Lost Pines

Habitat Conservation Plan

for Bastrop County, Texas

Environmental Assessment/Habitat Conservation Plan

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1.0 INTRODUCTION AND BACKGROUND

Bastrop County, Texas is blessed with natural beauty and character. Bastrop County has large amounts of open space with two State Parks, as well as a Lower Colorado River Authority lake and parks. The fact that Bastrop County is proposing to implement a Habitat Conservation Plan that was developed and supported by a cross-section of the community is a testament to the people of Bastrop County and their ability to come together as a community and develop viable solutions. Bastrop County's geographic size of 888 square miles (2,300 square kilometers), 912 linear miles (1,468 kilometers) of county roads & bridges, population density of 65 people/square mile, tax base of 2.9 billion, tax rate of .61/100 valuation, per capita income of $22,000, and nearly 12 percent of the population in poverty clearly demonstrates that Bastrop County has committed to mitigating to the maximum extent practicable.

Bastrop County is located in central Texas, east of the City of Austin and Interstate Highway 35 (I-35), which is a major north-south route along the North American Free Trade Agreement (NAFTA) corridor. Williamson and Lee counties lie to the north of Bastrop County, Fayette County lies to the east, Caldwell County lies to the south, and Travis County lies to the west (Figure 1-2).

Purpose

The Lost Pines Habit Conservation Plan (LPHCP) supports an application by Bastrop County to the U.S. Fish and Wildlife Service (Service) for an incidental take permit under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (ESA). The permit would authorize incidental take[1] of the federally listed endangered Houston toad (*Bufo houstonensis*) that may result from certain otherwise legal land development, agricultural practices, silvicultural practices, and certain other land-use activities. The LPHCP would also include the 46 subdivisions currently covered under the Service's "46-Subdivision EA/HCP" and section 10(a)(1)(B) permits (permit numbers TE-025965-2-X and TE-025997-2-X). The LPHCP and its associated incidental take permit will offer a simplified process for obtaining authorization for incidental take under section 10(a)(1)(B) of the ESA for a variety of activities and provide regulatory certainty for local landowners and other community interests. Upon issuance of the incidental take permit for the LPHCP, the Service will either dissolve or let the 46-Subdivision EA/HCP expire. Any currently valid permit under the 46-Subdivision HCP will be covered under the LPHCP through its expiration date. All Permitees previously issued a 46-Subdivision permit must adhere to the mitigation requirements described in their permit, rather than mitigation required under this Habitat Conservation Plan (HCP).

The LPHCP covers an area of approximately 124,000 acres (50,181 hectares) in Bastrop County, Texas (Plan Area). This area roughly corresponds to the ecological area locally known as the Lost Pines. The LPHCP establishes a conservation program for the Houston toad that minimizes and mitigates for the expected impacts to the species arising from certain human activities within the Plan Area. The overall biological goal of the LPHCP is the long-term preservation, restoration, enhancement, and management of habitat for the Houston toad in Bastrop County.

Participation by landowners and other community interests in the LPHCP is voluntary. That is, individuals, businesses, and other local interests have the option of obtaining incidental take authorization through participation in the LPHCP or by seeking individual authorization directly from the Service. If landowners and other community interests choose to participate in the LPHCP, they must agree to implement the appropriate avoidance, minimization, and mitigation obligations set forth in Section 6 of this HCP and the land-use guidelines (appendices C, D, E, and F).

[1] The term incidental take herein means any take of a Houston toad that is incidental to and not the purpose of carrying out an otherwise lawful activity.

The Planning Effort

The initiative to draft and adopt an HCP did not come from "land development" interests or from groups desiring to stop or slow down the pace of land development. Bastrop County took the lead in the HCP planning process after the Service communicated to the Bastrop County community, as well as elected officials, that a more focused enforcement stance regarding the Houston toad would result in restrictions to historical land uses within the Plan Area, as well as Federal funding and permitting of those historical land uses. The Service based its position, in part, on the perception that land ownership within the Lost Pines area was becoming more fragmented. Except for the conversion of forested land to agricultural use, historical uses of land within the Lost Pines area have generally sustained the forest character of the Plan Area. Therefore, the resulting heightened level of uncertainty relating to historical land uses within the Lost Pines area (agriculture, timber, low density housing, etc.) affected local landowners rather than outside economic interests.

The Bastrop County Commissioners' Court formally initiated the Houston Toad Community-based Conservation Project in July 2000 and appointed a Bastrop County Stakeholder Workgroup (Workgroup) to develop and evaluate options for an HCP for the Houston toad in Bastrop County. The Workgroup included representatives from local business, development, agricultural, timber, utility, landowner, environmental, non-profit, and governmental agency interests. Table 1-1 identifies Workgroup participants and their affiliations. The Workgroup that formulated the LPHCP was not interested in recommending the investment of time, effort, and money in a permit requirement that would not benefit the Houston toad in Bastrop County and the community. The Workgroup seriously questioned the biological viability of the "typical" HCP preserve or bank approach for the Houston toad. Instead, the Workgroup judged that a net benefit to both the Houston toad and landowners could be accomplished by enlisting landowners who would be willing to modify their land use practices. Using this strategy, a larger percentage of the Plan Area would be managed and protected by private landowners for the benefit of the Houston toad. Additionally, the LPHCP proposes on-going research in order to further refine protection strategies for the Houston toad. Therefore, the level of take was tailored to sustain, over the long-term, both the overall forest character of the Plan Area and the historic economic uses of the forested areas within the Plan Area.

An Innovative Approach

The LPHCP represents an innovative approach to implementing HCPs approved since the adoption of the section 10(a)(1)(B) permitting process in 1982. These innovations result from a confluence of several factors in Bastrop County. First, the LPHCP is the first HCP to be prepared by a local governmental entity in Texas since the revision of Chapter 83, Texas Parks and Wildlife Code in 1999 (See Section 1.7.2.). "Traditional" HCPs entail either "habitat banks" or the establishment of preserves to mitigate for habitat permanently lost (Service 1996). Under Texas law, local governmental entities are encouraged to work with landowners as early as possible when developing large HCPs. Local governmental entities are authorized to acquire preserve land designated in a federal permit; but funding and acquisition must be completed within the reasonable time frame of two to four years. When Bastrop County began its considerations of whether to develop a HCP for the Houston toad, the Service initially recommended a preserve system of 15,000 acres (6,070 hectares) to mitigate for development within the remainder of the Lost Pines Area.

Many community leaders in Bastrop County questioned the stated and unstated biological and life cycle assumptions that supported a "traditional" HCP for the Houston toad. In response to the various concerns raised in the community, the Bastrop County Commissioners Court decided to investigate an alternative type of HCP that would be biologically sound and that would receive broad community support. As an initial step, Bastrop County retained Dr. Michael Forstner of Texas State University to conduct several

years of studies of the Houston toad during the toad's breeding season. Based on the data developed by Dr. Forstner, Bastrop County developed a proposed HCP that focuses on the preferred mitigation strategies of avoidance and minimization of take (Service 1996). Under the various guidelines regarding activities that would be authorized by the proposed HCP, aquatic features that could serve as viable breeding locations for the Houston toad are identified during pre-activity planning and avoided (see appendices C, D, E, and F).

Best available scientific information (as reviewed by the Biological Advisory Team (BAT)) regarding the Houston toad indicates that the immediate adverse effects of low density housing development do not radiate beyond the footprint of disturbance and that the setbacks from potential breeding locations identified in the activity guidelines will protect the effectiveness of the breeding locations. Additionally, other avoidance and mitigation strategies are required in the various land-use guidelines (see appendices C, D, E, and F). As a result, on-site minimization and mitigation will occur in conjunction with authorized activities. Authorizing a reasonable, but low level of economic utilization of land within the Plan Area allows for the long-term protection of Houston toad habitat within the financial means of Bastrop County. The potential long-term benefits of Conservation Subdivisions are discussed further in Appendix C. As a result, the overall long-term habitat capability of large tracts, greater than 100 acres (40.5 hectares), of toad habitat should be minimally affected by the land use activities described in the attached land use activities guidelines (Appendices C, D, E, and F).

One objective of the LPHCP is to increase the amount of land set aside and managed for the benefit of the Houston toad; however, the LPHCP does not commit local tax revenue funds to the purchase and management of a publicly owned, interconnected, habitat preserve system. Large areas of publicly owned preserve lands (e.g., Bastrop and Buescher State Parks (SP)) already exist in Bastrop County. Instead, this alternative focuses limited available resources on facilitating conservation efforts by private landowners, encouraging land uses that are compatible with Houston toad conservation (e.g., conservation subdivisions and low-impact agricultural land uses). This approach is intended to preserve the overall ability of the Plan Area to function as Houston toad habitat, while allowing for responsible economic and recreational use of the land. Preserving the overall functionality of the Plan Area as Houston toad habitat allows for connectivity between Houston toad preserves and subpopulations in adjacent counties without specifically dedicating some areas of high quality toad habitat for protection and others for development.

The LPHCP does not provide incidental take authorization for all development and land management activities that are expected to occur within the Plan Area over the term of the LPHCP. The LPHCP does not provide incidental take authority for the large scale removal of toad habitat. Instead, the LPHCP authorizes land use activities that generally only affect less optimal toad habitat and sustain key components of toad habitat through the prescriptive management of habitat to achieve specific biological characteristics for the long-term.

Local Economics

The financial demands of completing a 15,000 acre preserve system for the Houston toad is beyond the financial resources of Bastrop County. Bastrop is a growing county adjacent to Travis County where the state capital, Austin, is located. The population of Bastrop County is currently estimated at about 70,000. While growth is often viewed as beneficial for economic health, one must also consider the nature of growth in order to determine actual economic effects. Bastrop County has been experiencing significant population growth over the past ten years; however, very little industrial tax base exists and very little growth in industrial tax base has occurred. This growth has placed a heavy burden on Bastrop County's government, school districts, and property taxpayers.

The initial estimates of land acquisition costs to complete the 15,000-acre preserve system nearly equaled an entire annual budget for Bastrop County. The Commissioners Court of Bastrop County assessed the viability of an election to incur bonded indebtedness to acquire preserve land for the Houston toad. The Commissioners Court determined that the requirement to finance the acquisition of preserve land imposed by state law made the formulation of a "typical" HCP by Bastrop County financially and politically impossible (see Section 1.7.2.).

The Bastrop Independent School District has experienced three failed bond elections since 2000 and has yet to pass a bond that would bring a 3A high school infrastructure to the 5A infrastructure currently needed.

Bastrop County qualifies as "economically disadvantaged" under the criteria established in the Texas Transportation Code, 222.053, which defines an economically disadvantaged county as a county that has, in comparison to other counties in the state:

(1) below average per capita taxable property value;

(2) below average per capita income; and

(3) above average unemployment

Of the 254 counties in the State of Texas, 62 counties qualified as economically disadvantaged in 2005.

Bastrop County qualifies for a 45 percent decrease in the minimum match requirement for various Texas Department of Transportation projects. Title 43, Texas Administration Code 15.55 (2005), states that the commission will consider a local government's effort and ability to meet the local matching funds requirement, and will consider the following criteria when evaluating a request for an adjustment to the requirement;

(1) population level;

(2) bonded indebtedness;

(3) tax base;

(4) tax rate;

(5) extent of in-kind resources available; and

(6) economic development sales tax

An adjustment cannot exceed 95 percent or be less than 15 percent.

Travis County, a neighboring county to the west, committed to land acquisition within the framework of the BCCP; however, the geographic proximity of Bastrop and Travis County is the only common statistic. The Travis County tax base is approximately 20 times the size of Bastrop County or roughly 2,000 percent larger. Bastrop County's total tax levy for 2003 was $17.8 million compared to Travis County's $292 million. Bastrop County's Tax rate of Travis County is 19 percent lower than Bastrop County's (0.6061 vs. 0.4918). The per capita income (BEA) in Bastrop County is $22,057. Travis County's per capita income is $35,492. When comparing these numbers as a whole it is clear that Bastrop County taxpayers are financially burdened and the local government is challenged to provide basic services. Of Bastrop County's 912 miles (1,467 kilometers) of county roads, nearly half are unpaved. Numerous creeks cross though Bastrop County resulting in significant numbers of drainage structures and bridges, many of which are load limited, and low water crossings are abundant.

The approaches of the LPHCP and the Utility HCP are substantially different. Under the LPHCP the only substantive land use conversions authorized are to conservation subdivisions with a focus on active and adaptive land management and county road and drainage projects that will eliminate breeding sinks. Several utilities within Bastrop County have been issued a permit based on a more traditional HCP for the Houston toad where fees are collected to provide for mitigation measures (see Section 1.8.6). These Utilities are not subject to the state law that regulates Bastrop County's authority to plan and implement an HCP, and therefore they have more flexibility. Additionally, the Utilities' HCP does not propose to acquire specific tracts as preserve but rather to pay funds in support of various activities benefiting the Houston toad. Bastrop County intends to work with the electric utilities and other groups working for the benefit of the Houston toad to leverage resources for further conservation efforts. Bastrop County hopes that the LPHCP will serve as the functioning hub of Houston toad conservation efforts in Bastrop County.

1.1 Project History

In 1994, elected Bastrop County officials and business, landowner, and environmental interests began meeting with Service staff to explore options for compliance with the ESA regarding incidental take of Houston toads in Bastrop County. In 1999, the search for a feasible conservation effort to help relieve the regulatory burden of ESA compliance by private landowners resulted in the formation of a Citizen's Task Force by the Bastrop County Commissioners' Court. The Citizen's Task Force ultimately recommended, with the concurrence of the Service, that Bastrop County develop an HCP for the Houston toad and apply for an endangered species incidental take permit under section 10(a)(1)(B) of the ESA.

The Workgroup, with the assistance of the Texas A&M University (through the Texas Agricultural Extension Service, currently known as the Texas Cooperative Extension Service), prepared a preliminary draft HCP for the Houston toad in July 2001. The Workgroup received extensive comments from Service staff on the July 2001 draft HCP. To address some of these comments and develop an administratively complete HCP and associated draft National Environmental Policy Act (NEPA) document, the Workgroup obtained the assistance of Dr. Michael Forstner of Texas State University, a team of environmental consultants led by Loomis Austin, Inc., KES Consulting, and legal counsel from Mr. Robert Kleeman of Munsch, Hardt, Kopf & Harr, PC. A BAT was formed in the summer of 2002 to help evaluate and comment on the revised HCP (Appendix A, Table 1-1).

Table 1-1. Participants Involved with the Development of the LPHCP.

Bastrop County Stakeholder Workgroup

Stakeholder Group	Representative/Alternate
Agriculture	Robert K. Long, Sr.
Board of Realtors	Virgil Eaves/Bill McPherson
Bastrop County Builders' Association	Donald Barron/Bill McPherson
Bastrop County Appraisal District	Mark Boehnke
Private Developers	Les Appelt, ColoVista, Inc./Bobby Glen, Choice Homes
Bastrop County Forest Landowners	Daniel Lewis, Texas Forest Service/Dave Musgrave, Lost Pines Forest Landowners' Assoc.
Residential Homeowners	Gwen O'Barr, Tahitian Village Property Owners' Association

Table 1-1. Participants Involved with the Development of the LPHCP.

Bastrop County Stakeholder Workgroup	
Stakeholder Group	Representative/Alternate
Ranchette Property Owners	Clara Beckett, JE Wolf Property Owners/Randy Givens, Local landowner
Utilities	Michael Neese, Aqua Water Supply Corporation
Utilities	Sherri Kuhl, Lower Colorado River Authority
Utilities	Matt Bentke, Bluebonnet Electric
Bankers/Lenders	Brook Hurta, First National Bank
Boy Scouts of America-Capitol Area Council	Ray Smith
Businesses/Cities	Joe Newman, Bastrop Economic Development Corporation
Environmental Organizations	Tom Dureka, Bastrop County Environmental Network
Bastrop & Buescher State Parks	Brent Leisure, Texas Parks & Wildlife Dept.
Agricultural/Undeveloped Properties	Terry James, Landowner
Workgroup Co-Chairs	
Kariann Sokulsky, KES Consulting	Ernie Bogart, Attorney at Law, Owens, Bogart and Rogers
Consultants	
Clifton Ladd and Amanda Hunter, Loomis Austin, Inc.	Dr. Michael R. J. Forstner, Texas State University
Robert Kleeman, Attorney at Law, Munsch, Hardt, Kopf & Harr, P.C.	Tom Bourland, Tom Bourland and Associates
Biological Advisory Team	
Dr. Paul Robertson, Texas Parks and Wildlife Dept. (Chairman)	Dr. Jim Dixon, Texas A & M University (retired)
Dr. Andy Price, Texas Parks and Wildlife Dept.	Dr. David Hillis, University of Texas at Austin
Dr. Neal Wilkins, Texas Agricultural Extension Service	Dr. Michael R.J. Forstner, Texas State University
John Kuhl, Travis County Natural Resources Program	Dawn Johnson, Texas Army National Guard, Camp Swift
Jim Yantis, Texas Parks and Wildlife Dept. (retired)	Bill McPherson, Natural Resources Conservation Service (retired)
Lee Sherrod, Horizon Environmental Services	Randy Givens (independent)
U.S. Fish and Wildlife Service (Ex officio)	

This project was primarily funded from its inception in July 2000 through August 2003 by a Federal challenge cost-share ESA section 6 HCP planning grant and a Federal planning grant, both obtained through the Service and matched with over $200,000 in local contributions from businesses, banks, utilities, realtors, environmental groups, and local and state governments (Service et al. 2000; Bastrop County 2001).

The Bastrop County Commissioners' Court established that local community values and the input of Bastrop County citizens were important factors in the development of the LPHCP. The development process drew heavily upon the expertise and insight of members of the community, including members of the Workgroup and BAT, to help craft feasible conservation strategies for protecting the Houston toad and assisting the Bastrop community with ESA compliance. Statements by individual Workgroup members regarding the LPHCP and its development are included in Appendix B.

The LPHCP gives the community an option for ESA compliance. While participation in the LPHCP is voluntary, initial and continued incidental take authorization for a given activity is dependent upon on-going compliance with applicable avoidance, minimization, and mitigation obligations set forth in Section 6 of this HCP and the land-use guidelines (appendices C, D, E, and F). That is, those seeking incidental take authorization under the LPHCP must agree to implement the appropriate avoidance, minimization, and mitigation obligations set forth in Section 6 of this HCP and the land-use guidelines (appendices C, D, E, and F). The LPHCP emphasizes the importance of the avoidance and minimization of potential take and its impacts through the active and adaptive management of habitat through implementation of the various land-use guidelines.

Bastrop County will hire a full time administrator that will ensure the implementation of the various land-use guidelines described in appendices C, D, E, and F, will review conservation subdivision designs and ensure compliance Additionally, the Administrator will be involved in community education, coordinating an advisory group, and acting as a liaison with the Service. Through these actions Houston toad habitat is expected to increase and the quality enhanced.

Research by Dr. Michael Forstner of Texas State University during the previous years has generated a significant amount of new information regarding the life cycle of the Houston toad. Dr. Forstner's research has provided new insights into the range of the Houston toad as well as its habitat needs (Forstner 2002a, 2004). Dr. Forstner has verified the persistence of the Houston toad in large lot subdivisions occupied by people (Forstner 2002b). Assessment of the characteristics of large lot subdivisions where the toad has persisted yielded the framework for the *Conservation Subdivision Development Guidelines*. The *Conservation Subdivision Development Guidelines* go well beyond just requiring large lots; they provide for self mitigation that commensurate with the level of take. These guidelines will assist planners and engineers in planning and laying out new subdivisions that will protect key toad habitat areas on a long-term basis.

Additionally, the LPHCP promotes land uses that are expected to be economically sustainable and that the Applicant believes will maintain, on a long-term basis, the key physical characteristics of toad habitat on private lands. It is anticipated that the confluence of these two policy goals will ultimately protect a far greater amount of Houston toad habitat than through conventional HCP methodologies.

When avoidance and minimization are not practical, such as house construction within any of the existing 46 subdivisions, the LPHCP will continue to provide a mitigation and participation mechanism to residents of Bastrop County for take associated with covered activities. In 2000, the Service issued two short term incidental take permits for residential construction and associated structures in 46 existing subdivisions platted before 1995 within the Plan Area. These subdivision plats were not designed to minimize and avoid adverse impacts on the Houston toad. For example most of the subdivisions have

lots smaller than the five acre average size specified in the *Conservation Subdivision Development Guidelines*. The platting and subsequent sale of lots to the public makes re-platting and redesigning these subdivisions impossible. The Service intended the 46-Subdivision EA/HCP to facilitate development of, and within 5 years time be incorporated into, an area HCP for Bastrop County, Texas. Once the LPHCP is approved, the Service would dissolve or otherwise let the 46-Subdivision HCP expire. Any current permits covered by the 46-Subdivision HCP would be incorporated into and supported by this HCP and its associated permit, although the mitigation requirements described in the current 46-subdivision permit shall be adhered to, rather than mitigation described herein, until their expiration.

As Bastrop County prepares for future growth, the LPHCP will help protect the Houston toad and other important natural resources in a manner consistent with the values and available financial resources of the local community.

