We are not aware of any information regarding disease or predation of Georgetown salamanders and do not consider this a significant factor threatening this species now or in the foreseeable future.

D. The inadequacy of existing regulatory mechanisms.
The Georgetown salamander is not listed on the Texas State List of Threatened or Endangered Species (Texas Parks and Wildlife Department (TPWD 2010, pp. 2-3). Therefore, it is receiving no direct protection from the State. Under authority of the Texas Administrative Code (Title 30, Chapter 213), the Texas Commission on Environmental Quality (TCEQ) regulates activities having the potential for polluting the Edwards Aquifer and hydrologically connected surface streams (TCEQ 2001, pp. 1-14). Although all of the known Georgetown salamander sites occur within the portions of the Edwards Aquifer regulated by TCEQ, the regulations do not address land use, impervious cover limitations, non-point source pollution, or application of fertilizers and pesticides over the recharge zone (30 TAC 213.3). We are unaware of any water quality ordinances more restrictive than TCEQ in Williamson County.

Human population growth within the vicinity of the City of Georgetown continues to increase rapidly. Existing regulations do not address many of the sources of groundwater pollution that are typically associated with urbanized areas. Therefore, we conclude that the protections from the existing regulatory mechanisms are not adequate to limit or alleviate the threats to the Georgetown salamander.

E. Other natural or manmade factors affecting its continued existence.
We are not aware of any information regarding other natural or manmade factors affecting the Georgetown salamanders' continued existence. Therefore, we have determined that there are no other natural or manmade factors significantly affecting this species now or in the foreseeable future that constitutes a threat to the Georgetown salamander.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED: The TCEQ has developed voluntary water quality protection measures for developers to minimize water quality effects to springs systems and other aquatic habitats within the Edwards Aquifer region of Texas. In February 2005, the Service concurred that these measures, if implemented, would protect several aquatic species from take, including the Georgetown salamander, which would otherwise occur due to water quality degradation resulting from development in the Edwards Aquifer region. However, it should be noted that as a non-listed species, "take" prohibitions do not apply to this species.

The Williamson County Conservation Foundation (Foundation), a non-profit organization established by Williamson County in 2002, is currently working to find ways to conserve endangered species and other unlisted species of concern in Williamson County, Texas. This organization held a Georgetown salamander workshop in November 2003, in an effort to bring together landowners, ranchers, farmers, developers, local and state officials, Federal agencies, and biologists to discuss information currently known about the salamander and to educate the public on the threats faced by this species.

With the help of a section 6 grant, the Foundation developed a regional habitat conservation plan (HCP) to obtain a section 10(a)(1)(B) permit for incidental take of federally listed endangered species in Williamson County, Texas. This HCP became final in October 2008. Although the Georgetown salamander is not currently listed and is not a "covered" species, the Foundation has included considerations for the Georgetown salamander in their HCP. In particular, they plan to conduct a status review of the Georgetown salamander. The Foundation plans to fund at least $50,000 per year for 5 years for monitoring, surveying, and gathering baseline data on water quality and quantity at salamander spring sites. Information gathered during this status review will be used to develop a conservation strategy for this species. In recent years, the concept of regional conservation planning for the Georgetown salamander has only been contemplated, but since the HCP has been finalized, the Service is confident in the Foundation's commitment to conserve this species. Moreover, the Foundation allocated funding for Georgetown salamander research and/or monitoring beginning in 2010. A portion of this will fund mark-recapture studies of the Georgetown salamander at two of its known localities (Twin Springs and Swinbank Spring) beginning in 2010. Additional funds will be directed at chemical and hydrological assessments of at least one known locality and efforts to find previously undiscovered Georgetown salamander populations (Benjamin Pierce, Southwestern University, pers. comm. 2010).