1.2 Purpose and Need

The purpose of the LPHCP is to support an application by Bastrop County for an incidental take permit from the Service. The permit would authorize incidental take[2] of the federally listed endangered Houston toad (*Bufo houstonensis*) that may result from certain otherwise legal land development, agricultural practices, silvicultural practices, and certain other land-use activities. The LPHCP describes a conservation program that avoids, minimizes, and mitigates for expected impacts to the Houston toad that may result from otherwise lawful activities covered by the LPHCP, and offers an alternative process to gain authorization for incidental take under section 10(a)(1)(B) of the ESA. While mitigation measures are expected to conserve and enhance habitat for a variety of other wildlife and plant species, this HCP and the requested incidental take permit specifically address only the Houston toad and applies an area-wide, habitat-based conservation approach. The requested incidental take permit will provide greater regulatory certainty for local landowners and other community interests regarding their responsibilities under the ESA. For a list of covered activities see section 4.0 or Table 5-6.

The importance of the Plan Area to the survival of the Houston toad, coupled with the recent and future expected increase in human population and land use in the same area, prompted the need for a coordinated plan that conserves toad habitat and complies with the ESA.

1.3 Expected Community Benefits

The LPHCP is expected to provide multiple benefits to Bastrop County, local landowners, and other community interests, including:

- Reduced uncertainty regarding ESA compliance;
- Increased local control of endangered species management;
- Increased recognition of the role of private landowners in endangered species conservation and wildlife habitat management;
- Conservation of the Lost Pines ecosystem and the Bastrop County semi-rural way of life;
- Encouragement of economic development that is consistent with Houston toad conservation;

[2] The term incidental take herein means any take of a Houston toad that is incidental to and not the purpose of carrying out an otherwise lawful activity.

- Reduced administrative process and associated cost for obtaining incidental take authorization from the Service;
- Increased options for obtaining incidental take authorization and mitigating for expected impacts on the Houston toad;
- Increased opportunities for financial and technical assistance with habitat improvement projects on private lands; and
- Increased opportunities for landowner to obtain a wildlife exemption from their property under Chapter 23, Subchapter D, Texas Tax Code.

1.4 Species to be Covered by the Permit

Amateur herpetologists first discovered the Houston toad near Houston, Texas in the late 1940's, and scientists described the toad as a distinct species in 1953 (Service 1984). The species has been known to occur in 12 Texas counties: Fort Bend, Harris, Liberty, Austin, Bastrop, Burleson, Colorado, Lavaca, Lee, Leon, Milam, and Robertson (Service 1984; Yantis and Price 1993; Kuhl 1997). However, biologists conducting surveys for the toad between 1984 and 1992 failed to find the species in Fort Bend, Harris, and Liberty counties or at several of the sites where they were previously known to occur in other counties (Hillis et al. 1984; Yantis and Price 1993). Currently, the toad is believed to exist in only nine counties: Austin; Bastrop; Burleson; Colorado; Lavaca; Lee; Leon; Milam; and Robertson (Figure 1-1). A possible Houston toad specimen was also collected in Freestone County, but the identification of this specimen is in dispute (Yantis 1990; Andy Price, Texas Parks and Wildlife Department (TPWD), pers. comm.). Due to indications of a decline in known toad populations, the Service listed the Houston toad as a federally endangered species on October 15, 1970, pursuant to the Endangered Species Conservation Act of 1969, which was subsequently replaced by the ESA in 1973 (35 Federal Register (FR) 16047).

The Houston toad is found only in parts of the eastern one-third of Texas, most often associated with forests over deep sandy soils. The Lost Pines area of Bastrop County supports the largest known and most studied population of Houston toads, and the Service designated approximately 82,400 acres (33,346 hectares) of the Lost Pines area as critical habitat for the species in 1978 (43 FR 4022; Bastrop County Environmental Network 1996-1999) (Figure 1-2). The Service also designated a small area of Burleson County near Lake Woodrow as critical habitat (43 FR 4022).

The bald eagle (*Haliaeetus leucocephalus*) is currently listed as a threatened species under the ESA (Service 2002a). This species occurs in Bastrop County as an uncommon to rare winter resident along the shores of Lake Bastrop and the Colorado River (Kutac and Caran 1994; Freeman 1996). Both of these areas are adjacent to, but outside of, the Plan Area. Since activities inside the Plan Area are unlikely to directly impact bald eagle habitat in Bastrop County, the County is not requesting incidental take authorization for this species. Therefore, the bald eagle will not be covered by this HCP.

The endangered Navasota ladies'-tresses (*Spiranthes parksii*) was first discovered in Bastrop County in September 2004, at the University of Texas' Stengl Lost Pines Biological Station. This initial identification was based solely on morphology; however, since the initial discovery genetic confirmation of the species as Navasota ladies'-tresses has been made (pers.comm., Charmaine Delmatier, 2004, Service Botanist).

The take prohibition for federally listed plants under the ESA is more limited than for listed animals. Section 9(a)(2)(B) of the ESA prohibits the removal of listed plants or the malicious damage of such plants on areas under Federal jurisdiction, or the destruction of listed plants on non-Federal areas in violation of state law or regulation. Thus, the ESA does not prohibit the incidental take of federally listed

plants on private lands unless the take or the action resulting in the take is in violation of state law. This, generally, eliminates the need for an incidental take permit for plants. However, because the section 7(a)(2) prohibition against jeopardy applies to plants as well as wildlife species, the Navasota ladies'-tresses will be considered in the Service's Biological Opinion developed as part of the HCP and permit application process. It should be noted that this was a previously unknown population that was not considered in the Recovery Plan for the species and thus, it is unknown whether it will be essential for the species' recovery. Critical habitat for this species will not be impacted since none has been designated.

1.5 Permit Duration

The LPHCP supports an application by Bastrop County to obtain a section 10(a)(1)(B) incidental take permit from the Service. The desired term for this permit is 30 years and the permit would authorize incidental take of the Houston toad within the 124,000-acre Plan Area during that period. A 30-year term ensures that estimates of take and required mitigation are based on solid data, such as human population growth and land development estimates. Beyond 30 years, these estimates generally become unreliable due to the inherent uncertainty in projecting trends over extended periods. The 30-year term should also be adequate for completing any mitigation measures required under this HCP.

Unless the permit is amended to extend its duration, no new take of the Houston toad would be authorized under the permit after it expires (potential increases in developed areas within clustered conservation subdivisions are allowed up to the minimum size of the Conservation Area, or 70 percent, after the LPHCP expires, in accordance with the *Conservation Subdivision Development Guidelines*; see Appendix C). However, mitigation that was required to compensate for the impacts from any permanent loss of Houston toad habitat that occurred under the permit (e.g., including the indirect impacts of residential or commercial land use in Houston toad habitat) would continue in accordance with the terms of legally binding, instruments recorded in public records pursuant to this HCP, unless the species becomes extinct.

1.6 Plan Area

The LPHCP Plan Area encompasses approximately 124,000 acres north of the Colorado River in Bastrop County (Figure 1-2), and represents approximately 28 percent of Bastrop County. The LPHCP Plan Area includes the approximately 13,863 acres (5,610 hectares) described in the "46-Subdivision EA/HCP" section 10(a)(1)(B) permits previously issued by the Service (Permit Numbers TE-025965-2-X and TE-025997-2-X). The area encompassed by these 46 subdivisions is referred to as the "46 subdivisions." The Plan Area, including the 46 subdivisions, is the area for which the authorization of incidental take of the Houston toad is sought and where mitigation efforts will be focused under this HCP. The Plan Area extends from the northeast section of the Bastrop-Lee county line to just north of the Colorado River. Portions of State Highway (SH) 71, the M-K-T railway, and the Colorado River delineate the southern extent of the Plan Area. The western boundary generally follows east of Camp Swift and Lake Bastrop, then turns west to include Bastrop State Park (SP) along SH 95. The eastern extent is bounded by SH 21, Farm to Market (FM) 2104, and FM 153.

The Plan Area, as recommended by the Workgroup, encompasses much of the potential Houston toad habitat in Bastrop County, and includes much of the critical habitat designated for the species by the Service in 1978. The Service's Austin office staff delineated an area of potential toad habitat on a map dated April 2000, which became the basis for the Plan Area boundary. The delineation of potential habitat was based on the geology, soils, and vegetation types that are known to support toad populations in Bastrop County. Based on information available at the time, Service staff excluded portions of the

critical habitat that are along part of the Colorado River and northwest of Lake Bastrop from the area of potential habitat (Scott Rowin, Service, pers. comm.).

1.7 Legal and Regulatory Framework for the LPHCP

1.7.1 Endangered Species Act and Related Policy

Section 9 of the ESA prohibits the taking of endangered species, where "take" is defined by section 3 of the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S. Code (U.S.C.) 1532(19)). "Harm" is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering (40 FR 44412; 46 FR 54748). However, the ESA provides an exception to section 9 for take that is incidental to otherwise lawful activities on privately owned lands via the issuance of a section 10(a)(1)(B) permit (also known as an incidental take permit) (16 U.S.C. 1532(19)).

The Secretary of the Interior (through the Service) may issue an incidental take permit provided the applicant prepares and implements an HCP that satisfies the following criteria specified in section 10(a)(2)(A) of the ESA:

1. The HCP identifies the impact that will likely result from the permitted taking;
2. The HCP describes the steps the applicant will take to minimize and mitigate for such impacts;
3. The HCP identifies the funding that will be available to implement the proposed minimization and mitigation measures;
4. The HCP discusses alternative actions to the proposed taking that the applicant considered and the reasons why such alternatives are not being utilized; and
5. The HCP includes other measures deemed necessary by the Secretary of the Interior, such as providing for monitoring pursuant to the implementing rules for the ESA (50 CFR part 17; 16 U.S.C. 1532(19)).

The Secretary of the Interior must also find that the proposed action meets the requirements of section 10(a)(2)(B) before an incidental take permit may be issued, such that:

1. The proposed taking will be incidental to otherwise lawful activities;
2. The applicant will, to the maximum extent practicable, minimize and mitigate for the impacts of such taking;
3. The applicant ensures adequate funding for the plan will be provided;
4. The proposed taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild;
5. The applicant has met other requirements imposed by the Secretary of the Interior, such as monitoring and reporting; and
6. The Secretary of the Interior has received assurances that the plan will be implemented (16 U.S.C. 1532(19)).

The Plan Area includes nearly the entire region designated as critical habitat for the Houston toad in Bastrop County. The Service may issue incidental take permits in critical habitat, if the permitted activity

meets the approval criteria listed above and ensures that the constituent elements of critical habitat will not be altered or destroyed by the proposed activities to the extent that the survival and recovery of affected species would be appreciably reduced (Service and National Marine Fisheries Service 1996).

The Service issued additional policy statements in recent years that are intended to enhance the effectiveness of the HCP process and provide assurances to landowners who are properly implementing approved HCPs, including "No Surprises" and the five-point policy. The Service issued a final No Surprises policy on February 23, 1998 (63 FR 8859) that provides assurances to incidental take permittees that no additional mitigation, including land, water, or funds, will be required of them (or their successors or assigns) in the event of unforeseen circumstances for species adequately covered by their HCP (see Section 10.0 for updates to the Service's No Surprises policy). These assurances apply as long as the permittee has fully and completely implemented the terms of the HCP, incidental take permit, and other associated agreements. The Service finalized the five-point policy on July 3, 2000, as an addendum to the *Habitat Conservation Planning Handbook* (65 FR 35242). The policy emphasizes the development of biological goals and objectives, adaptive management strategies, monitoring provisions, permit duration considerations, and public participation in HCPs as a way to increase their effectiveness. The LPHCP addresses each of the criteria for permit issuance and incorporates all aspects of the five-point policy.

1.7.2 Texas Parks and Wildlife Code (Chapter 83, Subchapter B)

Under Texas law, counties have no inherent powers; all legal authority must be explicitly granted by the state constitution or by state law. In response to a "regional habitat conservation plan" (RHCP) adopted in Travis County, the Texas Legislature in 1999 significantly redrafted the statute that authorized counties and other political subdivisions of the state to develop and implement "regional habitat conservation plans." One of the stated purposes of Chapter 83, Subchapter B of the Texas Parks and Wildlife Code is to "encourage governmental entities to use the authority under this subchapter to develop and implement habitat conservation plans instead of regional habitat conservation plans."

Section 83.011(6) of the Parks and Wildlife Code defines a "Habitat Conservation Plan" as "a plan or program to protect endangered species by habitat preserves or other protection strategies developed in order to obtain a federal permit: (A) that does not require the regulation of non-habitat preserve land; and (B) for which the land to be used as habitat preserves, at the time of application for the federal permit: (i) is owned by a plan participant; or (ii) is subject to a contract agreed to by each owner of land in the habitat preserve or proposed habitat preserve providing that all or part of the owner's land be used or managed as a habitat preserve."

Section 83.011(12) of the Parks and Wildlife Code defines a "Regional Habitat Conservation Plan" as "a plan or program to protect endangered species by habitat preserves or other protection strategies developed in order to obtain a federal permit that requires the acquisition or regulation of land or interests in land not owned by a plan participant at the time of application for a federal permit."

In general, Chapter 83, Subchapter B of the Texas Parks and Wildlife Code imposes various procedural and financial requirements in connection with the study, development, application, and implementation of a RHCP. For reasons discussed in Section 1.7.3, Bastrop County has decided to develop an HCP rather than a RHCP. However, Bastrop County has complied with many of the procedural requirements that apply only to RHCPs, such as private landowner representation and guidance from a BAT, in an effort to improve the final LPHCP. The requirement for public meetings and stakeholder involvement in the planning process also meets several of the goals of the Service's five-point policy.

1.7.3 Bastrop County Policies

Bastrop County is primarily a rural jurisdiction with a very limited tax base and generally strong support for private property rights. In response to concerns regarding the potential legal and financial liabilities resulting from holding an incidental take permit, the Workgroup, in consultation with members of the Bastrop County Commissioners' Court, recommended five policies to help guide Bastrop County's decision to accept this responsibility (Houston Toad Community Conservation Project 2002):

1. Bastrop County will not commit local tax revenues for land acquisition under the permit;
2. Bastrop County's liability and enforcement responsibilities must be limited and consistent with state law. Bastrop County will not be held responsible if a land owner or local interest does not participate in the LPHCP;
3. The Service shall maintain responsibility for enforcing the ESA[3];
4. Participation in the HCP by local interests shall be voluntary and will be one of multiple options for complying with the ESA. Bastrop County will not condition approval of subdivisions or other licensing activities based on endangered species issues; and
5. County staffing needs for administration of the HCP shall be minimized to one or two staff members. Additional resources may be procured through inter-local agreements or other contract options.

The Workgroup, incorporating the opinions and values of the local community, identified additional requirements for the development and implementation of this proposed HCP (Houston Toad Community Conservation Project 2001a). These requirements include:

1. Ensuring that the proposed HCP meets the standards required for approval of an incidental take permit under section 10(a)(1)(B) of the ESA;
2. Developing a process for complying with the ESA that is fair, simple, and straightforward;
3. Providing certainty regarding mitigation requirements for individual participants in the HCP;
4. Minimizing administrative costs for HCP implementation to help maximize funds available for conservation measures;
5. Building mechanisms into the HCP that provide for a self-funding program; and
6. Engaging the local community during the development of policies to protect the Houston toad and to participate in the LPHCP.

The policies of the Commissioners' Court and Workgroup guided the development of innovative and flexible strategies for conserving the Houston toad and its habitat. These strategies, described in Section 6.0, also ensure that the conservation value of available funds is maximized to the greatest extent possible.

1.8 Other Local Houston Toad Conservation Efforts

Since the designation of critical habitat for the Houston toad in 1978 (43 FR 4022), Bastrop County has been recognized as an important area for the recovery and continued survival of the Houston toad. Prior to the development of this HCP, a number of other conservation efforts were implemented or under

[3] The US Congress has given the Fish and Wildlife Service the authority to implement the Endangered Species Act of 1973, as amended.

development, including the establishment of a conservation fund, development of individual HCPs, and preparation of the 1984 Houston Toad Recovery Plan. These efforts contribute to the regional conservation effort within Bastrop County that this HCP aims to help expand and coordinate.

1.8.1 Houston Toad Recovery Plan

The current Houston Toad Recovery Plan was written in 1984 and was based primarily on data from the late-1970s and earlier. The Service has begun the process of revising the recovery plan; however, no new guidance is available to the public at this time. Unfortunately, the 1984 plan is out of date with respect to the distribution and status of the Houston toad and development and land use trends in Bastrop County. However, the HCP does identify some of the threats to the species that may result from residential development, recreational development of parks, cattle grazing, raising crops, road construction and maintenance, herbicide and pesticide use, mining, and other types of land uses common in Bastrop County at the time. Fire and the use of prescribed burns as a management tool had been identified as potential threats to the species and its habitat (Service 1984). However, controlled burns within Bastrop SP are being monitored for possible long-term benefits to the Houston toad. Long-term non-management of mono-culture forests (especially pine) is suspected of evolving into unfavorable habitat conditions for the Houston toad and of increasing the likelihood of catastrophic, uncontrolled fires within the forest (Forstner pers. comm.).

The recovery plan states that self-sustaining populations of Houston toads must be present in at least five Texas counties for the species to be delisted. To reach recovery goals across the range of the species, the 1984 Houston Toad Recovery Plan lists the following necessary recovery efforts (Service 1984):

1. Maintain and enhance existing Houston toad populations in their present habitats by monitoring existing populations and habitats, identifying population needs and habitat requirements, and protecting existing populations;
2. Locate additional natural populations of Houston toads through systematic searches and monitoring;
3. Determine the systematic status and taxonomic relationships of the Houston toad and similar species;
4. Restore and manage populations of Houston toads in suitable areas of its former range by identifying suitable habitat, developing management plans, introducing new populations of Houston toads, and continued monitoring and management of reestablished populations; and
5. Enforce all federal and state laws protecting populations and habitats of the Houston toad by coordinating agencies and disseminating information about the species.

While the ESA does not require HCPs to provide for the recovery of a listed species, considering recovery goals and objectives in the HCP process will help provide a net benefit to the conservation of the species. The LPHCP incorporates these recommendations, as applicable, into the biological goals listed in Section 6.1, and is designed to aid in the recovery of the Houston toad.

1.8.2 State Parks and Other Public Lands in the Plan Area

The TPWD holds two state parks in Bastrop County: Bastrop State Park which is comprised of approximately 5,800 acres (2,347 hectares) and Buescher SP which is comprised of approximately 1,017 acres (412 hectares). The largest known population of Houston toads is located in Bastrop SP. Approximately 1,700 individual Houston toads were tagged by TPWD within one watershed in Bastrop SP between 1990 and 1996 (TPWD 1997). The University of Texas Cancer Center also owns

approximately 717 acres (290 hectares) adjacent to Buescher SP. Each of these publicly owned lands are located within the Plan Area and contain large areas of known or potential Houston toad habitat.

Approximately 5,300 acres (2,145 hectares) of Bastrop SP are permanently dedicated to the protection and management of the Houston toad, with the remaining 500 acres (202 hectares) of Bastrop SP are developed for recreational activities and not managed as toad habitat. The designation of Bastrop SP as a dedicated Houston toad preserve was required by an ESA section 7 consultation between the National Park Service and the Service in 1995 that allowed TPWD to expand the Lost Pines Golf Course (Service 1995). Authorization of the golf course expansion resulted in the increase of Bastrop SP from approximately 3,500 acres (1,416 hectares) to 4,500 acres (1,821 hectares) in January 2000 (TPWD 2000). Subsequent additions to Bastrop SP in 2001 (see Section 1.8.3) increased the acreage of the park to approximately 5,800 acres.

Buescher SP is located approximately 12 miles (19 kilometers) southeast of Bastrop SP, and contains habitat similar to that found on Bastrop SP. Houston toads have been observed in Buescher SP (Service 1984), and toads have recently been heard calling near the park (Forstner 2002b). However, recent surveys have not been conducted in Buescher SP to reaffirm the presence of the species on the property. Further, no special management provisions or habitat designations have been made for Houston toads in Buescher SP by TPWD (Brent Leisure, TPWD, pers. comm.).

The University of Texas Cancer Center acquired approximately 717 acres (290 hectares) of Buescher SP from TPWD in 1968 (Buescher SP was approximately 1,738 acres (703 hectares) at the time of the acquisition) (TPWD 2002a; Ronnie Ray, TPWD, pers. comm.). Use of the property is restricted to research purposes and for a science park. However, as part of a deal in 1986 to create a new entrance to the property, the University of Texas was to dedicate a portion of the tract for recreational use (i.e., hiking trails and camp sites) and place a conservation easement on other areas. These recreation and conservation agreements were never completed (Ronnie Ray, TPWD, pers. comm.). The property is not currently managed for Houston toad habitat.

1.8.3 Houston Toad Conservation Fund

The Service established the Houston Toad Conservation Fund (HTCF) in 1998 that is administered by the National Fish and Wildlife Foundation (NFWF) (Service and NFWF 1998). NFWF is a private, non-profit organization created by Congress in 1984 to support "the conservation of native fish, wildlife, plants and their habitats by attracting diverse investments to conservation and encouraging locally supported stewardship on private and public lands" (NFWF 2002). The HTCF collects mitigation fees and other contributions to be used exclusively for land acquisition and management of Houston toad habitat.

As of April 2005, the Service had issued 183 section 10(a)(1)(B) permits encompassing a total area of 383.6 acres (155.2 hectares) under the Service's 46-Subdivision HCP. The Service also issued an additional 51 individual section 10(a)(1)(B) permits covering a total area of 787.6 acres (318.7 hectares). Two additional incidental take permits have been issued for activities in Bastrop County. One permit was issued to the Boy Scouts of America, Capital Area Council, for the development and operation of an approximately 4,848-acre (1,962 hectares) high adventure Boy Scout camp in Bastrop County, and the second permit was issued to several utility companies (collectively referred to as the "Utilities") for activities related to installation, upgrading, and maintenance of utility infrastructure in a 142,526 acre (57,677 hectares) service area in Bastrop and Lee counties. These acreage totals reflect the total area of properties and not an estimate of "take" in terms in habitat. As of December 2005, the HTCF collected approximately $742,369 from local public and private mitigation fees, and had a fund balance of

approximately $226,743.65 (Scott Rowin, Service, pers. comm.). Of this account balance, $166,372.84 is encumbered for Bastrop County to purchase land, leaving $60,370.81 in unencumbered funds in the account. Major accomplishments supported by HTCF funds include providing leverage for two Service ESA section 6 grants awarded to County of Bastrop. In Fiscal Year (FY) 2000, the Service awarded Bastrop County and TPWD a $1.5 million HCP Land Acquisition challenge grant under section 6 of the ESA, using funds from the HTCF and TPWD as a local match to provide a total of approximately $2 million (Service et al. 2000). TPWD used this grant in 2001 to purchase 1,275 acres (516 hectares) adjacent to Bastrop SP, which increased the total size of the state park to approximately 5,800 acres (TPW 2001). The Service awarded a similar grant to Bastrop County in FY2001 for $900,000, which was also matched by HTCF dollars for a total of $1.2 million to be used for Houston toad habitat acquisition. The Bastrop County used this grant in 2003 to purchase approximately 400 acres (162 hectares). The acquired acreage is adjacent to the Griffith League Ranch, (owned by the Capitol Area Council of the Boy Scouts of America (BSA)) and is managed by Southwest Texas State University (Texas State University 2003).

1.8.4 46-Subdivision EA/HCP

The Service's Austin Ecological Service Field Office developed the 46-Subdivision EA/HCP to support individual 10(a)(1)(B) permit applications by private landowners in 46 existing subdivisions in Bastrop County (Service 2001a). The two permits issued under the 46-Subdivision EA/HCP (one addressing subdivisions in low-quality habitat and one addressing subdivisions in medium-quality habitat) were initially approved on August 28, 2000, and revised on July 10, 2001. This umbrella EA/HCP significantly streamlined the section 10(a)(1)(B) permitting process for the construction and occupation of single-family residences and other similar structures on up to 0.5 acre (0.2 hectare) of a covered tract in any of the designated subdivisions.

The 46-Subdivision EA/HCP and its associated permits covered residential construction and associated structures in 46 existing subdivisions platted before 1995 within the Plan Area and included approximately 9,220 undeveloped lots covering approximately 6,609 undeveloped acres (2,675 hectares) at the time they were approved (Service 2001a). As of April 2005, the Service issued approximately 183 permits under the 46-Subdivision EA/HCP.

Landowners participating in the 46-Subdivision EA/HCP pay a mitigation fee of $1,000 to $1,500 per 0.5 acre impacted, depending on the quality of Houston toad habitat in the subdivision. Mitigation fees collected under the 46-Subdivision EA/HCP are held in the HTCF. Other standardized minimization measures required under the EA/HCP include the retention of the natural vegetation on the remainder of the tract, the use of appropriate erosion control measures on construction sites, efforts to reduce the impact of red imported fire ants (*Solenopsis invicta*), the avoidance or minimization of the use of herbicides and pesticides, and the protection of wetlands and other temporary ponds on the property (Service 2001a).

Bastrop County will assume responsibility under the LPHCP for issuing certificates of participation, based on criteria set forth in the HCP, for those who want to construct homes or other similar structures on undeveloped lots within the 46 subdivisions and obtain incidental take authorization. Upon issuance of the federal incidental take permit for the LPHCP, the 46-Subdivision EA/HCP will cease to be a stand-alone permitting option. Bastrop County will use collected funds to implement the LPHCP. All Permitees previously issued a 46-Subdivision permit must adhere to the mitigation requirements described in their permit, rather than mitigation required under this HCP.

1.8.5 Boy Scouts of America EA/HCP for the Griffith League Ranch

Capitol Area Council #564 of the Boy Scouts of America (BSA) submitted a final draft EA/HCP to the Service on November 25, 2002, to support the issuance of a section 10(a)(1)(B) incidental take permit for the Houston toad (BSA and Service 2002). The incidental take permit was issued on November 5, 2003. The EA/HCP covers the proposed development of a "high adventure" Boy Scout camp on the 4,848-acre Griffith League Ranch (GLR) located within the Plan Area. The GLR contains occupied Houston toad habitat and represents one of the largest blocks of woodland/forest vegetation in the Plan Area.

The proposed "high adventure" camp (the Preferred Alternative identified in the EA/HCP) would feature the phased development of a conference center, museum, ranch headquarters, chapel, computer lab, dormitories, three-hole golf course, lakes, camping areas, wrangler's quarters, ranger's residence, horse stable, livestock pastures, trails, and other improvements. The proposed camp would subject approximately 19 percent of the property (914 acres (370 hectares)) to high- or medium-impact land uses (BSA and Service 2002). The remaining 81 percent would have low impacts and be managed for ecosystem health and preservation of the toad.

Minimization of impacts to the Houston toad resulting from the proposed development on the GLR would occur via the preparation and implementation of various resource management plans to guide activities on the property. Mitigation for unavoidable impacts would occur through the designation of a conservation easement on Houston toad habitat within the GLR at a rate of one acre (0.4 hectare) of protected habitat for every one acre impacted by high disturbance activities and 0.6 acre (0.24 hectare) of protected habitat for every one acre impacted by moderate disturbance activities whether or not these activities disturbed actual habitat. Mitigation for low impact disturbances would occur by the implementation of education and research programs under the proposed EA/HCP. Additionally, the BSA established a conservation bank in 2004 of Houston toad habitat from which mitigation credits not used by the BSA could be sold to other parties needing to offset development activities elsewhere within Houston toad habitat (BSA and Service 2002).

1.8.6 Utility HCP

Aqua Water Supply Corporation, the Lower Colorado River Authority (LCRA), Bluebonnet Electric Cooperative, Inc., and Austin Energy (collectively, the "Utilities") cooperatively prepared and submitted a final draft EA/HCP to the Service in July 2003 to support an application for an incidental take permit. The incidental take permit for this HCP was issued on August 19, 2005, and will allow the Utilities to conduct otherwise lawful utility-related actions, while avoiding, minimizing, and mitigating for potential adverse impacts on the Houston toad in a cost-effective and efficient manner that facilitates long-term budgetary planning. The EA/HCP proposes to avoid impacts to the bald eagle. The Utilities' requested incidental take permit and final draft EA/HCP cover an approximately 142,526-acre area in Bastrop and Lee counties that includes Houston toad habitat within their combined service areas. The term of the requested permit and final draft EA/HCP is 30 years (SWCA Environmental Consultants 2003).

Activities for which the Utilities are seeking incidental take authorization include the maintenance, repair, upgrade, and new installation of linear facilities (e.g., transmission lines, distribution lines, water and wastewater lines, rights-of-way, fence lines, and trails) and fixed-foundation facilities (e.g., substations, lift stations, telecommunication facilities, storage tanks, wells, pump stations, standpipes, park pavilions, cabins, and restrooms). The proposed EA/HCP estimates that covered activities will impact approximately 6,792 acres (2,749 hectares) of the permit area of which approximately 92 percent (6,265 acres (2,535 hectares)) are or will be located within an existing right-of-way or are on an existing facility at the time the application was submitted. Avoidance and minimization measures proposed in the

EA/HCP include Best Management Practices that address: employee/contractor training; avoidance of Houston toad habitat; precautions for pesticide, herbicide, and fungicide use; monitoring of installation and construction activities; tree protection within rights-of-way; restoration of disturbed areas with native plant species; and other items (SWCA Environmental Consultants 2003).

The Utilities will pay a mitigation fee for all covered activities in the permit area, regardless of the actual location or amount of Houston toad habitat impacted by any particular activity. Mitigation for the construction of new linear facilities would occur at a ratio of 0.15 acre (0.06 hectare) of mitigation for each 1 acre of construction area. Mitigation for the construction of new fixed-foundation facilities would occur at a ratio of 1.05 acres (0.42 hectare) of mitigation funds for each 1 acre permanently occupied by non-vegetative cover, and a ratio of 0.15 acre of mitigation for each 1 acre cleared during construction and later revegetated. Additionally, the Utilities would contribute $20,000 annually during the term of the permit as mitigation for the ongoing repair and maintenance of facilities. Mitigation funds would be used for land acquisition and management, biological monitoring, research, and other Houston toad conservation efforts in Bastrop and Lee counties, and would be increased annually to account for inflation and rising costs of land acquisition (SWCA Environmental Consultants 2003). A committee of representatives of the Applicants, advised by Bastrop and Lee counties, the Service, the TPWD, and members of the Houston toad recovery team would determine how mitigation funds generated by the requested permit would be expended for toad conservation.

1.8.7 Safe Harbor Agreements

The Service's "Safe Harbor" policy was finalized on July 19, 1999 (64 FR 32717), and allows the Service to enter into voluntary agreements with private and non-federal landowners wishing to maintain or improve habitat for listed species on their property. The Safe Harbor policy permits the incidental take of the listed species on the property at a level that allows the landowner to return the land to baseline conditions that were present prior to the implementation of habitat management practices (64 FR 32717). Because of the flexibility allowed by a Safe Harbor, it does not count toward recovery goals for the species.

Mr. Robert K. Long and family, with the assistance of Environmental Defense, have finalized a Safe Harbor Agreement with the Service for the Houston toad on approximately 540 acres (218 hectares) within the Plan Area. The net benefits of this Safe Harbor Agreement include the creation and enhancement of Houston toad habitat, the collection of research data on the species and effectiveness of management strategies, and the demonstration of the application of the Safe Harbor policy for the Houston toad in Bastrop County (Long et al. 2003).

The Robert K. Long Safe Harbor Agreement allows the Long family to implement conservation measures for the Houston toad despite the potential for incidental take. Conservation measures proposed by the Robert K. Long Safe Harbor Agreement include creating breeding ponds, excluding cattle from toad breeding areas, thinning understory vegetation, creating brush piles and wooded corridors between ponds and woodlands, developing a prescribed fire plan, and treating red imported fire ants. The Safe Harbor Agreement also requires monitoring of conservation measures and reporting to document progress and effectiveness (Long et al. 2003).

At the end of the permit term of the Safe Harbor Agreement (12 years), the Long family may return the property to baseline conditions, if desired, by discontinuing Houston toad management practices, returning cattle to excluded areas, removing ponds, and similar actions (Long et al. 2003).

Small Family Investments, with the assistance of Environmental Defense, have finalized a Safe Harbor Agreement with the Service for the Houston toad on approximately 836 acres (338.3 hectares) within the

Plan Area. The net benefits of this Safe Harbor Agreement include the creation and enhancement of Houston toad habitat, the collection of research data on the species and effectiveness of management strategies, expansion and enhancement of potential breeding, foraging, and hibernating habitats for the Houston toad and demonstrating that habitat conservation measures can be implemented on private lands that will benefit both the Houston toad and the private landowner. (Small et al. 2006)

The Small Ranch Safe Harbor Agreement allows the Long family to implement conservation measures for the Houston toad despite the potential for incidental take. Conservation measures proposed by the Robert K. Long Safe Harbor Agreement include the implementation of prescribed fires and brush thinning to support the initial and ongoing implementation of prescribed fires.

At the end of the permit term of the Safe Harbor Agreement (12 years), the Small family may return the property to baseline conditions, if desired, by discontinuing Houston toad management practices and discontinuing the creation and maintenance of an open understory and native bunchgrass. (Small et al. 2006).

2.0 ENVIRONMENTAL SETTING

Bastrop County, and the Plan Area in particular, is rich with natural resources, including pine forests, oak woodlands, lakes and ponds, and abundant wildlife. The unique character of the Lost Pines, which provides habitat for the Houston toad, also attracts a growing human population to this historically rural county. A description of the climate, land and water resources, wildlife, vegetation, and human population follows. Additional information on the characteristics of the Plan Area can be found in Section 3.0 of the Environmental Assessment.

2.1 Climate

Bastrop County experiences a modified maritime climate that is subtropical and humid, with hot summers and relatively mild winters (Soil Conservation Service (SCS) 1979; Larkin and Bomar 1983). According to the National Water and Climate Center (1999) for data collected at the National Weather Service Cooperative Network climatic station at Smithville from 1961 through 1990, the average annual high temperature was 79.0° Fahrenheit (F) (26.1° Celsius) and the average annual low temperature was 54.8° F (12.6° Celsius). The average monthly high temperature was greater than 90° F (32.2° Celsius) during June, July, August, and September. The average monthly low temperature was lower than 40° F (4.4° Celsius) from December through February, but was not below 32° F (0° Celsius) in any month (National Water and Climate Center 1999).

Summers tend to be hot and dry, with relatively consistent daily conditions, while winter weather is characterized by short spans (36 to 72 hours) of cold temperatures interspersed with more mild temperatures (SCS 1979). The growing season generally extends from early March through late November, although freezing temperatures have been recorded as early as late October and as late as the end of April (SCS 1979; National Weather Service 2002).

Average annual precipitation at the Smithville climate station was 37.2 inches (94.5 centimeters), with an average of 49 days per year receiving at least 0.1 inch (0.25 centimeters) of precipitation. The months of May, June, September, and October generally received the most rain each year (average monthly precipitation was greater than 3.5 inches (8.89 centimeters), while July and August received an average of less than 2.25 inches (7.87 centimeters) of rain (National Water and Climate Center 1999).

Extreme weather events are common in Texas, including droughts and floods. Severe to extreme droughts (events with a Palmer Drought Severity Index of –3.0 or less) have occurred in the Texas Gulf Coast basin, which includes Bastrop County, at least once every 10 years between 1895 and 1995 (National Drought Mitigation Center 1996). The most severe drought in Texas on record occurred between approximately 1950 and 1957. Similar events may be expected every 50 to 100 years (Votteler 2000).

Flash flooding is a regular part of the Texas climate and is caused by tropical weather systems, hurricanes, or slow-moving thunderstorms. There is a one percent chance of between 10 and 11 inches (25.4 and 27.9 centimeters) of rain falling within a 24-hour period in Bastrop County in any year (Hershfield 1961). This amount of rainfall is sufficient to produce serious flooding, especially along normally dry or slow-flowing waterways. Approximately nine percent of the Plan Area lies within the 100-year floodplain and has a 26 percent chance of being inundated within a 30-year period (Federal Emergency Management Agency (FEMA) 1996).

2.2 Topography and Geology

Bastrop County is within the Gulf Coastal Plains physiographic province of Texas (Bureau of Economic Geology (BEG) 1996). This province has relatively little topographic relief, and elevations in Bastrop County range from approximately 400 feet (122 meters) above mean sea level (MSL) to approximately 600 feet (183 meters) MSL (SCS 1979). The terrain is generally gently sloping to moderately steep (SCS 1979).

Several geologic formations outcrop within the Plan Area, including three recent deposits from the Quaternary age and several other Tertiary-aged formations (Figure 2-1). The most recent geologic formations in the Plan Area are alluvium (Qal), fluviatile terrace deposits (Qt), and high gravel deposits (Qhg). Each of these recent deposits are composed of various proportions of sand, silt, clay, and gravel, and are generally found in the floodplains and lowlands surrounding the Colorado River and other larger streams in the Plan Area, such as West Yegua Creek, Pin Oak Creek, and Piney Creek (BEG 1981).

The Tertiary-aged geologic formations within the Plan Area include the Yegua (Ey), Cook Mountain (Ecm), Sparta Sand (Es), Weches (Ew), Queen City Sand (Eqc), Reklaw (Er), Carrizo Sand (Ec), and Calvert Bluff (Ecb) formations. These formations generally consist of sandstones, mudstones, sands, and clays that run in bands oriented northeast to southwest. The Sparta Sand, Queen City Sand, and Carrizo Sand formations provide friable, deep sandy soils that contribute to Houston toad habitat (BEG 1981).

2.3 Soils

Broad soil associations mapped within the Plan Area include the Patilo-Demona-Silstid, Axtell-Tabor, Crockett-Wilson, Behring-Crockett-Heiden, and Bosque-Smithville-Norwood associations. However, the Patilo-Demona-Silstid association, typically located on uplands, and the Axtell-Tabor association that is also found on bottomlands make up the majority of the Plan Area. The Patilo-Demona-Silstid association contains dominant soil series with fine-textured sandy surface layers underlain by sandy clay loams, clay loams, or sandy clays. The permeability of these lower soil horizons is moderate to moderately slow. The dominant soil series of the Axtel-Tabor association generally have a fine sandy loam surface layer underlain with mottled clays or sandy clays. These underlying clayey layers are generally very slowly permeable (SCS 1979).

Deep sandy soil types, principally of the Patilo, Demona, and Silstid soil series, have fine sands or loamy fine sands to a depth of 52 inches (132 centimeters) for Patilo series soils or 28 inches (71 centimeters)

for Demona and Silstid series soils. These sandy surface soils tend to be loose, moist, and slightly acidic, and cover approximately 40 percent of the Plan Area (Figure 2-2) (SCS 1979; NRCS 2002).

2.4 Water Resources

The major aquifer system underlying the Plan Area is the Carrizo-Wilcox Aquifer. Two minor aquifers, the Queen City Aquifer and Sparta Aquifer, also underlie portions of the Plan Area (Ashworth and Hopkins 1995). Other major water sources in the area include the Colorado River and Lake Bastrop.

The Plan Area lies primarily within the Colorado River Basin; however, several streams in the northern portion of the Plan Area contribute to Yegua Creek, a tributary to the Brazos River Basin. The divide separating the Colorado River and Brazos River basins roughly follows U.S. Highway (US) 290 through the Plan Area. Major intermittent streams within the Plan Area include Piney Creek, Alum Creek, West Yegua Creek, Pin Oak Creek, and Gravelly Creek. In addition, numerous named and unnamed intermittent and ephemeral streams also occur within the Plan Area (Figure 2-3).

The larger impounded waters within the Plan Area include Lake Bastrop, Buescher Lake, Droemer Lake, Lake Thunderbird, and several small lakes in Bastrop SP. In addition, numerous small, excavated stock ponds also occur throughout the Plan Area. According to the FEMA Flood Insurance Rate Maps (FIRMs) of Bastrop County, areas within the 100-year floodplain have been identified along the Colorado River, as well as along numerous intermittent streams throughout the project area, including Piney Creek, Alum Creek, West Yegua Creek, Pin Oak Creek, Gravelly Creek, and associated tributaries (Figure 2-3).

2.5 Vegetation

The Plan Area lies primarily within the Post Oak Savannah vegetation area of Texas, with a small portion of the Plan Area classified as Blackland Prairie (Hatch et al. 1990). Vegetation types within the Plan Area include pine hardwood forest, post oak woodland and forest mosaic, post oak woodland/forest/grassland mosaic, and areas of introduced vegetation, such as improved pasture and crops (Figure 2-4) (Hatch et al. 1990). The loblolly pine (*Pinus taeda*) forest in Bastrop County, known as the "Lost Pines," is a unique feature of the Plan Area. The Lost Pines are a disjunct segment of the pine forests of east Texas, being separated from these more extensive forests by approximately 100 miles (161 kilometers). The underlying geology of the area, primarily the Carrizo Sands formation, provides the deep, moist, acidic, and sandy soils necessary for the loblolly pines to persist (van Buijtenen et al. 1976; Maxwell 1970).

A list of common plant species found in forested or wooded vegetative communities, native grasslands, pastures and crop fields, and riparian areas is included in Section 3.3 of the LPHCP Environmental Assessment (EA).

2.6 Wildlife

Wildlife found in Bastrop County is generally typical of those of the Post Oak Savannah vegetation area of Texas, as well as those adapted to the pine-oak woodlands of the Lost Pines area.

Bastrop County currently has over 200 documented species of birds (Freeman 1996). A discussion of the common bird species documented in Bastrop County is included in Section 3.4 of the LPHCP EA. Notably, Bastrop County represents the southwestern-most range of the pileated woodpecker (*Dryocopus pileatus*) and pine warbler (*Dendroica pinus*), and the western range extension of the Kentucky warbler

(*Oporornis formosus*), hooded warbler (*Wilsonia citrina*), and Swainson's warbler (*Limnothlypis swainsonii*) (Rappole and Blacklock 1994).