Although the Service worked with the Foundation to develop the regional HCP for several listed karst invertebrates, it is also expected to benefit the Georgetown salamander by lessening the potential for water quality degradation within the spring systems it inhabits. As part of this HCP, the Foundation is looking to set aside land that is beneficial to karst invertebrate species, but also provides water quality protection for the Georgetown salamander. For example, the Foundation has purchased an easement on the 64.4 acre (ac) (26.1 hectare [ha]) Lyda tract (Cobb Cavern) in Williamson County through the section 6 grant program. This section 6 grant was awarded for the protection of listed karst invertebrate species; however, protecting this land also benefited the Georgetown salamander. Although the spring where salamanders are located was not included in the easement, a portion of the contributing watershed for this spring was included. For this reason, water quality benefits to the salamander are expected. In January 2008, the Foundation also purchased the 145 ac (58.6 ha) Twin Springs preserve area. This tract is one of the sites known to be occupied by Georgetown salamanders (Gary Boyd, Williamson County Conservation Foundation, pers. comm. 2009).

SUMMARY OF THREATS (including reasons for addition to or removal from candidacy, if appropriate): The primary threat facing the Georgetown salamander is the degradation of the water quality that feeds the springs that support habitat for this species. The restricted range of the salamander makes it vulnerable to both acute and chronic water quality degradation.

Specific strategies to reduce water quality degradation and protect the Georgetown salamander's habitat are anticipated to occur through the implementation of the Williamson County regional HCP. We believe that this recent commitment to a watershed-based approach to conserving water quality for the Georgetown salamander reduces the magnitude of the threats it faces. However, because such conservation strategies have not yet been outlined or implemented, the Service finds that this species continues to be warranted for listing throughout all of its range. We therefore find that it is unnecessary to analyze whether it is threatened or endangered in a

significant portion of its range.

For species that are being removed from candidate status:

____Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES: The Service recommends developing and implementing comprehensive regional plans to address water quality threats. A plan to protect or enhance water quality should include measures for projects constructed over the contributing and recharge zones of the Northern Segment of the Edwards Aquifer. Such measures should include impervious cover limits, buffer zones for streams and other sensitive environmental features, low-impact developments, structural water quality controls, and other strategies to reduce pollutant loads. Land preservation through acquisition, conservation easements, or deed restrictions can also provide permanent protection for water quality. Programs should be developed to reduce pollutant loading from existing development and other potential sources of pollutants such as golf courses and transportation infrastructure. Partnerships should be formed with the landowners of the spring sites and efforts should be made to protect the surface habitat of the salamander. The Barton Springs Salamander Recovery Plan (Service 2005, pp. 2.1-1-2.1-6) outlines conservation measures in more detail. The measures set forth in this recovery plan were developed to protect another aquatic species in the Barton Springs Segment of the Edwards Aquifer, but many of these could be applied to the Georgetown salamander as well. The Service also recommends searching for previously undocumented locations of the Georgetown salamanders so steps can be taken to protect additional populations. The Georgetown salamander is a high priority species in the Wildlife Action Plan of Texas (TPWD 2005, p. 748). This may help in securing State funds for both research and recovery efforts for this species.

LISTING PRIORITY

THREAT			
Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/population	3
	Non-imminent	Monotypic genus	4
		Species	5
		Subspecies/population	6
Moderate to Low	**Imminent**	Monotypic genus	7
		Species	**8***
		Subspecies/population	9
	Non-imminent	Monotypic genus	10
		Species	11
		Subspecies/population	12

Rationale for listing priority number:

Magnitude: Water quality impacts threaten the continued existence of the Georgetown salamander by altering the physical aquatic habitats of the salamander. However, the Williamson County Conservation Foundation (Foundation) is actively working to protect habitat and acquire land within the contributing watershed for the Georgetown salamander. Through the development of their regional HCP for listed karst invertebrates in Williamson County, Texas, the Foundation is also seeking to proactively protect the Georgetown salamander. In doing so, they are preserving land that would benefit both karst invertebrates and the Georgetown salamander and providing funding to monitor and collect data in an effort that is expected to lead to the development of a conservation strategy for this species. Land preserved within Georgetown salamander habitat would help prevent the degradation of water quality that would likely occur if that land were developed. Before the Foundation's recent efforts, no region-wide commitment existed for the conservation of the Georgetown salamander. The regional HCP was finalized in October 2008. Therefore, we believe the Foundation has demonstrated their commitment to protecting water quality for the Georgetown salamander and that this commitment to a watershed-based approach to conserving water quality for the Georgetown salamander reduces the magnitude of the threats it faces to a moderate level. However, because such conservation strategies have not yet been outlined or implemented, the Service finds that this species continues to be warranted for listing throughout all of its range.