Documented mammals in Bastrop County include the white-tailed deer (*Odocoileus virginiana*), common raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), black-tailed jackrabbit (*Lepus californicus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), common gray fox (*Urocyon cinereoargenteus*), bobcat (*Lynx rufus*), ringtail cat (*Bassariscus astutus*), Virginia opossum (*Didelphis virginiana*), fox squirrel (*Sciurus niger*), eastern cottontail (*Sylvilagus floridanus*), nine-banded armadillo (*Dasypus novemcinctus*), eastern red bat (*Lasiurus borealis*), eastern mole (*Scalopus aquaticus*), short-tailed shrew (*Blarina* sp.) Attwater's pocket gopher (*Geomys attwateri*), white-footed mouse (*Peromyscus leucopus*), northern pygmy mouse (*Baiomys taylori*), hispid cotton rat (*Sigmodon hispidus*), Brazilian free-tailed bat (*Tadarida brasiliensis*), cave myotis (*Myotis velifer*), eastern flying squirrel (*Glaucomys volans*), and eastern spotted skunk (*Spilogale putorius*) (Davis and Schmidly 1994). See Section 3.4 of the LPHCP EA for additional information on the mammals of Bastrop County.

Amphibians documented in Bastrop County include the smallmouth salamander (*Ambystoma texanum*), cricket frog (*Acris crepitans*), green toad (*B. debilis*), Houston toad, Texas toad (*B. speciosus*), Gulf coast toad (*B. valliceps valliceps*), Woodhouse's toad (*B. woodhousii*), eastern narrowmouth toad (*Gastrophryne carolinensis*), great plains narrowmouth toad (*G. olivacea*), Cope's gray treefrog (*Hyla chrysoscelis*), green treefrog (*Hyla cinerea*), gray treefrog (*H. versicolor*), spotted chorus frog (*Pseudacris clarki*), Strecker's chorus frog (*P. streckeri*), striped chorus frog (*P. triseriata*), Rio Grande leopard frog (*Rana berlandieri*), bullfrog (*R. catesbeiana*), green frog (*R. clamitans*), southern leopard frog (*R. sphenocephala*), Couch's spadefoot (*Scaphiopus couchi*), and Hurter's spadefoot (*S. hurteri*) (Dixon 2000).

Reptiles in Bastrop County include the American alligator (*Alligator mississippiensis*), spiny softshell (*Trionyx spiniferus*), common snapping turtle (*Chelydra serpentina serpentina*), Texas map turtle (*Graptemys versa*), yellow mud turtle (*Kinosternon flavescens flavescens*), river cooter (*Pseudomys texana*), eastern box turtle (*Terrapene carolina*), ornate box turtle (*T. ornata ornata*), red-eared slider (*Trachemys scripta elegans*), green anole (*Anolis carolinensis*), Texas spotted whiptail (*Cnemidophorus gularis gularis*), six-lined racerunner (*C. sexlineatus*), eastern collared lizard (*Crotaphytus collaris collaris*), spot-tailed earless lizard (*Holbrookia lacerata*), Texas horned lizard (*Phrynosoma cornutum*), Texas spiny lizard (*Sceloporus olivaceus*), fence lizard (*S. undulatus*), ground skink (*Scincella lateralis*), and tree lizard (*Urosaurus ornatus*) (Dixon 2000; Society for the Study of Amphibians and Reptiles 2000).

Several snakes occur in Bastrop County, including the broad-banded copperhead (*Agkistrodon contortrix laticinctus*), western cottonmouth (*A. piscivorus*), eastern glossy snake (*Arizona elegans arenicola*), eastern racer (*Coluber constrictor*), western diamondback rattlesnake (*Crotalus atrox*), corn snake (*Elaphe guttata*), Texas rat snake (*E. obsoleta lindheimeri*), eastern hognose snake (*Heterodon platyrhinos*), prairie kingsnake (*Lampropeltis calligaster*), common kingsnake (*L.s getula*), western coachwhip (*Masticophis flagellum testaceus*), Texas coral snake (*Micrurus fulvius*), plain-bellied watersnake (*Nerodia erythrogaster*), southern watersnake (*N. fasciata*), diamondback watersnake (*N. rhombifera*), rough greensnake (*Opheodrys aestivus*), bullsnake (*Pituophis catenifer sayi*), Texas long-nosed snake (*Rhinocheilus lecontei*), mountain patch-nosed snake (*Salvadora grahamiae*), Texas brownsnake (*Storeria dekayi*), flat-headed snake (*Tantilla gracilis*), checkered gartersnake (*Thamnophis marcianus*), orange-stripped ribbonsnake (*T. proximus proximus*), and rough earthsnake (*Virginia striatula*) (Dixon 2000, Society for the Study of Amphibians and Reptiles 2000). The timber rattlesnake (*C. horridus*) was also recently documented in Bastrop County (Ahlbrandt et al. 2002).

Some of the major fish species that are likely to occur in the Plan Area include predatory species, such as gar (*Lepisosteus* sp.), black bass (*Micropterus* sp.), and flathead catfish (*Pylodictus olivaris*). Others are considered forage species, including a variety of shiners (mostly *Notropis* spp.) and minnows (*Pimephales* spp.), gizzard shad (*Dorosoma cepidianum*), and sunfish (*Lepomis* spp.). Largemouth bass (*M. salmoides*), Guadalupe bass (*M. treculi*), channel catfish (*Ictalurus punctatus*), flathead catfish, white crappie (*Pomixis anularis*), and several sunfish species are pursued by recreational anglers (LCRA 2002).

A variety of other freshwater organisms occur in the rivers, streams, creeks, lakes, and ponds of Bastrop County. Section 3.4 of the LPHCP EA includes a discussion of some of the more common freshwater mussles and aquatic invertebrates found in Bastrop County waters.

The Houston toad and bald eagle are the only federally listed species known to occur in Bastrop County (Service 2002b). These species are also listed by TPWD as endangered or threatened, respectively. Other state-listed threatened or endangered species identified by TPWD as possibly occurring in Bastrop County (some may be only likely to occur as a potential migrant species) are the whooping crane (*Grus americana*), arctic peregrine falcon (*Falco peregrinus tundrius*), wood stork (*Mycteria americana*), blue sucker (*Cycleptus elongatus*), timber rattlesnake, and Texas horned lizard (TPWD 2002b).

Other rare species occurring in Bastrop County include, but are not limited to, Henslow's sparrow (*Ammodramus henslowii*), mountain plover (*Charadrius montanus*), cave myotis, Elliot's short-tailed shrew (*Blarina hylophaga hylophaga*), plains spotted skunk, spot-tailed earless lizard, and Texas gartersnake (*T. sirtalis annectens*) (TPWD 2002b). Populations of these species do not currently merit a federal or state listing status. However, these species are tracked by TPWD and would likely benefit from the conservation measures described in the LPHCP.

2.7 Human Population

This section provides a brief description of Bastrop County's human population. It describes the past, present, and projected future human population in Bastrop County and the Plan Area, and identifies where changes in the population are occurring most rapidly. The population analyses are followed by a discussion of projected housing needs in the Plan Area that are expected to accompany the projected increase in human population.

While considerable effort has been taken to provide accurate descriptions and projections of population and land-use changes in the Plan Area, the available data had some limitations. Most notably, variations in the geographic coverage of data from different sources (federal, state and local) or from different years caused differences in acreage calculations. Where appropriate, raw acreages were normalized to the known acreage of the Plan Area to account for these differences and allow for consistent comparisons among the various data.

The human population of Bastrop County is projected to increase approximately 114 percent between 2000 and 2030 (approximately 66,164 people), while the projected increase for the Plan Area is approximately 125 percent (approximately 12,738 people) over the same period (see Section 2.7.2). The projected increase in population is expected to create the need for approximately 6,340 new residences in the Plan Area over the term of the LPHCP (see Section 2.7.3). While much of this new construction could be absorbed by vacancies in existing subdivisions, some new fragmentation and loss of currently forested open-space will likely occur in the Plan Area (see Section 2.8).

2.7.1 Area Description

Bastrop County is part of the Austin-San Marcos Metropolitan Statistical Area (MSA), which also includes Travis, Williamson, Hays, and Caldwell counties. This fast-growing region grew from 846,227 people in 1990 to 1,249,763 people in 2000 (City of Austin 2000). A moderate climate and diverse employment opportunities helped drive this expansion.

Bastrop County has three major population centers (Figure 2-5). The City of Elgin, with a population of 5,700 in 2000, is in the northwestern corner of Bastrop County, and its jurisdiction extends into Travis County. The City of Bastrop, with a population of 5,340 people in 2000, is located in the center of Bastrop County and is the county seat. The City of Smithville, with a population of 3,901 in 2000, is in the southeastern part of Bastrop County (U.S. Census Bureau 2001). Of these three population centers, only the City of Bastrop extends into the Plan Area.

A number of state highways cross through Bastrop County and the Plan Area. US 290 crosses the northern one-third of Bastrop County in a northwesterly-southeasterly direction. US 290 is a major link between Austin and Elgin, and also links Bastrop County to Houston in the southeast. SH 21 bisects Bastrop County from the City of Bastrop to the northeastern edge of the County. SH 95 links Elgin with the City of Bastrop. Finally, SH 71 crosses the center of Bastrop County from Austin, through the City of Bastrop, and past Smithville in the southeastern portion of Bastrop County (Figure 2-5).

SH 130, a proposed bypass for I-35 around Austin, is scheduled for completion by December 2007 (Texas Department of Transportation 2002). The proposed SH 130 alignment bypasses the City of Austin through Travis and Williamson counties to the west of Bastrop County. The Austin Bergstrom International Airport opened in 2000. The airport is located approximately 30 miles (48.3 kilometers) west of the City of Bastrop on SH 71 in Travis County. The location of the new highway and airport may shift land development activity in Bastrop County to the western portions of Bastrop County.

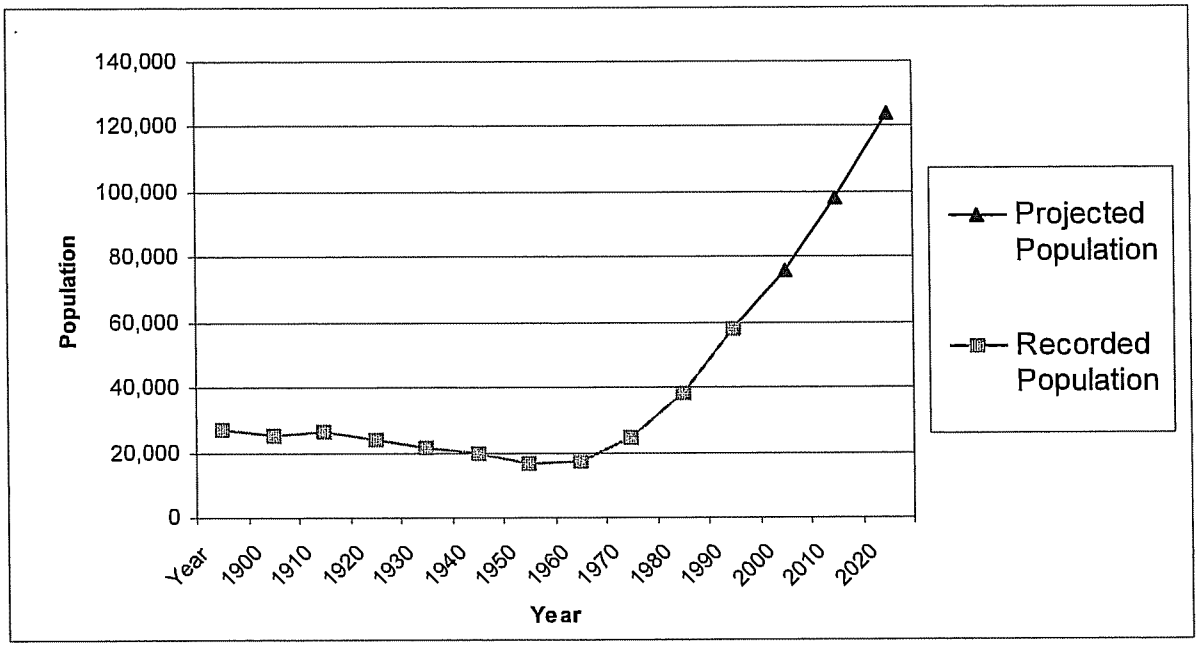
While most of the Plan Area lies within unincorporated portions of Bastrop County, approximately 2,300 acres (929.2 hectares) of the Plan Area (approximately two percent) is within the city limits of the City of Bastrop. Conversely, approximately 60 percent of the City of Bastrop lies within the Plan Area.

2.7.2 Human Population

Historic Trends

Bastrop County

Bastrop County's population declined between 1900 and 1960 from approximately 26,845 people to approximately 16,925 people (U.S. Census Bureau 1995). After 1960, however, the population of Bastrop County grew exponentially (Figure 2-6) (U.S. Census Bureau 1995). By 1990, Bastrop County had 38,263 residents and approximately 37 percent of the population lived in or around the cities of Elgin, Bastrop, and Smithville (U.S. Census Bureau 1991).



By 2000, Bastrop County's population grew to 57,733 people, which is an increase of just over 50 percent from 1990. Within Bastrop County, the area northeast of the City of Bastrop and the area in the southwest corner of Bastrop County (Census Tracts 9505 and 9508) had the highest population in 2000 (Figure 2-7). Currently, Census Tract 9505 supports nearly one-fifth of the total County population. Population growth between 1990 and 2000 was greatest in the southwestern corner of Bastrop County (Census Tract 9508), which is nearest to Austin and I-35.

Table 2-1 shows how the population was distributed within Bastrop County during 1990 and 2000. Census Tract boundaries for Bastrop County are shown in Figure 2-7.

Table 2-1. Population Distribution and Change in Bastrop County by Census Tract Between 1990 and 2000.

Census Tract	1990		2000		Percent Change (1990-2000)
	Population	Percent of Total Population	Population	Percent of Total Population	
9501	4,888	13%	7,286	13%	49%
9502	5,350	14%	6,196	11%	16%
9503	5,082	13%	7,438	13%	46%
9504	5,155	13%	7,335	13%	42%
9505	6,436	17%	11,194	19%	74%
9506	2,915	8%	4,459	8%	53%
9507	3,530	9%	4,197	7%	19%
9508	4,907	13%	9,628	17%	96%
TOTAL	38,263		57,733		51%

Data source: U.S. Census Bureau 1991 and 2001.

Plan Area

Population within the Plan Area was estimated by analyzing census data at the Block Group level. Block Groups are sub-areas of Census Tracts that allow a finer analysis of census data. Six Block Groups from four different Census Tracts occur within the Plan Area (Figure 2-8). However, the boundaries of the Block Groups do not correspond with the boundary of the Plan Area. Therefore, to estimate the population in the Plan Area, the population within the Block Group was assumed to occur uniformly throughout the Block Group. A proportion of the population in each Block Group was then assigned to the Plan Area based on the amount of acreage of the Block Group that was contained within the Plan Area. The percentage of each Block Group contained within the Plan Area is shown in Table 2-2.

Table 2-2. Block Group Acreage Within the Plan Area.

Block Group	Total Acreage	Acreage in Plan Area	Percent in Plan Area
9501 1	25,085	12,837	51%
9504 6	6,683	6,053	91%
9505 1	55,437	37,945	68%
9505 3	19,077	3,914	21%
9505 4	52,577	39,095	74%
9506 1	50,391	24,091	48%

Data source: U.S. Census Bureau 2000a.

Using this methodology, the Plan Area had an estimated population of approximately 6,174 people in 1990 and approximately 10,175 people in 2000-- an increase of approximately 4,000 people (65 percent). In both 1990 and 2000, over 50 percent of the estimated population of the Plan Area lived in Block Groups 9504 6 (at the southwest corner of the Plan Area) and 9505 1 (generally covering half of the northwestern end of the Plan Area). Consistent with this finding is the fact that these two Block Groups as a whole experienced the greatest increase in population between 1990 and 2000. Block Group 9505 3 (located just outside of the City of Bastrop) experienced a slight decrease in population between 1990 and 2000 (Table 2-3).

Projected Population Changes (2000 through 2030)

Bastrop County

Population projections for Bastrop County were obtained from the Texas State Data Center (TSDC), which is the state liaison to the U.S. Census Bureau. The TSDC develops growth rate scenarios for Texas counties that incorporate fertility rates, mortality rates, and net migration rates based on census data. The TSDC currently recommends that most counties use their moderate growth scenario for population projections because many Texas cities experienced abnormally high growth rates during the 1990-2000 period. TSDC predicts that high growth rates will not to continue long term (TSDC 2001).

Table 2-3. Estimated Population Distribution and Change in the Plan Area Between 1990 and 2000.

Block Group	1990		2000		Percent Change (1990 – 2000)
	Plan Area Population	Percent of Total	Plan Area Population	Percent of Total	
9501 1	394	6%	503	5%	28%
9504 6	1,490*	24%	3,005	30%	102%
9505 1	1,551	25%	2,986	29%	93%
9505 3	958	16%	877	9%	-8%
9505 4	1,179	19%	1,887	19%	60%
9506 1	603	10%	917	9%	52%
Plan Area	6,174		10,175		

**Includes the population of Block Group 9504 7, which was merged with 9505 6 in 2000.*

Data source: U.S. Census Bureau 1991 and 2001.

The TSDC projected that the population of Bastrop County will more than double from 57,733 people in 2000 to 123,987 people in 2030 (Table 2-4). The Bastrop County Commissioners' Court adopted these projections for planning purposes on July 15, 2002. Population projections for individual Census Tracts in Bastrop County were based on the proportional rate of change for each Census Tract. These proportional rates of change were calculated by multiplying the rate of change for the entire county by the observed rate of change for each Census Tract between 1990 and 2000. Projections for Census Tracts 9505 and 9508 suggest that these areas will double in population within 20 years.

During 2003, LCRA conducted studies and projections of water and wastewater infrastructure needs in the western portion of Bastrop County. Analysis of the expected build out projections of thirteen existing and projected large developments in western Bastrop County correlated strongly with a moderate growth scenario traffic serial zone projections for Bastrop County prepared by the Capital Area Planning Council (CAPCO) (draft LCRA 2003). The study area used in the 2003 LCRA draft report includes a small portion of the Plan Area (e.g., Tahitian Village subdivision and the southern half of Census Block 9504 6).

Table 2-4. Projected Population in Bastrop County by Census Tract between 2000 and 2030 and the Percent Change from the Previous Decade.

Census Tract	2000	2010		2020		2030		Percent Change (2000 - 2030)
	Population	Population	Percent Change	Population	Percent Change	Population	Percent Change	
9501	7,286	9,434	29%	11,887	26%	14,695	24%	102%
9502	6,196	6,785	10%	7,406	9%	8,022	8%	29%
9503	7,438	9,510	28%	11,888	25%	14,588	23%	96%
9504	7,335	9,199	25%	11,452	24%	14,000	22%	91%
9505	11,194	15,784	41%	21,781	38%	28,751	32%	157%
9506	4,459	5,878	32%	7,642	30%	9,725	27%	118%
9507	4,197	4,674	11%	5,141	10%	5,608	9%	34%
9508	9,628	14,346	49%	20,658	44%	28,508	38%	196%
Bastrop County	57,733	75,609	31%	97,854	29%	123,897	27%	115%

Data source: U.S. Census Bureau 2001

Plan Area

Population projections for the Plan Area were estimated by multiplying the projected rate of change for Bastrop County by the observed rate of change between 1990 and 2000 of each Block Group intersecting the Plan Area. As mentioned earlier, the population figures for each Block Group within the Plan Area were modified to account for the portion of its acreage within the Plan Area. All Block Groups within the Plan Area are projected to experience positive population growth over the next 30 years. Using the above described methodology, a population increase of approximately 125 percent is projected within the Plan Area between 2000 and 2030 (Table 2-5). However, given the abnormally high growth rates during the 1990-2000 period (TSDC 2001) and current planning efforts to construct water and waste water infrastructure in western Bastrop County that is not within the Plan Area, a projection of 125 percent may overstate the amount of population growth in the Plan Area during the requested permit period.

Table 2-5. Projected Population in the Plan Area by Block Group Between 2000 and 2030.

Block Group	2000	2010		2020		2030		Percent Change (2000 - 2030)
	Population	Population	Percent Change	Population	Percent Change	Population	Percent Change	
9501 1	503	590	17%	651	10%	692	6%	37%
9504 6	3,005	4,881	62%	6,713	38%	8,227	23%	174%
9505 1	2,986	4,538	52%	5,956	31%	7,073	19%	137%
9505 3	877	1,253	43%	1,576	26%	1,820	15%	107%
9505 4	1,887	2,562	36%	3,113	22%	3,515	13%	86%
9506 1	917	1,202	31%	1,426	19%	1,587	11%	73%
Plan Area	10,175	15,026	48%	19,435	29%	22,913	18%	125%

Data source: U.S. Census Bureau 2001.

The population of Block Groups 9504 6 and 9505 1, which were the two most populous sections of the Plan Area in 2000, are predicted to increase by approximately 174 percent and 137 percent, respectively, by 2030 (Table 2-5). Block Group 9504 6 is almost entirely within the City of Bastrop, and it is likely that the provision of city services will help drive the projected population increase in this area. Further, it is reasonable to anticipate that the population growth expected for the Plan Area will not be evenly distributed across an entire Block Group. Rather, future growth likely will be concentrated near established population centers, existing subdivisions, and existing major roadways.

2.7.3 Housing and Development

Septic Permits

Septic permits are issued by Bastrop County for new residential and non-residential construction and provides a more precise indicator of where new growth is occurring than Block Groups. Septic permit data for Bastrop County, derived from County permitting records, were obtained from KES Consulting (Table 2-6). The precise location of some permits could not be determined, such as those issued for

properties along the Plan Area boundary (e.g., SH 95). KES Consulting assigned uncertain permit locations to outside of the Plan Area. Most of the septic permits included in this table are for residential construction projects. Only three non-residential septic permits were issued within the Plan Area in 2000. Similarly, only four non-residential septic permits were issued in 2001, and only one was issued in the first part of 2002.

Table 2-6. Septic Permits Issued In Bastrop County and the Plan Area Between 1999 and Early 2002.

Year	Permits Issued in Bastrop County	Permits Issued in Plan Area		Permits Issued Outside Plan Area[a]	
		Number	Percent of Annual Total	Number	Percent of Annual Total
1999	734	301	41%	433	59%
2000	861	284	33%	577	67%
2001	885	195	22%	690	78%
2002[b]	263	68	26%	195	74%
Total	2,743	848	31%	1,895	69%

[a]Includes permits issued for locations along the boundary of the Plan Area (e.g., along SH 95).
[b] 2002 data from January 1, 2002 through May 1, 2002.

Of those permits issued within the Plan Area, KES Consulting also identified the number of permits issued outside of the subdivisions covered by the 46-Subdivision EA/HCP (Table 2-7). Approximately 16 percent of the total number of septic permits issued by Bastrop County within the Plan Area between 1999 and early 2002 were outside of the subdivisions covered by the 46-Subdivision EA/HCP and approximately 84 percent were inside these 46 subdivisions. Since the subdivisions covered by the 46-Subdivision EA/HCP include most platted and unplatted subdivisions present in the Plan Area, the permits issued outside of these subdivisions generally represent those issued for construction on large non-platted tracts in the Plan Area.

Although the septic permit data span a relatively short time period, there is a noticeable decrease in the percentage of permits issued within the Plan Area between 1999 and early 2002. This decrease may be due to the potential construction of a new school in the southwestern part of Bastrop County and/or heightened public awareness of the Houston toad and the requirements of the ESA that may have shifted new construction projects out of the Plan Area. The opening of Austin Bergstrom International Airport in late 1999 may also have contributed to the shift of development intensity from the eastern and central parts of Bastrop County to the southwest part of the County.

Table 2-7. Septic Permits Issued Within the Plan Area for Tracts Outside of the Subdivisions Included in the 46-Subdivision EA/HCP.

Year	Permits Issued Within Plan Area	Permits Issued Outside of the 46-Subdivision EA/HCP	
		Number	Percent of Annual Total
1999	301	29	10%
2000	284	43	15%
2001	195	53	27%
2002[a]	68	11	16%
Total	848	136	16%

[a] 2002 data from January 1, 2002 through May 1, 2002.

Housing Projections (2000 - 2030)

Housing needs in the Plan Area are expected to increase to accommodate the growing human population over the next 30 years. The average household sizes for 1990 and 2000 were obtained from the U.S. Census Bureau (Table 2-8) for Census Tracts intersecting the Plan Area (U.S. Census Bureau 1991 and 2001). Projected household sizes for 2010, 2020, and 2030 were extrapolated from the 1990 and 2000 data. The projected average household size for the Plan Area was based on the average value for each of the Census Tracts in Table 2-8.

Table 2-8. Observed and Projected Average Household Size in the Plan Area by Census Tract.

Census Tract	1990	2000	2010	2020	2030
9501	2.82	2.82	2.82	2.82	2.82
9504	2.60	2.55	2.52	2.49	2.46
9505	3.20	2.73	2.49	2.28	2.10
9506	2.68	2.58	2.52	2.46	2.41
Plan Area Average	2.83	2.67	2.59	2.51	2.45

Data source: U.S. Census Bureau 1991 and 2001.

The number of households expected to occur within the Plan Area between 2000 and 2030 was calculated by multiplying the projected population (Table 2-5) and the corresponding average household size (Table 2-8) for each Block Group in the Plan Area. These projections only represent the number of occupied households anticipated to occur in the Plan Area between 2000 and 2030. Unoccupied households, such as second homes or vacation homes, are not included in this analysis. Approximately 6,340 new households would be required to accommodate the projected population increase in the Plan Area between 2000 and 2030 (Table 2-9).

Table 2-9. Projected Number of Occupied Households in the Plan Area Between 2000 and 2030.

Block Group	Approximate Number of Occupied Households in Plan Area				Number of Additional Households Required (2000 - 2030)
	2000	2010	2020	2030	
9501 1	178	209	231	245	67
9504 6	1,178	1,937	2,696	3,344	2,166
9505 1	1,094	1,822	2,612	3,368	2,274
9505 3	321	503	691	867	546
9505 4	691	1,029	1,365	1,674	983
9506 1	355	477	580	659	304
Plan Area	3,817	5,977	8,175	10,157	6,340

2.8 Land Use and Land Cover

Land use and land cover trends in the Plan Area were developed from data obtained from the Bastrop Central Appraisal District (BCAD) and from Fregonese Calthorpe Associates (Fregonese Calthorpe Associates are currently involved with the Envision Central Texas project, a regional planning initiative).

Where possible, conclusions were made regarding projected land use and land cover changes in the Plan Area.

The BCAD data had some limitations that prevented a robust analysis of land use trends in the Plan Area. First, while GIS databases of parcel boundaries were available for 1997, 1999, and 2001, land use data associated with each parcel was only available for the 2001 data set. The lack of historic data precluded the projection of land use trends into the future.

Second, the 1997 GIS parcel database did not include properties within the City of Bastrop. Therefore, parcels within the City of Bastrop were analyzed separately in the parcel size distribution analysis (Section 2.8.1).

Finally, the GIS data sets from BCAD did not overlay precisely, and most of the individual parcel boundaries did not correspond exactly with the boundary of the Plan Area. These errors resulted in slight variations in the summed acreage of parcels in the Plan Area among years. In all analyses, parcels that crossed the boundary of the Plan Area had their entire acreage included in the analysis for the Plan Area. The acreage covered by these over-extending parcels was less than four percent of the total acreage of the Plan Area in any year. To facilitate a comparison among the slightly divergent parcel datasets, acreages were normalized to a total Plan Area acreage of 124,000 acres.

2.8.1 Parcel Size Distribution

An analysis of parcel sizes in the Plan Area can help identify where fragmentation is occurring, estimate the number of potential Plan participants that may seek incidental take coverage, and target conservation strategies to specific types of landowners or land uses. Most of the Plan Area (approximately 89,289 acres (36,703 hectares)) is distributed in large parcels (over 50 acres (20.2 hectares)), but there are relatively few of these parcels in the Plan Area (less than four percent of the total number of parcels). Therefore, a relatively small number of landowners control most of the acreage in the Plan Area. The vast majority of individual parcels in the Plan Area are 5 acres (2.02 hectares) or less (approximately 85 percent).

Parcels Outside of the City of Bastrop

Table 2-10 and Figure 2-9 show the distribution of parcel sizes within the Plan Area (outside of the City of Bastrop). The data show that large parcels (over 50 acres) contained the vast majority of the acreage of the Plan Area (89,289 acres or 72 percent of the acreage of the Plan Area in 2001). Further, parcels over 100 acres in size contained 57 to 60 percent of the acreage of the Plan Area in each of the years for which data were available. However, these large parcels only represented a small fraction of the total number of parcels in the Plan Area in any year (less than four percent of the total number of parcels in any year).

Conversely, small tracts (those that are five acres or less) represented approximately 85 percent of the total number of parcels in the Plan Area (outside of the City of Bastrop). These small tracts contained less than eight percent of the total acreage of the Plan Area (Table 2-10).

Table 2-10. Parcel Size Distribution in the Plan Area Outside of the City of Bastrop Between 1997 and 2001.

Parcel Size Category	1997		1999		2001		Percent Change (1999 - 2001)	
	No. Parcels	Acreage	No. Parcels	Acreage	No. Parcels	Acreage	No. Parcels	Acreage
0 – 1 ac	9,965	3,305	10,005	3,257	9,919	3,308	<1%	<1%
>1 – 5 ac	2,292	5,883	2,379	5,932	2,471	6,202	7%	5%
>5 – 20 ac	1,338	11,638	1,392	11,931	1,421	12,481	6%	7%
>20 - 50 ac	323	10,376	348	10,872	357	11,508	10%	10%
>50 - 100 ac	243	17,171	251	17,513	244	17,505	<1%	2%
>100 ac	285	74,434	282	73,322	281	71,784	-1%	-4%

Data source: Bastrop Central Appraisal District 1997, 1999, and 2001.

Parcels Within the City of Bastrop

Within the portion of the City of Bastrop that lies within the Plan Area, 85 percent of the parcels were five acres or smaller in 1999 and 2001, similar to the representation of small parcels in other parts of the Plan Area. However, these small parcels accounted for a much larger proportion of the total acreage within the City of Bastrop (16 to 17 percent) than in other parts of the Plan Area, where small parcels only accounted for less than eight percent of the total acreage.

Table 2-11. Parcel Size Distribution in the Plan Area Within the City of Bastrop Between 1999 and 2001.*

	1999		2001		Percent Change (1999 - 2001)	
Parcel Size Category	No. Parcels	Acreage	No. Parcels	Acreage	No. Parcels	Acreage
0 - 1 ac	69	32	68	32	-1%	-2%
>1 - 5 ac	73	158	77	170	5%	7%
>5 - 20 ac	17	140	17	153	0%	8%
>20 - 50 ac	4	129	3	108	-33%	-19%
>50 - 100 ac	2	118	2	122	0%	3%
>100 ac	3	595	3	628	0%	5%

*Acreage normalized to 124,000 acres (including the area outside of the City of Bastrop) to assist comparison.
Data source: Bastrop Central Appraisal District 1999 and 2001.

2.8.2 Land Use and Land Cover Distribution

Land Use

BCAD provided data on the land use of each parcel in its 2001 parcel database, which was current as of early 2002 (Table 2-12 and Figure 2-10). Acreages for each category of land use were normalized to 124,000 acres to facilitate comparison with other datasets. Developed commercial and residential land uses occupied approximately ten percent of the acreage of the Plan Area in early 2002. Undeveloped land uses, including the BCAD's general "Acreage" category (which primarily represents large tracts generally used for non-intensive agricultural practices), pasture lands, orchards, parkland, row crops, timberland, and land used for wildlife management, represented approximately 87 percent of the Plan Area. The use

of some parcels (approximately 488 parcels representing three percent of the Plan Area) was not identified by BCAD (Table 2-12).

Table 2-12. Land Uses in Plan Area as of 2002.

BCAD Land Use Classification	Parcels		Acreage	
	Number	Percent	Number	Percent
Developed Parcels				
Residential Lot	11,352	76%	8,903	7%
Residential	556	4%	2,184	2%
Commercial	144	1%	677	1%
Developed Sub-total	12,052	81%	11,764	10%
Undeveloped Parcels				
Acreage	835	6%	19,883	16%
Native Pasture	760	5%	30,701	25%
Improved Pasture	573	4%	40,592	33%
Row Crop	62	<1%	6,080	5%
Orchard	12	<1%	687	1%
Timberland	11	<1%	749	1%
Wildlife	45	<1%	1,778	1%
State Park	25	<1%	7,528	6%
Undeveloped Sub-total	2,323	16%	107,998	87%
Not Labeled	488	3%	4,239	3%

Data source: Bastrop Central Appraisal District 2002.

Developed Land Uses

Developed land uses in the Plan Area included residential and commercial use. The residential land-use classifications corresponded to parcels that were 10 acres (4 hectares) or less in size, with an average size of less than 1 acre (0.4 hectare). The vast majority of residential parcels (approximately 95 percent) were located within named subdivisions (Table 2-13). There was relatively little commercial land in the Plan Area and the average size of commercial parcels was approximately 4 acres (1.6 hectares). Parcels in these two developed categories represented almost 90 percent of the parcels in the Plan Area, but they comprised less than 10 percent of total acreage.

Of the parcels classified as "residential" or "residential lot," approximately 70 percent (8,330 parcels) were cross-listed by BCAD with a State Property Tax Board Code (SPTB code) for vacant or undeveloped land (Table 2-13). Approximately 72 percent of parcels within named subdivisions (8,227 total parcels) were classified as vacant or undeveloped. Less than 20 percent of residential parcels outside of named subdivisions were listed as vacant or undeveloped (Table 2-13).

Table 2-13. Development Status of Residential Parcels in the Plan Area as of 2002.

Occupancy Status	Parcels Within Subdivisions		Parcels Outside Subdivisions		All Residential Parcels	
	No. of Parcels	Percent	No. of Parcels	Percent	No. of Parcels	Percent

Vacant or Undeveloped	8,227	72%	103	19%	8,330	70%
Developed	3,138	28%	440	81%	3,578	30%
Total	11,365		543		11,908	

Data source: Bastrop Central Appraisal District 2002.

The number of vacant residential parcels in the Plan Area in 2002 (approximately 8,330) could be sufficient to accommodate the expected need for new households over the duration of the LPHCP (Table 2-9). However, specific conditions in different portions of the Plan Area may lead to the development of new subdivisions to accommodate growth in particular areas. For example, the regions along US 290 and SH 95 (Block Groups 9505 1 and 9505 3) are anticipated to experience higher than average rates of growth. In 2001, BCAD parcel data showed that there were approximately 2,371 parcels in Block Group 9505 1 and 737 parcels in Block Group 9505 3. These are fewer parcels than would be required to accommodate the expected number of households in those areas (Table 2-9), assuming the new households are single-family residences, each constructed on a single parcel. Accommodating this growth would require the addition of approximately 1,136 parcels to these Block Groups. Further, some lots in existing residential subdivisions (particularly Tahitian Village) are not developable due to drainage and septic issues (KES Consulting, pers. comm.).

Undeveloped Land Uses

According to the BCAD, native pasture and "Acreage," both undeveloped and generally uncultivated land uses, comprise a combined 41 percent of the acreage of the Plan Area. Cultivated land uses, including improved pasture, row crops, and orchards, cover approximately 39 percent of the Plan Area. Approximately six percent of the Plan Area is classified as parkland (e.g., Bastrop and Buescher state parks). Timberland and land appraised for wildlife management use make up a relatively small percentage of the total acreage of the Plan Area (approximately two percent).

Figure 2-10 shows how land uses, based on BCAD data from early 2002, are distributed within the Plan Area. With the exception of Bastrop SP, much of the land in the immediate vicinity of the City of Bastrop, SH 71, and SH 21 is categorized as residential land. Scattered residential subdivisions and individual home sites are also present throughout the Plan Area. Conversely, much of the property along US 290 remains in larger tracts (over 50 acres). Elsewhere in the Plan Area, agricultural and other open-space land uses dominate the landscape. These agricultural parcels also tend to be larger than developed parcels.

Data on agricultural land uses in Bastrop County spanning from 1987 to 1997 were obtained from the 1987 and 1997 Census of Agriculture produced by the National Agricultural Statistics Service of the U.S. Department of Agriculture (USDA) (USDA 1999). The data show a loss of nearly 24,000 acres (9,696 hectares) of pastured woodland (presumably analogous to the BCAD "Acreage" category) and a loss of more than 10,000 acres (4041 hectares) of non-cropland/non-woodland pasture (presumably analogous to the BCAD native pasture category) in Bastrop County between 1987 and 1997. Conversely, the acreage of grazed cropland, harvested cropland, and orchards increased over that time. Overall, an approximately three percent loss in agricultural land was observed between 1987 and 1997 (Table 2-14).

Table 2-14. Agricultural Land-use Acreage by Category for Bastrop County Between 1987 and 1997.

Agricultural Census Category	Analogous BCAD Land-use Category	1987 (acres)	1997 (acres)	Total Change (1987 - 1997)	
				Acreage	Percent
Woodland pastured	"Acreage"	81,205	57,335	-23,870	-29%
Pastureland/rangeland other than cropland/woodland pastured	Native Pasture	185,453	174,914	-10,539	-6%
Cropland used only for pasture or grazing	Improved Pasture	83,188	96,164	12,976	16%
Harvested cropland	Row Crops	33,202	41,107	7,905	24%
Land in orchards, total	Orchard	2,211	2,454	243	11%
All categories		385,259	371,974	-13,285	-3%

Data source: USDA 1999.

The changes observed in the agricultural census data were applied to the 2002 agricultural land-use acreages in the Plan Area obtained from BCAD (Table 2-12). Projections of the amount of acreage in each land-use category were calculated by multiplying the acreage in each category by the percent change observed from the agricultural census data. These figures were then adjusted to reflect the overall three percent loss in agricultural land observed between 1987 and 1997 (Table 2-14). The projections estimate that approximately 14,000 acres (5656 hectares) of "Acreage" or pastured woodland and almost 9,400 acres (3,798 hectares) of native pasture in the Plan Area will be lost between 2002 and 2032. Much of these lands will be converted to intensive agricultural uses, since these land-use categories are projected to increase by nearly 15,000 acres (6060 hectares) over the term of the LPHCP. Approximately 8,500 acres (3434 hectares) of agricultural land will be lost overall (Table 2-15).

Table 2-15. Projected Acreage of Agricultural Land Uses in the Plan Area by Decade (2002 Through 2032) (for data source, see Land Cover below).

Agricultural Land-use Category	2002	2012	2022	2032	Total Change (2002 - 2032)	
					Acreage	Percent
"Acreage"	19,883	13,580	8,988	5,796	-14,087	-71%
Native Pasture	30,701	28,012	24,764	21,332	-9,369	-31%
Improved Pasture	40,592	45,393	49,185	51,928	11,336	28%
Row Crops	6,080	7,282	8,451	9,556	3,476	57%
Orchard	687	738	767	778	91	13%
All Categories	97,943	95,005	92,155	89,390	-8,553	-9%

Land Cover

Land cover data from 1990 and 2000 produced by Space Imaging (a firm specializing in processing space imagery and aerial photography) were acquired from Fregonese Calthorpe Associates. These data were based on satellite images (Landsat Thematic Mapper data) that depict electromagnetic radiation (visible light through a portion of the thermal-infrared spectrum) reflected from the surface of the earth. The data have a resolution of 98.4 by 98.4 feet (30 meters by 30 meters) (USGS 2002). The data were classified into 75 spectrally unique groups, which were then labeled based on the major land cover type they represented. The classified data was further processed by a series of unsupervised and manual edits to reduce error (Space Imaging, undated).

The 1990 and 2000 land cover data are classified into six categories: high density developed, low density developed, undeveloped with trees, undeveloped without trees, open water, and wetlands. The area covered by the data was broken into 30-meter by 30-meter grids (each covering approximately 0.22 acre (0.09 hectare)). Each grid was given a land cover classification based on the dominant land cover category within it. Therefore, the data are useful in identifying broad land cover trends across the Plan Area, but cannot provide detailed data for small areas, such as individual parcels.

The acreage of each type of land use/land cover category in the Plan Area for 1990 and 2000 is shown in Table 2-16. The acreage in each category was normalized to a total Plan Area acreage of 124,000 acres, since some grids extended beyond the irregular boundary of the Plan Area and other data manipulations created a small difference (approximately 244 acres (98.6 hectares)) in the raw calculated acreage compared to the known acreage of the Plan Area. Figure 2-11 shows land cover within the Plan Area in 2000.

Table 2-16. Land Use and Land Cover Within the Plan Area in 1990 and 2000 (for data source, see Land Cover above).

Category	1990		2000		Percent Change
	Acreage	Percent of Total	Acreage	Percent of Total	
High-Density Development	348	<1%	357	<1%	2%
Low-Density Development	472	<1%	1,176	1%	148%
Undeveloped Treed	73,547	59%	69,571	56%	-5%
Undeveloped Non Treed	48,990	40%	52,269	42%	7%
Open Water	634	1%	621	1%	-2%
Wetland	11	-	11	-	0%

Data source: Fregonese Calthorpe Associates 2002

Land cover in the Plan Area, as interpreted from satellite images, showed that approximately one percent of the Plan Area (approximately 1,533 acres (619.3 hectares)) was visible as developed land in 2000. The amount of visibly developed land increased by approximately 710 acres (286.8 hectares) (approximately 86 percent) between 1990 and 2000. Approximately 437 acres (176.5 hectares) of undeveloped treed land in 1990 was converted to developed land cover in 2000. Most of the land in the Plan Area was visibly undeveloped in 1990 and 2000. Slightly more of this undeveloped acreage was covered with trees rather than open-canopy vegetation in both years. However, approximately 3,631 acres (1,467 hectares) of undeveloped treed land in 1990 was converted to undeveloped untreed cover in 2000. The conversion of treed land to untreed or developed land cover narrowed the gap between the amount of undeveloped treed and untreed land cover in 2001.