Imminence: This species occurs in one of the most rapidly growing regions in the United States. Because urbanization can dramatically alter the hydrologic regime and water quality of watershed drainages, degradation of water quality is an imminent threat of total habitat loss.

__X__ Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? Yes.

Is Emergency Listing Warranted? No. No information has been received that would indicate threats are likely to extirpate this species before a normal listing process could be conducted.

DESCRIPTION OF MONITORING: Because most of the known Georgetown salamander locations are on private property, access to these sites is difficult. Although range-wide monitoring of the salamander is not occurring in regular intervals, we have received information from a few known sites. Dr. Benjamin Pierce at Southwestern University has visited several of the historic salamander sites over the past several years to determine if salamanders are still present at these locations. He has not observed Georgetown salamanders in recent years at San Gabriel Spring and Buford Hollow, despite a few survey efforts to find it. He has observed Georgetown salamanders at six of the historic sites (Swinbank Spring, Knight Spring, Twin Springs Preserve, Hogg Hollow Spring, Cowen Creek Spring, and Cobbs Cavern Spring), but in relatively low numbers (Dr. Benjamin Pierce, Southwestern University, pers. comm. 2009).

Dr. Pierce and his students have been monitoring two Georgetown salamander sites. One of these sites is Swinbank Spring, a large spring located on private property on the North San Gabriel River between Lake Georgetown and Interstate Highway 35. Since April 2007, Dr. Pierce and his students have been conducting monthly salamander surface counts at this spring and the lower part of the associated spring run, which is located on U.S. Army Corps of Engineers property. Numbers of Georgetown salamanders observed at Swinbank Spring during surface counts have been relatively small, ranging from 5 to 43 (Benjamin Pierce, Southwestern University, pers. comm. 2009). Dr. Pierce has also been monitoring at Twin Springs (also known as Taylor Ray Hollow Spring), which is a small, permanent spring located on the northwest side of Lake Georgetown. He observed 24 Georgetown salamanders at this site during one survey effort in April 2007. Dr. Pierce and his students have been conducting monthly surface counts at the Twin Springs in late 2008 (Benjamin Pierce, Southwestern University, pers. comm. 2009). Dr. Pierce also periodically surveys San Gabriel Spring located within San Gabriel Park in the City of Georgetown. Georgetown salamanders have been known to occur at this site as recently as 1990, but he has not observed any salamanders at this location during any of his visits (Benjamin Pierce, Southwestern University, pers. comm., 2009).

Because there has been no regular, range-wide monitoring program in place for this species, the presence of the Georgetown salamander at other sites in the Northern Segment of the Edwards Aquifer in 2009 is unknown. However, the Foundation has recently funded studies to locate other Georgetown salamander populations beginning in 2010 (Benjamin Pierce, Southwestern University, pers. comm. 2010). Dr. Pierce and TPWD are currently surveying spring sites within Williamson County in an effort to find previously undiscovered Georgetown salamander populations. They are also working to gain access to historic Georgetown salamander locations to reconfirm their presence at these sites (Dr. Andy Gluesenkamp, TPWD, pers.comm., 2010). We rely heavily on the information provided by our partners, their monitoring efforts, and the regional HCP implementation process to make the assessment that this species is not likely to go extinct while waiting to be listed.

COORDINATION WITH STATES: In March 2010, the Service contacted Andy Gluesenkamp, State Herpetologist for TPWD by email requesting information on the status of this and other candidate species. As part of his response to this inquiry, Dr. Gluesenkamp indicated that TPWD is working collaboratively with Dr. Benjamin Pierce at Southwestern University to find previously undiscovered Georgetown salamander populations. They are also working to gain access to historic Georgetown salamander locations to reconfirm their presence at these sites (Dr. Andy Gluesenkamp, TPWD, pers.comm., 2010).

Indicate which State(s) did not provide any information or comments: N/A

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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: _____ May 21, 2010

Acting Regional Director, Fish and Wildlife Service Date

Concur: _____ ACTING Director, Fish and Wildlife Service Date: October 22, 2010

Do not concur: _____ _____

Director, Fish and Wildlife Service Date

Director's Remarks:

Date of annual review: April 2010
Conducted by: Paige A. Najvar, Austin Ecological Services Field Office