Assuming the rate of change among land cover categories remains the same, Table 2-17 shows the projected distribution of land cover in the Plan Area over the next approximately 30 years. The projections estimate that there would be a loss of almost 12,000 acres (4,848 hectares) of woodland or forest cover in the Plan Area over the next 30 years, assuming that current conditions continue. Under current conditions, most of this land would remain undeveloped (i.e., converted to undeveloped, non-treed cover) and probably converted to high-intensity agricultural land uses. Developed land cover in the Plan Area would nearly quadruple by 2030, with approximately 2,000 acres (808 hectares) of new low density development and approximately 25 acres (10.1 hectares) of high density development. While the projections estimate a loss of approximately 46 acres (18.6 hectares) of open water, this may be an over estimate, since some of the losses observed between 1990 and 2000 may have been due to fluctuating water levels in existing ponds, not necessarily a loss in the number of ponds.

Table 2-17. Projected Land Cover Distribution (acres) in the Plan Area Between 2000 and 2030 (for data source, see Land Cover above).

Category	2000	2010	2020	2030	Difference (2000 - 2030)	
					Acreage	Percent
High-Density Development	357	365	373	381	25	7%
Low-Density Development	1,176	1,880	2,584	3,288	2,112	180%
Undeveloped Treed	69,571	65,595	61,619	57,643	-11,928	-17%
Undeveloped Non-Treed	52,269	55,548	58,827	62,106	9,837	19%
Open Water	621	606	591	575	-46	-7%
Wetland	11	11	11	11	0	0%

3.0 SPECIES OF CONCERN: HOUSTON TOAD

The Houston toad is a relict species now isolated from the once widespread distribution of the American toad (*B. americanus*) during the Wisconsin Ice Age (10,000 years before present) (Blair 1972). This isolated population, left behind during the retreating glacial event, became weakly differentiated from the parental population, and was named as a separate species by Sanders in 1953. The toad was listed as endangered in 1970 (Seal 1994; Service 1995). The most severe threats to the remaining Houston toad populations known or hypothesized include habitat destruction and degradation, landscape fragmentation, hybridization, predation by introduced fire ants, and drought. Yet, because the species has a very high reproductive potential, the possibility for a sustainable population remains.

3.1 Geographic Range

Forstner and Dixon (2000) describe the Houston toad as one of six members (*americanus, hemiophrys, houstonensis, terrestris, microscaphus*, and *woodhousii*) of the Americanus Group (Blair 1972). This group of toads ranges from James Bay, Canada south to northern Chihuahua, Mexico; west to Imperial Valley, California, and the Columbia River Valley in Oregon and Washington; east to the Atlantic coast from southern Quebec, Canada and finally into Florida.

The Houston toad is restricted to Texas. The Houston toad has been recorded from twelve or thirteen counties in Texas. Surveys by Yantis (1989; 1990; 1991; 1992) indicated the Houston toad had disappeared from Liberty, Harris, and Fort Bend counties but remained in 9, or possibly 10, other counties in Texas. These include: Austin; Colorado; Lavaca; Bastrop; Milam; Burleson; Leon; Freestone; and Robertson counties. Both Kuhl (1997) and Forstner and Dixon (2000) have reported the presence of significant Houston toad breeding events in Lee County; however, significant clearing of forested habitat began in Lee County in 2001. When audio surveys of the historical chorusing sites in Lee County were undertaken in the spring of 2006, no Houston toads were heard at any of the previous locations (Forstner 2006). Of the remaining Houston toad populations, the Bastrop County toad population is considered to be the most robust and may be the only remaining sustainable population (Seal 1994; Service 1995). Aside from the recent population surveys in Lee (Forstner and Dixon 2000) and Bastrop Counties (Forstner 2002b) the current status of Houston toads in other counties is very unclear. Often these populations represent only a few individuals (Yantis 1989; 1990; 1991; 1992) and, as a consequence, may have been at very high risk of extirpation during the drought of the 1990s

3.2 Distinguishing characteristics

The Houston toad is a small to medium sized animal with a 1.8-2.76 inch (45-70 millimeter) snout-vent length (SVL) in males and a 2.0-3.2 inch (52-80 millimeter) SVL in females. The dorsal color is usually light brown, but may vary from nearly black to reddish. The back has a variable number of black spots that enclose one wart or a group of fused warts. The chest is heavily suffused with black pigment and occasional black spots. The paratoid glands are elongate, usually two to three times longer than wide and irregular in shape. The belly is cream to yellowish. The inter-orbital and postorbital crests are occasionally thickened. On the molecular level, the Houston toad is diagnosable by mitochondrial DNA sequence as a unique evolutionary unit separate from both *Bufo valliceps* and *B. woodhousii* (Forstner and Dixon 2000).

The Houston toad can be confused with the Gulf Coast toad. However, the Gulf Coast toad is a much larger toad commonly reaching 4.33 inches (11 centimeters) in length. The Gulf Coast toad has a dark lateral stripe along the full length of the toad from behind the eye to the pelvic junction. It has very dramatic cranial crests, which form a deep valley or groove between the eyes. It also has a much larger and more distinct parotoid gland than does *B. houstonensis*. While the color pattern is variable, Gulf Coast toads have a distinct white or crème middorsal stripe present in contrast to nearly all Houston toads. Finally, male Gulf Coast toads have a dark throat patch, but are otherwise unmarked on the venter (Forstner and Dixon 2000).

Distinguishing between Houston toads and Woodhouse's toads can be more difficult as these two species are more similar than either is to the Gulf Coast toad. Woodhouse's toad is also a larger toad than is *B. houstonensis*, commonly attaining lengths greater than 3.9 inches (10 centimeters). They also tend to show a light dorsal stripe, but the Houston toad does not. Likewise, the venter of Woodhouse's toad is usually unmarked, but the Houston toad will have dark spots on the chest and abdominal areas. Males of both species will have a dark throat patch. Finally, the cranial crests differ between the two species. In Woodhouse's toad the cranial crests touch the parotoid glands, but in Houston toads they do not (Forstner and Dixon 2000).

3.3 Reproduction

The life expectancy of the Houston toad is approximately four years (Price 1992). Males reach sexual maturity at about one year, but females require two years to achieve reproductive maturity (Quinn 1981). Adults may be seen as early as December and remain intermittently active until late June depending on humidity and temperature (Forstner 2002a). Houston toads generally breed earlier in the year than other toad species in the area. The timing of the breeding season is one means by which potential hybridization with other species is avoided. Breeding is triggered, in part, by rainfall and warm nighttime temperatures, with activity peaking in February and March (Hillis et. al., 1984; Dixon 1982; Dixon et. al., 1990; Price and Yantis 1993). While significant factors, rainfall and temperature are not the only important variables initiating choruses for the Houston toad. For example, Price (1992) found that Houston toads do not generally call during the 7 to 10 days prior to the full moon. Generally, temperatures above 53.6° F (12.0° Celsius) for 24 hours prior to the chorus event are typical, but toads have been found calling at temperatures below 53.6 F and without rainfall. The water temperatures during this early spring breeding cycle normally vary from 39.2° to 75.2° F (4.0° to 24.0° Celsius). It remains obvious that not all cues initiating breeding choruses of males are known (Dixon et al. 1990).

Toads, like many amphibians are explosive breeders. They tend to concentrate their reproductive effort to producing large numbers of eggs, with each egg having a low overall probability of survival. Female Houston toads lay between 500 and 6,000 eggs, but less than 1 percent of the eggs survive to maturity

(Seal 1994). Female toads normally come to the water body only once to deposit their eggs, whereas individual males may visit the same pond 15 times or more in the same spring. Males are infrequently found calling from their daytime retreats at some distance from the water in early evening, but eventually arrive at the pond to sing in chorus with other male toads. The call of the Houston toad consists of a very long 7 to 22 second (average 14 second), high pitched (1,646 to 2,300 cycles per second) trill at 14-36 pulses/second (Brown 1973).

This call is unique in duration, but similar in pitch and trill to that of *B. woodhousii*. Female Houston toads responding to the call are encountered by males at the pond's edge, amplexed, and eggs are subsequently deposited among vegetation or debris near the bank. An occasional female will arrive at the pond already in amplexus with a male. This suggests that the female either approached a calling male while he was still within his daytime retreat, or a male located and amplexed the female while she was traveling toward the pond (Dixon et al. 1990). The average distance that Houston toads travel to reach a breeding pond is not clear, but Price (1992) documented that individual Houston toads have traveled up to 0.95 of a mile (1.52 kilometers) between breeding ponds. The eggs are laid in strings, each egg separated from the next by a thin wall. Depending on the size of the female each egg string can contain up to 6,000 eggs (Quinn and Mays 1987). The tadpoles contain three rows of teeth on the lower lip, and the tail musculature is dark, heavily pigmented with black. The dorsal surface of the tail is evenly pigmented while the ventral surface is narrowly unpigmented along the midline. The ratio of tail length to tail height is 2.7 or less. Tadpoles remain in the pond for a period of 40-80 days depending on environmental factors. Upon emergence, the juveniles remain near the pond for several days prior to dispersing away from the pond (Thomas and Allen 1997).

3.4 Habitat

The Houston toad requires two distinct habitat types in order to complete its life cycle. For breeding and larval stages they require aquatic habitat, while after metamorphosis they require the terrestrial habitats which surround the wetlands for the adult life stage. There is an obvious interaction between the two habitat zones given that the aquatic habitats must be within or immediately adjacent to, suitable terrestrial habitat for the adults. There is some flexibility in this constraint as Houston toads are known to move approximately 1,600 meters (5,248 feet) to the water during the breeding season (Price 1992). This allows the toad to use secondary breeding sites outside of the areas characterized as suitable to the species, such as abandoned quarries in gravelly or stony soils.

Houston toads typically breed in small pools of water and ephemeral ponds. They have been heard or captured in a variety of aquatic sites, e.g., man-made ditches, ponds, lakes, plowed fields, puddles in roads, moist areas in yards, flooded pastures, and such natural areas as prairie potholes, ponds, streams, and ephemeral rain pools. Permanent ponds and stock tanks have also been documented as breeding sites for Houston toads (Forstner 2001). Survival of eggs, tadpoles, and juveniles are very low in permanent water bodies that are not adjacent to forested areas (Forstner 2004). Permanent water bodies in the area tend to have increased predators (i.e., invertebrates, bullfrogs) and an increased probability of livestock or agricultural usage; however, fish tend to eat the larger invertebrates in the pond that eat eggs and tadpoles (Forstner 2004). Forstner (2001) reported stock tanks with heavily impacted margins were not used by Houston toads, but were subsequently used after livestock access to the ponds was limited or prevented. However all of these ponds are within suitable habitat or in pastures adjacent to forested areas known to be inhabited by the Houston toad (Forstner 2001). Postmetamorphic survival of the juveniles is also influenced by the area immediately surrounding the pond (Forstner 2002a; Thomas and Allen 1997). The average range of the Houston toad around a breeding pond is 29.5 feet (9 meters) (Forstner 2004). Thus, the area immediately adjacent to the ponds is especially important habitat for the Houston toad. The

availability of a treed area immediately adjacent to the breeding pond is critical to the survival of emerging toadlets. At least 50 percent canopy cover appears necessary for survival (Forstner 2004).

Adult Houston toad occurrence is strongly correlated to deep sandy soils (e.g. Patilo sands of the Carrizo Sand geologic formation) and this may be a consequence of their preference of sandy substrates for day-time retreats. Houston toads are poor diggers, hence their affinity for loose soils. Houston toads apparently spend their daylight hours within forested sites, often in the burrows of other animals, such as rats, mice, moles, gophers, and insects. They have been found in daylight searches of the areas under and around the roots of trees and grasses near ponds, under leaf litter, logs, and occasionally under garbage cans or other anthropogenic surface debris.

While deep billowy sands like the Patilo sands of the Carrizo Sand formation occur throughout Bastrop County, toads do not appear to be supported by all areas having this soil type. The reason for this is most likely part of the definition of such geologic formations, rather than any variance in the type of habitat required by the Houston toad. The deep geology of a region provides one aspect of surface soil characteristics. The surface soils themselves are another part of the whole. Thus, the "same" Patilo sands across Bastrop County are very different dependent upon the geological formation which they overlay. There are two primary factors which vary between the Patilo sands in the Plan Area and other Patilo sands in Bastrop County. First, the underlying geology varies widely effecting a change in the mineral (parent) composition of the sandy soil. For example, Patilo sands over the Calvert Bluff are primarily mudstone while over the Carrizo Sand, sandstone. The Calvert Bluff mudstone results in a Patilo sandy soil with more clay particles than the Carrizo Sand Patilo soil. This means the mudstone sands tend to become more indurate when desiccated (Ayers and Lewis 1985; Baker 1979).

Seeps and springs (and the historical occurrence of ponds) also follow the varying geology. Seeps and springs are more predominant in the Carrizo Sand formation than other geologic areas. This is significant as it may have limited the historical distribution of the Houston toad; however, the recent (in geologic time) occurrence of man-made ponds may have served to increase the distribution of amphibians in general. This has both the benefits of additional breeding areas and the detriments of allowing introductions of predators such as the bullfrog. So prior to the 1900s, Houston toads would have been restricted in breeding to only those pools available naturally. Those pools would have, in all likelihood, been only found over the Carrizo Sand. Hence, the toad is unlikely to persist in areas which lack the deep billowy sands with the associated hydrological characteristics found in this formation.

The toads are believed to burrow into the deep sands to escape winter cold (hibernation) and summer heat and drought (estivation). Hence, soil class alone cannot strictly influence the occupancy of land by the Houston toad. Vegetation type is also important. The amount of tree canopy to shelter and filter sunlight and thereby prevent heating of sand soils is also believed to be a significant factor in determining the likelihood toads will occupy a parcel of land. Although pine trees are indicative of the Houston toad habitat in Bastrop County, the toads have been found associated with oaks, yaupon, and other vegetative cover within those soil associations.

In the Bastrop area, the principal soil types utilized by the toad belong to the Patilo-Demona-Siltid and the Axtell-Tabor soil associations within the Carrizo Sands Outcrop Formation, all of which occur widely in Bastrop County and surrounding counties to the northeast. These soils also support the majority of the loblolly pine forest remaining in Bastrop County.

In Bastrop County, the Houston toad is thus associated as much with a forested land cover as it is soil type. This is despite early suggestions that the Houston toad was primarily a prairie species (Seal 1994). Specifically in Bastrop County, the toad is most often associated with the loblolly pine, forest ecosystem, but does move out of these forests to breeding ponds (Forstner 2002b). However, four years of trapping

results on the GLR failed to collect any adult Houston toads in pastures of mixed Bermuda/native grass stands at any distance greater than 492 feet (150 meters) from the forested edge (Forstner 2002a, 2004). Thus, it is known that the Houston toad does survive in a loblolly pine woodland. In fact, the largest populations of Houston toads thus far reported are all located in the loblolly pine association. Therefore, it can be inferred that Houston toads are able to forage for insects and other invertebrates in this woodland system. Unmanaged forests, and forests that sustain other types of land uses, such as residential, recreational, or agricultural activities, can become less suitable as Houston toad habitat over time. Without active management, forests can become too dense and shaded, accumulate dangerous levels of burnable duff and debris, and be negatively impacted by cattle, pollutants, and vehicles. These and other changes may reduce the ability of forest ecosystems to provide quality Houston toad habitat by altering the toad's food base and competitive environment, increasing the risk of catastrophic fires that could destroy large blocks of habitat, and reduce Houston toad reproductive success. Active management of existing forests and reducing negative impacts from various types of land uses within and adjacent to forested areas is essential to the long-term sustainability of Houston toad habitat in the Plan Area (Forstner 2004). It is not fully known whether it matters to the Houston toad which type of woodland (i.e., forest cover) provides its habitat since it is unknown how environmental parameters such as soil moisture or arthropod and other invertebrate composition may vary as loblolly pines transition into hardwoods. Increasing fuel loading in forested areas decreases the vegetational diversity impacting insect diversity while prescribed fire increases the insect diversity (Ferrenberg et al. 2006), thus fire suppression acts to reduce the habitat value of unmanaged forests. Working from the available data, this makes the Lost Pines ecosystem of Bastrop County the primary system requiring management considerations for the Houston toad.

The specifics of habitat use by the Houston toad are only now becoming known. Recent studies by Forstner (2002a, 2004) strongly support the concept that Houston toads fail to cross large open spaces, such as pastures or cleared areas. While surface activity is far more than most previous studies have indicated, adults are not normally found at distances in excess of 3,280 feet (1,000 meters) from known breeding ponds. Juveniles and occasional sub-adults can be found at distances up to 6,560 feet (2,000 meters) from a known breeding pond; however the average range is 29.5 feet from the breeding pond and never farther than 82 feet (25 meters) from a forested edge (Forstner 2004). While adult Houston toads are very rarely seen outside of the breeding season, Houston toads may be on the surface during the non-breeding season. Juveniles, commonly, and adults, rarely, are present as active surface dwellers during intermittent rains and cooler weather throughout the summer and fall (Forstner 2002a).

3.5 Current Status

As mentioned above, the Houston toad is found only in east and east central Texas. When originally named as a species in 1953, its distribution was believed to be limited to Harris and surrounding counties (Sanders 1953). By 1994, the toad had been extirpated from Harris, Liberty, and Fort Bend counties but was known to occur in seven other counties; it was uncertain at that time whether Lee County contained toads (Seal 1994). The toad was previously believed to exist in nine or ten counties: Bastrop, Burleson, Milam, Robertson, Lee, Leon, Austin, Colorado, and Lavaca, and possibly Freestone (Service, 1984). In Harris County, the toad is believed to have disappeared primarily as a result of habitat loss, concurrent increases in introduced pathogens (including pesticides), and predation, coupled with the severe effects of the 1950s drought. Unfortunately, the radical habitat changes in Harris County and the lack of adequate documentation of historical breeding localities have made the assessment of the original habitat in that county nearly impossible (Service 1984). No toads have been documented in Lavaca County since 1991. Also, none have been documented in Burleson County (designated critical habitat) since 1983. During limited range-wide surveys in the 2006 breeding season, Houston toads were heard chorusing in only two (Bastrop and Leon) out of the theoretically nine occupied counties (Forstner 2006). Since it has been 15

years since the last range-wide surveys were completed, the status of the species in all but Bastrop County remains unclear. However, Houston toad researchers are doubtful that the toad remains in nine counties in Texas (Forstner 2006).

3.5.1 Current Population Estimates

Population estimates for the Houston toad are difficult to develop because of the non-random nature of historical surveys, lack of access to private lands to conduct surveys, lack of acceptable methods to extrapolate breeding counts to the population as a whole, and the difficulty in locating the toad in times other than the breeding season. Further complicating the issue is the reality that estimates for the "population" of Houston toads most often are not attempting to reference a biologically defined "population". A biologically defined population would represent the genetically defined reproductive community of Houston toads. By that measure, the population might or might not have boundaries correspondent to those of the Plan Area or even of Bastrop County itself. Hence, while colloquially referred to as the Bastrop County "population", the toads in Bastrop County are more likely part of a larger biologically relevant population. Biological boundaries for the toad "population" of which Bastrop County toads are a part, will likely lie at the Colorado river to the south and well into Lee County to the north. Thus, conservation management of Houston toads in Bastrop County may be most productively designed with the underlying biology taken into proper account (Forstner 2002b). In practical terms this requires consideration of the full Plan Area and remaining cognizant of the larger area corresponding to the actual biologically relevant population of toads in Bastrop and adjacent counties.

Brown (1975) suggested only 300 toads occurred in Bastrop County in 1975. Hillis et. al. (1984) suggested numbers were not critically low although the toad was still endangered. Seal (1994) estimated 2,000 Houston toads existed in Bastrop County. This latter estimate was primarily based upon studies in Bastrop SP. Only the population at Bastrop SP in Bastrop County has been consistently studied over significant periods of time. As previously mentioned, the current status of Houston toad populations in other counties remains unknown. Other than Bastrop and Buescher state parks and the land owned by the Lower Colorado River Authority around Lake Bastrop, no other populations are known to occur on public lands in Bastrop County (Espey Huston, et al. 1994).

TPWD data at Bastrop SP indicate the toad population there declined from 1990-1999, but it is unknown if the decline is a result due to stochastic events, like drought (which occurred in 1995-1996 and 1998-2000), or because of other stressors such as reduced food supply resulting from the thick duff layers on the forest floor. The decline in the estimated total toad population at Bastrop SP is most notable during the period from 1996-1999 (the 1996 drought started in October 1995). If drought is the primary controlling factor, some rebound may be expected despite the influence of other stressors. As of 2002, unpublished data compiled by Dr. Andrew Price and his colleagues at the TPWD indicate very low numbers of toads currently exist within Bastrop SP, but the populations may be maintaining at those lower levels or even increasing (see below in Conservation Management; Price 2003; Forstner 2002a).

In addition to the research at GLR and Bastrop SP, in 2002 Forstner and his colleagues reexamined historical sites and potential breeding sites within generally low-density subdivided areas currently separating large contiguous habitat blocks like the GLR and Bastrop SP and found many locations retained chorusing groups of Houston toads (Forstner 2002b). Unfortunately, the 2002 survey data cannot be used to develop an accurate estimate of the relative success of Houston toad reproduction in these areas as the observations were audio only (Forstner 2002b). In 2003, Forstner and his colleagues (Forstner 2002b, Forstner et al. 2003b) conducted surveys in potential Houston toad habitat throughout Bastrop County including sections south of the Colorado River. They estimated that there could be as many as 200 Houston toads in chorus across the entirety of Bastrop County in 2003. Even if there were

an equal number of Houston toad females as males (although this is unlikely), 400 Houston toads would have occurred in Bastrop County in 2003. Given that chorusing was heard in only Bastrop and Leon counties in 2006 (see 3.5 Current Status), this would mean there would be only 1,000 to 1,500 (by the most liberal estimate) total Houston toad adults in the fall of 2006 (Forstner 2006). A population viability analysis (PVA) performed by Hatfield et al. (2004) on the Houston toad indicated that a female population size (carrying capacity of the habitat) of 1,000 toads ($\geq$ 1 year old) in two or three subpopulations with interconnectedness was required to stabilize the model with a low probability of extinction in 100 years.

3.5.2 Consequences of low Emergence and Skewed Sex Ratios

In an assumption laden conclusion and drawing a liberal estimate using data from GLR and BSP, it would appear that toads presently occur at a density not exceeding 1 adult toad per 25 acres of habitat (Forstner 2003a). However, the total number of toads is not as important as the number of toads that are available to reproduce and the relative success of those reproductive attempts. That means that the ratio of adult male toads to adult female toads is important and is unfortunately strongly male biased (Forstner 2002a; Swannack and Forstner 2007). While admittedly based on limited samples (approximately 100 captures), evidence from both breeding pond survey capture data at GLR and Bastrop SP, and field trapping studies at GLR indicates an average ratio of about seven males for every one reproductive adult female in the wild (Forstner 2006). On the 5,000 acres of the Griffith League Ranch only 40 male Houston toads were detected in 2003 (Forstner et al. 2003). Another 122 male Houston toads were detected throughout Bastrop County (excluding Bastrop State Park) the same year (Forstner 2003a). Thus, the most liberal number of male Houston toads in Bastrop County in 2003 (excluding Bastrop State Park) would be 162. Applying the biased sex ratio would result in only 23 reproductive female toads across Bastrop County. Therefore, the most robust population of Houston toads in an average year (2003) is dependent on just more than 20 adult females (Forstner 2006). The number of adult females is therefore a significant factor in the modeling of population trends and any stressors which increase female mortality would be a significant barrier to a population rebound. Strong male bias decreases the biological size of the population of Houston toads by decreasing the potential for reproduction and genetic diversity.

Finally, research on GLR over the last 5 years has provided detailed information about the relative breeding success for the Houston toad. Of 18 ponds surveyed across GLR, 15 ponds are documented with chorusing toads, and 11 had successful breeding. However, only 3 of these ponds (20 percent of the 15) had successful emergence of Houston toad juveniles over the three year period. Successful breeding appears to depend largely on the physical characteristics of the pond such as a shallow part of the pond being adjacent to forested areas with at least 50 percent canopy cover. Ponds surrounded by Bermuda or other turf grasses have virtually no successful emergence of toads and operate as breeding sinks (Forstner 2004). Thus there is conclusive evidence that chorusing does not mean breeding and consequently that chorusing without breeding is a sign of decline. Given the rarity of observed successful breeding, whether emergence of toads can be increased is critical information needed for the design of recovery and mitigation strategies for the toad.

3.5.3 Threats

Various threats to the Houston toad which are known or hypothesized include: habitat fragmentation, habitat degradation (including poor forest management), habitat loss especially conversion of lands to non-native sods, hybridization with and competition from other anurans partly as a result of fragmentation, imported fire ants, pesticide and herbicide use, chytrid fungus, and drought (Seal 1994, Forstner 2006). Natural predators of adult Houston toads include birds, mammals, snakes, and turtles. The introduction of domestic pets, particularly house cats and dogs, generally accompanies human

settlements and can have a major impact on amphibian populations. Accidentally wounding or killing of other toad species has been documented in some residential areas and may represent a threat to Houston toads.

Unfortunately the various conservation efforts being proposed or undertaken to protect and recover the Houston toad are occurring within a context of uncertainty due to a lack of trend and interaction data regarding the actual effects of various environmental stressors acting on the toad. There are several assumptions currently required to define habitat choice and use by the Houston toad and more importantly, the relationship between habitat changes and how those changes affect toad populations. These assumptions directly influence the options being considered for habitat enhancement, protection, land acquisition, and habitat management. Therefore, these assumptions need to be tested and critically examined as quickly as possible should they be incorrect.

Foremost among these assumptions are those regarding the habitat preference and configurations necessary to support Houston toad populations. Drawing upon the existing presence-absence data for occurrence, the Houston toad occurs in high correlation to deep sandy soils, ponds, and forested habitat; this correlation is supported by specific research on GLR (Forstner 2002a, 2004). Hence a reasonable assumption is that these three habitat characteristics are part of the required habitat needed to support Houston toads in Bastrop County.

The relative size of those descriptive characters in acreage or proximity to other suitable habitat fragments is becoming better understood through recent research in Bastrop County. It is reasonable to assume that in character with nearly all other woodland species, the larger the fragments of forest and more contiguous (least edges in shape) the better for the species in question. The long-term survival of the Houston toad in Bastrop County will depend, in part, on active management of existing forests and reducing negative impacts from various types of land uses within, and adjacent to, forested areas is essential to the long-term sustainability of Houston toad habitat in the Plan Area.

Strategic evaluation of potential lands for mitigation and recovery requires detailed information about the individual and cumulative effects from stressors on the toad. Likewise, there must be a coordinated effort to insure consistent management of protected lands appropriately acquired relative to existing sub-populations and populations of toads.

Fragmentation

The Lost Pines ecosystem, both its forest and its watersheds, has become increasingly fragmented by timber harvest, pasture conversion and increased home construction and occupancy. See Tables 2-14 and 2-15 for historical and projected trends for conversion to intense agricultural uses.

Home construction and occupancy consists of three types of residential/home land use: traditional small lots of approximately 1 acre (0.4 hectare) or less; moderate lots of approximately 2 to 5 acres (0.8 to 2.0 hectares); and "ranchettes" ranging from approximately 5 to 100 acres (2.0 to 40.4 hectares). These ranchettes are defined as either properties with low-density urban development and uses or properties which could be further subdivided but are typically purchased by owners who desire to maintain their land, at least in the short to medium time period, in its natural state or to use it for limited grazing or other avocational (non-commercial intensity) agricultural use such as small scale or hobby ranching or livestock rearing. As discussed above, the 2002 surveys of toads in Bastrop County indicate that at present some of these areas retain chorus groups of male Houston toads during the breeding season (Forstner 2002b), but the abundance of females and/or breeding success remains unknown. Significantly large tracts and non-commercial agriculture lands (100 acres or more) do still exist within the Lost Pines area, and it is upon a strategic combination and configuration of residential/ranchette/private and public

land preserves that eventual recovery efforts may succeed. Current data substantiates the Houston toad persisting in areas that have experienced some degree of subdivision (Forstner 2002b).

Approximately 14,500 acres (5,858 hectares) of the Plan Area have been subdivided. However, about one half of the residential lots and ranchette tracts have not yet been developed. It is important to note that Tahitian Village, one of the 46 subdivisions, is a higher density subdivision that contains approximately 52 percent of the existing lots and legal tracts within the Plan Area but only 18 percent of the acreage that has been subdivided. The Service determined that Tahitian Village contained low quality habitat for the Houston toad in the 46-Subdivision EA/HCP. Approximately 39 percent of the subdivided acreage has been subdivided into lots or tracts averaging five or more acres per lot or tract. Other subdivisions have developed at comparable densities as a result of homeowners buying more than one lot.

It is within some of the lower density subdivisions that many of the chorus events Forstner reported in 2002b may have occurred. Scientific uncertainty exists over: (1) how much development should be allowed on any given lot, and (2) how small lots should be for any given *new* subdivision that may be proposed within the Lost Pines area, and how much additional subdivision of the Lost Pines area can occur without precluding recovery of the Houston toad. Of critical importance is creating a framework which, at absolute minimum, does not allow further irretrievable damage to the remnant Houston toad population.

With subdivision and consequent fragmentation comes a suite of coincident threats. Fragmentation degrades the original habitat for the Houston toad in the loss of contiguous forest. Increased human population brings with it increased roads which are a significant mortality burden on toads (Fahrig et al. 1995). Similarly, increased homesites bring with them increased herbicide and pesticide usage, but also increased runoff from impermeable driveways and similar surfaces. This runoff will then carry chemical and nitrogenous wastes degrading the water bodies used by the toad for reproduction. Likewise by increasing access to interior forested areas, urbanized predators (e.g., raccoons and the house cat) increase to the detriment of native fauna. Often the use of non-native landscaping, especially sod grasses, decreases the utility of the areas immediately adjacent to new homes as toad habitat. The disturbances brought about both during construction and with clearing of the forest for homesites bring red imported fire ants. While not common in densely forested areas, the red imported fire ant has been demonstrated to be detrimental to juvenile Houston toads (Freed and Newman 1988) and may decrease the overall reproductive output of an entire pond. Finally, while not directly a local anthropogenic affect, drought cycles are a strong selective pressure on Houston toads. During historical droughts in the 1950s the Houston toad was extirpated from several counties (Seal 1994) most notably Harris County from which it was originally described (Sanders 1953). Fragmentation acts to exacerbate the effect of drought on a local scale by increasing heat at the surface and increasing moisture loss as a consequence.

All of the aforementioned effects brought about by human encroachment are not likely to eliminate the Houston toad by themselves. However, couple threats from fragmentation with the increased stress of a drought and toad populations may decrease to a level from which they might not recover. Therefore, the design for conservation management of the Houston toad necessitates minimizing abnormal stressors on the population to allow it to sustain itself during periods of increased environmental stressors, such as drought.

Hybridization and Anthropogenically Influenced Competition

This threat results from fragmentation and consists of exotic species entering the microhabitat of the Houston toad. As the environment is modified from large contiguous tracts of forest, competitive species are able to enter the microhabitat of the Houston toad. It is thought that forest fragmentation opens the way for invasion of primarily pastureland species into breeding sites for the Houston toad. Woodhouse's

toad is one such competitor which will hybridize with Houston toads at breeding ponds. In one documented example, the Houston toad may breed with Woodhouse's toad (Brown 1971). While there is little information that correlates the effects of known or potentially damaging invasive species like Woodhouse's toad on Houston toad populations, in the worst case, species hybridization events can lead to extinction (Avise and Nelson 1989). In contrast, some species maintain more or less fixed levels and areas of hybridization (Hafner et al. 1998).

Red Imported Fire Ants

The red imported fire ant has had a devastating effect on native ant populations, ground nesting bird species, and a wide range of other terrestrial vertebrates in Texas (Allen et. al., 1994; Vinson and Sorenson 1986). It is also specifically documented that fire ants impact Houston toads (Dixon et al. 1990; Freed and Newman 1988). Forstner (2002a) reported impacts from fire ants upon newly metamorphosed toads near artificial ponds constructed to evaluate factors affecting tadpoles and emerging Houston toads. Fire ants can directly impact Houston toads, but they also affect arthropod communities in general. Hence, in addition to directly reducing Houston toad populations in the wild, fire ants are also very likely to affect the arthropod prey populations utilized by the toad. As with all threats to the toad, fire ant invasion is often tied to forest fragmentation and the consequent disturbance associated with such activity. Fire ants are more likely to occur in open pastoral areas than in dense forest, penetrating only thinly beyond the forest edge. Hence, with fragmentation, fire ants are able to colonize a greater percentage of the overall habitat than within large contiguous forest areas.

Herbicides and Pesticides

While impacts of pesticides on amphibian populations have been documented for a variety of consumer and agricultural chemicals, the overall consequences of the use of these agents is unclear (Blaustein and Kiesecker 2002). It is apparent that runoff, accidental spills, and intentional applications can impact amphibians, but the causes for a decline of specific amphibians are not easily tied to a single stressor (Blaustein and Kiesecker 2002). The variety of easily available consumer and agricultural chemicals alongside the ambiguity of application or disposal directions make the effects on Houston toads nearly impossible to predict. The loss of native arthropods, eutrophication of impounded waters, and contamination of those same waters with a multi-chemical mixture via runoff, misapplication, inappropriate storage, subsequent leakage, and accidental spills, likely results in an overall negative impact on Houston toads in Bastrop County. However, quantifying that potential impact is not practical.

4.0 ACTIVITIES COVERED BY THE LPHCP

The human population within the Plan Area is expected to more than double over the next 30 years (see Section 2.7.2). This increase in population will bring with it increased residential and commercial development, with related roads, utilities, and other infrastructure. These new developments will join the more traditional land uses currently found in the Plan Area, such as timber production, agriculture, and wildlife management. Each of these types of land uses, have the potential to adversely impact Houston toads within the Plan Area.

The intent of the LPHCP is to address the impacts to the Houston toad resulting from certain human activities expected to occur in the Plan Area during the next 30 years. The LPHCP will support incidental take authorization, upon: 1) request by landowners or other interests for voluntary participation in the Plan; 2) an agreement to comply with applicable avoidance, minimization, and mitigation obligations set forth in Section 6 of this HCP and the land-use guidelines (appendices C, D, E, and F) for the activities that are described in this section. Incidental take authorization for activities not covered by the LPHCP

(high density subdivision development, conversion of land to intense agricultural use, etc.) must be obtained through consultation with the Service or by participation in other approved HCPs.

The LPHCP addresses incidental take from the following activities:

- Single-family residential construction and use on legal, non-platted lots;
- Single-family residential construction within existing platted lots;
- Commercial and multi-family construction and use on up to 1 acre;
- Conservation subdivision development;
- Agricultural management;
- Forest management;
- Wildlife management;
- Bastrop County infrastructure maintenance and improvement;
- Emergency services; and
- Ongoing use of previously developed land

The increasing density of human habitation increases the chances of encountering Houston toads and increases the potential interaction between humans, their animals, and the Houston toad. The LPHCP provides that should an activity authorized under the incidental take permit result in such interactions or encounters, no additional mitigation would be required.

4.1 Single-Family Residential Construction and Use

Single-family residential construction includes the construction or placement of a single-family home and related structures, as well as the modification or replacement of naturally occurring vegetation within the development area. Single-family homes include traditional "stick and mortar" structures, manufactured homes, and cabins for private use (e.g., not for commercial or public use). Other structures and improvements related to the residential use of a tract include the construction and use of garages, sheds, small barns, manufactured home pads, small guest houses, pools, tennis courts, driveways, paths, fountains, gardens, yards, septic systems, waterlines, other utilities, and similar features. Incidental take resulting from the use or maintenance of structures, landscaping, and other improvements after initial construction is also covered by the LPHCP, provided that the continued use of these improvements does not directly impact more than the acreage allotted to the home site.

The LPHCP covers incidental take of the Houston toad resulting from the construction and use (including home business use) of single-family residences on non-platted tracts in the Plan Area, upon the request of the property owner and after payment of mitigation fees or the recording of a Conservation Easement as described in Section 6.2.1.. The LPHCP will not cover new construction on illegally subdivided parcels. The LPHCP will also cover those subdivisions described in the 46-Subdivision EA/HCP that do not have recorded plats and on other tracts that can otherwise legally receive utility services under state law. Under current Texas law, in order to legally subdivide land without a plat, a number of criteria must be met, including a ten-acre minimum lot size. Depending on the tract size, the LPHCP may only cover incidental take on up to one acre per home site (the area covered for incidental take may be noncontiguous within the tract) based on the tract size requirements in Section 5.1.1. Multiple single-family residences may be located within a single non-platted tract (e.g., a landowner may obtain coverage for more than one single-family residence on a single non-platted tract, provided that the landowner

obtains separate Certificates of Participation for each residence and the construction of multiple residences is otherwise legal under applicable law and regulations). Single-family residential development that directly impacts more than one acre must seek incidental take authorization from the Service.

The LPHCP covers incidental take of the Houston toad resulting from the construction and use (including home business use) of single-family residences on lots within subdivisions that have a recorded subdivision plat as of October 1, 2003, (including within the 46 subdivisions) upon the request of the lot owner and the payment of mitigation fees. However, the LPHCP will only cover incidental take up to the allowable area per home site as outlined in Section 5.1.1). Coverage is not available under the LPHCP for any subdivision plat recorded after October 1, 2003, that does not comply with the *Conservation Subdivision Development Guidelines* described in Appendix C.

Incidental take resulting from other single-family residential construction and use in the Plan Area (e.g., home sites on platted tracts in new subdivisions) may be covered by the conservation subdivision development process described in Section 4.3, or by individual consultation with the Service.

The LPHCP automatically covers activities related to the on-going use single family homes constructed (Section 4.9). Upon the request of the lot owner, and the payment of mitigation fees or the recording of a Conservation Easement as described in Section 6.2.1, the LPHCP covers the enlarged development footprint on an existing single-family residential home site, if the total area of the expanded residential home site covers no more than the allowable area based on the size of the lot as defined in Section 5.1.1.

4.2 Commercial and Multi-Family Construction and Use

The LPHCP covers incidental take associated with the construction and use of small-scale, low density commercial or multi-family residential developments within subdivisions that have a recorded subdivision plat as of October 1, 2003, or on tracts that can otherwise legally receive utility services under state law, upon the request of the lot owner and after payment of mitigation fees or the recording of a Conservation Easement as described in Section 6.2.1. A small-scale development is defined under the LPHCP as occupying no more than one acre, regardless of the size of the tract or tracts upon which it is located. Developments meeting the one-acre limit must show that all improvements and land disturbance relating to the development, including structures, parking areas, septic systems and landscaping, are contained within an area of one acre or less. Developments directly disturbing more than one acre must seek authorization for incidental take directly from the Service or other Service approved process.

Upon the request of the lot owner and the payment of mitigation fees or the recording of a Conservation Easement as described in Section 6.2.1, the LPHCP may also cover the enlarged development footprint on an existing small-scale commercial or multifamily residential development, if the total acreage of the expanded development covers no more than one acre.

The LPHCP automatically covers activities related to the on-going use of small-scale, commercial or multi-family residential developments after construction including the maintenance of landscaping and lawns, use of pesticides and herbicides, recreational use of residential or parkland areas, driving and parking vehicles and equipment, and related uses, provided that the continued use of these improvements does not impact more than 1 acre per development. Incidental take resulting from the use and maintenance of structures, landscaping, and other improvements after initial construction is also automatically covered by the LPHCP, provided that the continued use of these improvements does not impact more than one acre per development. See Section 4.9.

4.3 Conservation Subdivision Development

The LPHCP may cover incidental take of the Houston toad resulting from the development of new subdivisions. Subdivisions may include single-family dwellings, multi-family dwellings, and small-scale commercial type structures and uses, such as retail and office, as provided for in the *Conservation Subdivision Development Guidelines* in Appendix C. Industrial uses are not allowed in conservation subdivisions receiving incidental take authorization through the LPHCP.

To receive incidental take coverage under the LPHCP, subdivisions must be designed and developed in accordance with the *Conservation Subdivision Development Guidelines* in Appendix C to avoid, minimize, and mitigate for incidental take of the Houston toad. These guidelines provide land developers with two general subdivision design options: a low density, large-lot design and a higher density, clustered design. The low density, large-lot subdivision design option requires a minimum lot size of at least 3 acres (1.21 hectares) and an average lot size of no less than 5 acres, and limits land use to single-family residential and small-scale commercial purposes. The higher density, clustered design option initially allows development to occur on up to 20 percent of the subdivision (clustered into a single area), with the potential for gradual increases in the amount of land available for development and the density of dwelling units over 30 years. Multi-family residences, including condominiums and apartments, and small-scale commercial structures are allowed in higher density, clustered subdivisions. Both design options direct the permanent protection of green space within the subdivision, and require restrictive covenants and management plans to minimize the direct and indirect impacts of land development on the Houston toad. Incidental take resulting from subdivision development or post-development utilization that does not follow the guidelines in Appendix C must be authorized independently by the Service or other Service approved process.

Activities associated with subdivision development that are likely to result in incidental take and that may be covered by this Plan include vegetation clearing, road construction, installation of utility connections, installation of utility distribution lines, the construction of storm water control features, and the construction and use of temporary contractor offices and equipment yards. The LPHCP also covers vegetation clearing and the construction of temporary sales offices associated with the marketing of subdivided lots or property. Further, incidental take resulting from the construction and use of individual residences and other end-use improvements within the subdivision is also covered by the LPHCP, provided that the guidelines in Appendix C are met.

Section 6.2.1 describes how participants may receive incidental take coverage for this activity by obtaining Certificates of Participation from Bastrop County.

4.4 Agricultural Management

Agricultural management includes activities associated with the use and management of agricultural land within the Plan Area existing on October 1, 2003. The LPHCP covers incidental take of the Houston toad resulting from activities associated with use of lands for agricultural purposes, as long as the activities follow the *Agricultural Management Guidelines* in Appendix D. However, the conversion of low-intensity agricultural land (e.g., pastured woodland or native pasture), timber land, or land under wildlife management use to high-intensity agricultural land (e.g., improved pasture, row crops, or orchards) is not covered by the LPHCP.

The LPHCP will cover incidental take from a variety of agricultural practices following the guidelines in Appendix D, such as controlling brush and weeds, installing and maintaining fences, grazing livestock and horses within the carrying capacity of the land, building barns and other structures for housing

animals, dispersing animal wastes on fields and pastures, constructing stock tanks, and similar activities. Incidental take from other activities is also covered, including planting and harvesting crops or forage in areas dedicated to these uses prior to the approval of the LPHCP, applying pesticides and herbicides in accordance with guidelines, mowing fields and pastures, constructing and maintaining farm and ranch roads or trails, constructing water crossings for livestock or equipment, and similar activities. In order to obtain coverage under the LPHCP, a signed Notice must be filed each year stating that the guidelines in Appendix D will be followed.

Incidental take resulting from the conversion of native vegetation communities to intensive agricultural uses, such as the creation of new crop fields, seeding native grasslands with non-native vegetation (e.g., coastal Bermuda grass (*Cynodon dactylon)*, King Ranch bluestem (*Bothriochloa ischaemum*), bahiagrass (*Paspalum notatum*), or other non-native species), or overstocking native pastures or rangeland with more animal units than the land can support, is not covered by the LPHCP. Incidental take authorization for conversion to high-intensity agricultural land uses must be obtained from the Service or other Service-approved processes.

Section 6.2.1 describes how participants may receive incidental take coverage for this activity from Bastrop County.

4.5 Forest Management

The LPHCP covers incidental take resulting from activities associated with the management of forests, including timber harvests, provided that management practices follow the *Forest Management Guidelines* in Appendix E. The guidelines in Appendix E are based on the Texas Forestry Best Management Practices (BMPs) developed by the Texas Forest Service and the Texas Forestry Association (TFA) (TFS and TFA 2000 et seq.) and are tailored toward minimizing and avoiding the potential negative impacts from forestry management on the Houston toad.

The forestry management guidelines in Appendix E address a number of forestry management practices, including: management planning, road construction and maintenance, site preparation and planting, chemical applications, timber harvesting, and prescribed burning. Specific provisions aimed at minimizing and avoiding negative impacts on the Houston toad include the designation of streamside management zones around potential breeding sites, deferment of certain activities until outside of the Houston toad breeding and emergence period, limitations on the use of chemicals, and the retention of a residual stand of trees after a harvest. Incidental take authorization for conversion to high-intensity agricultural land uses or any other non-forest land use is not provided under the LPHCP and must be obtained from the Service or other Service approved process. Section 6.2.1 describes how participants may receive incidental take coverage for this activity from Bastrop County.

4.6 Wildlife Management

Incidental take resulting from activities that enhance Houston toad or other native wildlife habitat may be covered by the LPHCP, if they are implemented in accordance with the *Wildlife Management Guidelines* in Appendix F. The guidelines in Appendix F were developed by TPWD biologists and are based on the TPWD management guidelines for the Houston toad (Campbell 1995).

The *Wildlife Management Guidelines* specify that management activities eligible for coverage under the LPHCP must be part of a management program, such that: (1) the landowner is a member of a wildlife management association with a TPWD-approved wildlife management plan that incorporates these guidelines; (2) the landowner currently receives the 1-d-1 open-space agricultural property tax appraisal

for wildlife management use (the wildlife appraisal) on his/her property and at least one of the three required management activities specifically addresses the Houston toad; or (3) the landowner has another type of wildlife management agreement with TPWD or other conservation group that incorporates these guidelines.

The *Wildlife Management Guidelines* address management planning, brush management, reforestation, prescribed burning, strip disking, planting food plots, overseeding pastures, restoring native grassland, constructing Houston toad breeding ponds, and controlling fire ants. Landowners are further encouraged under these guidelines to monitor Houston toad populations on their property. Activities that may be associated with the implementation of these types of habitat management practices include the limited clearing of vegetation, use of heavy machinery to construct ponds, mowing and turning soil to create or maintain firebreaks and stimulate forb production, and similar activities.

Specific provisions to help reduce any negative impacts to the Houston toad from the implementation of wildlife management practices include the designation of Water Management Zones[4] around potential breeding areas, deferment of certain practices until outside of the Houston toad breeding and emergence period, retention of a residual stand of trees during brush management activities, avoidance of highly erodible soils, the construction of ephemeral breeding ponds, and others.

Section 6.2.1 describes how participants may receive incidental take coverage for this activity from Bastrop County.

4.7 Bastrop County Infrastructure Maintenance and Improvement

The LPHCP covers incidental take resulting from the maintenance and use of all existing County of Bastrop infrastructure in the Plan Area, including roads, offices, parks, and other County facilities. Maintenance activities will include re-grading or maintaining road surfaces, bridge repair and improvement, mowing and other vegetation management activities, maintaining office and equipment storage yards and landscaping, and maintaining parks. Improvements include the installation of drainage facilities for roads, installation of drainage facilities outside of road rights of way, the upgrading or expansion of County roadways, bridges, and other County facilities that were in existence at the time the LPHCP was approved.

Section 6.2.1 describes how Bastrop County will authorize incidental take for this activity.

4.8 Emergency Services

The LPHCP covers incidental take resulting from governmental agencies responding to any public health or safety emergency situations in which life and property are threatened within the Plan Area, including, law enforcement, fire fighting, ambulance service, and rescue. These activities will mostly entail motorized vehicles operating on public rights-of-ways but will also include emergency services personnel performing their duties. Fire fighting activities may include grass and forest fires. These activities will be automatically covered by the LPHCP.

[4] The term Water Management Zone is used instead of Streamside Management Zone in order to clarify that water and ponding areas other than streams are also to be protected. The term Water Management Zone has the same meaning as Streamside Management Zone.

4.9 Ongoing Use of Previously Developed Land

Finally, upon request by landowners or other interests for voluntary participation in the Plan (and agreement to comply with applicable avoidance, minimization, and mitigation obligations set forth in Section 6 of this HCP and the land-use guidelines (appendices C, D, E, and F) the LPHCP covers incidental take in the Plan Area that may result from ongoing activities conducted on land that was developed prior to the approval of the LPHCP (excluding roadways which are covered under Section 4.7).

While developed land (including residential home sites, community parks, and commercial property), and lands having intense agriculture uses have not been generally considered habitat for the Houston toad, the species is now known to occur in some low-density residential subdivisions (Forstner 2002). The proximity of Houston toad observations to developed lands, and data showing that Houston toads sometimes travel long distances across the landscape (Price 1992), create the possibility for incidental take of the species in areas not considered habitat. Therefore, the LPHCP extends incidental take coverage to activities conducted on previously developed land in the Plan Area. The LPHCP does not retroactively authorize any incidental take that may have occurred from the development or use of these lands prior to the approval of the LPHCP.

Ongoing activities associated with existing developed areas include the use of residential areas that have already been impacted by development, such as yard maintenance activities or the addition of a deck or pool over an area of pre-existing lawn. Activities that directly impact areas that were not developed at the time the LPHCP was approved, such as the expansion of lawns, gardens, or structures into areas of native vegetation (excepting native-plant landscaping) are not considered an existing use. Incidental take for the expansion of existing developed areas that directly impact Houston toad habitat may be covered under other activity categories covered by the LPHCP (e.g., single-family residential construction and use or commercial and multi-family construction and use).

Section 6.2.1 describes how participants may receive incidental take coverage for this activity from Bastrop County.

5.0 POTENTIAL TAKE AND BIOLOGICAL IMPACTS ASSESSMENT

To permit incidental take, section 10(a)(2)(A)(i) of the ESA requires HCPs to specify "the impact which will likely result from such taking." This task involves determining how to measure take, estimating the amount of take that is likely to occur under the HCP, and estimating the potential impacts to the species resulting from the expected take. Finally, the HCP must state how much incidental take the applicant seeks to permit (Service and NMFS 1996). The Service may authorize the requested amount of incidental take, if such take would not "appreciably reduce the likelihood of survival and recovery of the species in the wild," among other provisions of section 10(a)(2)(B) of the ESA. To help make this determination, an evaluation of the direct, indirect, and cumulative impacts of the proposed LPHCP and other actions conducted in the Plan Area is required.

5.1 Estimated Incidental Take

The LPHCP estimates take in terms of the acres of potential Houston toad habitat affected by each of the covered activities. The LPHCP assumes that the entire Plan Area (approximately 124,000 acres) is potential habitat for the Houston toad; however, significant portions of the Plan Area are not currently considered Houston toad habitat because of existing uses such as intense agricultural activities and residential development (see Section 2.8.2; 46-Subdivision EA/HCP). Additionally, aquatic toad habitat and immediately adjacent terrestrial toad habitat areas used for breeding, nesting and forging are

generally not disturbed under the LPHCP. See Section 3.4; Secs. 2.1 and 2.1.1, App. C; Sec. 3.0, App. D; Sec. 2.0, App. E and Sec. 2.0, App. F. Although research continues, this approach is based on the best available information on the distribution and abundance, life history characteristics, and habitat requirements of the Houston toad. Given the incomplete state of knowledge about the Houston toad, and the general biology of explosive breeders like the Houston toad (e.g., Houston toads are a relatively short-lived species with reproductive characteristics that can result in large year-to-year fluctuations in population size depending on weather conditions), it is impossible to accurately assess the amount of incidental take and the degree of impacts to the species based on the absolute number of Houston toads likely to be affected by a particular activity.

The number of acres of Houston toad habitat affected by activities addressed by the LPHCP is estimated from projected changes in land development and land use patterns. This approach was chosen since the activities covered by the LPHCP are limited to those consistent with the current semi-rural nature of the Plan Area and that may be modeled by available data. This method assumes that past rates of change will continue into the future (at least as long as the term of this HCP). While this assumption may not hold for all situations (e.g., the implementation of the LPHCP may affect the amount and character of development activities and other types of land use practices in the Plan Area), it is assumed to be the most appropriate approximation of the amount of incidental take likely to occur under the HCP. All assumptions regarding the validity of observed trends as future predictors of land use changes are stated.

In this analysis, the acreage affected by certain types of activities may not be exclusive of other types of activities. For example, acreage impacted by forest management practices may also be affected by agricultural or wildlife management activities in the same or different years.

With the LPHCP, Bastrop County anticipates a mosaic of land uses in the Plan Area that allow Houston toads to persist with human uses of the land, including a variety of land management practices associated with low density conservation subdivisions, and agricultural, forestry, and wildlife management uses. Many of these land management practices may create negative impacts to the Houston toad in the short term, but improve habitat quality in the long-term (e.g., prescribed burning). This incidental take assessment includes areas subject to these long-term habitat management practices, since incidental take may occur during their implementation, and these activities may be expected to occur over nearly the entire Plan Area at least once during the term of the LPHCP.

The short and long-term impacts of future land development and land management activities are discussed in Section 5.2, and they provide the basis for determining the extent of any necessary mitigation.

5.1.1 Single-Family Residential Construction and Use

The LPHCP covers incidental take resulting from the construction and use of single-family residences and related structures on legally platted lots in the Plan Area that existed before October 1, 2003 and legal, non-platted tracts. This category of incidental take coverage does not include conservation subdivisions which are addressed in Section 5.1.3 and Appendix C. Development of each home site covered by this category of incidental take, including landscaping, must be limited to no more than the applicable allowable area per residence to be eligible for coverage by the LPHCP as described in this section.

Based on the data in Table 5-4 and recent trends observed, the LPHCP assumes that large lot or non-platted tracts will continue to predominate the housing market in the Plan Area. The large number of remaining undeveloped lots within the 46 subdivisions and the age of many of the 46-Subdivision developments also reflects the trend toward larger lots in the Plan Area. See Section 1.8.4 and Table 1 and Table 2 of 46-Subdivision EA/HCP. Therefore, the LPHCP anticipates that legal, non-platted tracts

and conservation subdivisions will achieve full build out during the term of the LPHCP permit and that new house construction within the 46 subdivisions will absorb the remaining demand in the Plan Area.

Under current state law, a non-platted tract must contain at least ten acres and meet other requirements in order to be a legal subdivision of land. This plan assumes that the ten-acre minimum for legal non-platted subdivisions will remain in effect through the life of the permit. To estimate the trends in house construction on non-platted tracts, an analysis of septic permits issued in the Plan Area was conducted. The septic permits issued for tracts outside of the 46-Subdivisions generally represent house construction on non-platted tracts in the Plan Area, since the 46-Subdivision EA/HCP covers almost all of the existing subdivisions in the Plan Area. KES Consulting estimated that approximately 84 percent of the septic permits issued by Bastrop County within the Plan Area between 1999 and early 2002 were for lots and tracts within the subdivisions covered by the 46-subdivision EA/HCP and approximately 16 percent of the septic permits issued by Bastrop County were for tracts outside of the subdivisions covered by the 46-Subdivision EA/HCP (see Table 2-7).

The LPHCP assumes that approximately 16 percent of the total new households expected in the Plan Area by 2030 (6,340) will be built on legal, non-platted tracts that are outside of the areas previously covered by the 46-Subdivision EA/HCP and that are not part of a conservation subdivision. Therefore, the LPHCP projects 1,015 households to be built on legal, non-platted tracts during the term of the LPHCP permit. The LPHCP allows up to one acre to be impacted by the construction and use of each single-family home site on a legal, non-platted tract. Therefore, the maximum estimated acreage to be directly impacted by single-family residential construction and use on legal, non-platted tracts during the term of the LPHCP is approximately 1,015 acres (410.8 hectares) (Table 5-1). Although the legal, non-platted tracts can be larger than ten acres, the LPHCP assumes that all such tracts will be ten acres. Thus nine acres of habitat or potential habitat will be set aside to provide conservation benefits to the toad. As a result, at least 9,135 acres will be set aside for the conservation benefit of the toad.

Based on the data from Table 3 of the 46-Subdivision EA/HCP attached as Appendix G, subdivisions within the 46-Subdivision EA/HCP have a wide range of lot sizes that are undeveloped. Approximately 27 percent of the remaining undeveloped lots within the 46 subdivisions have a platted density of five acres or more per lot and approximately 73 percent of the remaining undeveloped lots within the 46 subdivisions have a platted density of less than five acres per lot. As discussed above, the LPHCP does not anticipate full build out of the 46 subdivisions during the term of the LPHCP but, instead, assumes that the 46 subdivisions will satisfy remaining market demand for housing sites not fulfilled by conservation subdivisions discussed in Section 5.1.3 (2,444 households) and legal, non-platted tracts (1,015 households). Thus, 2,877 households or 45% of the expected new households within the Plan Area are anticipated to be constructed within the 46 subdivisions during the term of the LPHCP permit.

The LPHCP allows up to one acre to be impacted by the construction and use of each single-family home site on lots five acres or larger within the 46 subdivisions. The LPHCP allows one half acre to be impacted by the construction and use of each single-family home site on lots less than five acres within the 46 subdivisions. The single family development area will include the single-family residence or other structures, garage, yard, garden, pool, and any other associated structures. The development area does not include the driveway, provided the driveway is 16 feet wide or less. If the driveway is greater than 16 feet wide, it will be considered part of the one half acre development area.

Although historical trends suggest that a greater percentage of the lots within the 46 subdivisions used for new housing starts are likely to be five or more acres in size, the LPHCP assumes that market absorption of lots for new housing starts will reflect the current supply ratio between lots at least five acres in size and those lots less than five acres in size. Based on the data from Table 3 of the 46-Subdivision EA/HCP (attached as Appendix G), 27 percent of the 2,877 lots within the 46 subdivisions used for new housing

starts will be five acres or greater in size. Therefore, the LPHCP assumes that 775 lots within the 46 subdivisions, of at least five acres in size, will have new housing starts during the term of the LPHCP. As a result, 775 acres of habitat are expected to be impacted and at least 3,100 acres of toad habitat or potential habitat will be set aside and conserved for the benefit of the toad.

Additionally, the LPHCP assumes that 2,100 lots within the 46 subdivisions, of less than five acres, will have new housing starts during the term of the LPHCP permit. As a result of the 0.5 acre development area, 1,050 acres of habitat are expected to be impacted. Assuming an average lot size of 2.5 acres, then approximately 2.00 acres per house would be set aside for the conservation benefit of the toad. Based on these assumptions, at least 4,200 acres would be set aside for the conservation benefit of the toad. Therefore, the maximum estimated acreage to be directly impacted by single-family residential construction and use within the 46 subdivisions during the term of the LPHCP is approximately 1,825 acres. As discussed in Section 1.8.4, the Service determined that four of the subdivisions covered by the 46-Subdivision EA/HCP contained low quality toad habitat and forty-two subdivisions had medium quality habitat. There is insufficient data to precisely estimate how much of the projected 1,825 acres will be low quality habitat and how much will be medium quality habitat. Based on Table 3 of the 46-Subdivision EA/HCP (attached as Appendix G), approximately 84% of the remaining undeveloped lots within the 46 subdivisions are located within low quality toad habitat and that approximately one third of the remaining undeveloped acreage is within low quality habitat.

Table 5-1 below summarizes the amount of habitat impact from the construction of new households within the Plan Area during the term of the LPHCP.

Table 5-1. Approximate Number of New Households Expected to be Covered by the LPHCP Single-Family Residential Activity and the Approximate Acreage Impacted.

Category	2010	2020	2030	Total Change (2000 - 2030)
Expected Number of New Households				
Within the Plan Area	2,160	2,198	1,982	6,340
Outside of the 46 Subdivisions	346	352	317	1,015
Inside of the 46 Subdivision	998	1,030	849	2,877
Expected Acreage Impacted by Single-family Development Outside 46 Subdivision	346	352	317	1,015
Expected Acreage Impacted by Single-family Development Inside 46 Subdivisions	633	653	539	1,825
Expected Acreage Protected Outside 46 Subdivisions	3114	3168	2853	9,135
Expected Acreage Protected Inside 46 Subdivisions	2532	2613	2155	7,300

The LPHCP also covers incidental take from the enlargement of the development footprint on existing single-family residential home sites outside of the subdivisions covered by the 46-Subdivision EA/HCP, if the total area of the home site after expansion does not exceed one acre. Based on BCAD data for 2002, approximately 679 parcels in the Plan Area, exclusive of the parcels included in the 46-Subdivision EA/HCP, contained single-family residential improvements in 2002. Available data does not discern how many of these 679 households exist within or adjacent to toad habitat. Approximately 98,000 acres of the 124,000 acres within the Plan Area have an agricultural use. See Section 2.8.2 and Table 2-15. The LPHCP assumes that many of the 679 households described above occur in conjunction with agricultural

lands that do not contain toad habitat. However, for purposes of estimating the amount of take associated with home site area expansions, each household is assumed to be within or adjacent to toad habitat.

Based on the data discussed in Section 2.8, Section 4.1 and presented in Table 2-10 and 2-12, it is reasonable to assume that this particular category of existing single-family residences occur on parcels of 10 or more acres. Further, the home site area must currently be less than one acre in size in order to qualify for LPHCP coverage for an expansion of the home site area. Developing and maintaining an acre of land for a private single family residence in a non-agricultural setting requires substantial on-going expenditures of time and financial resources. Considering the amount of existing development within the home site and the cost of expanding a home site area, an expansion of 6,500 square feet or 0.15 acres is adopted as a reasonable prediction of the amount of the average home site expansion.

Therefore, assuming that each of these existing home sites expanded by an average of 0.15 acre (0.06 hectare) over the term of the LPHCP, a rough estimate of the amount of incidental take likely to result from the expansion of existing home sites outside of the 46 subdivisions is approximately 102 acres (41.3 hectares). The assumption that all existing commercial and multi-family developments will expand may not be completely valid, but this estimation represents a maximum amount of incidental take that could be associated with such expansions under the LPHCP.

The LPHCP also covers incidental take from the expansion of existing single-family residential home sites inside the subdivisions covered by the 46-Subdivision EA/HCP such that the total area of the home site does not exceed 0.5 acre. Based on Table 3 from the 46-Subdivision EA/HCP found in Appendix G, approximately 3,133 parcels within the 46 subdivisions contained single-family residential improvements in 2001. Assuming that 20 percent of these existing home sites (626) expanded by an average of 0.15 acres over the term of the LPHCP and that 50 percent of these existing home sites (1,566) expanded by an average of 0.035 acres (0.014 hectare) over the term of the LPHCP, a rough estimate of the area directly impacted from the expansion of existing home sites within the 46 subdivisions is approximately is 149 acres (60.3 hectares).

The total expected amount of incidental take from the construction of new homes (2,840 acres) and the expansion of existing home sites (251 acres) is approximately 3,091 acres (1,251 hectares).

5.1.2 Commercial and Multi-Family Construction and Use

New Construction

Approximately one percent of septic permits (seven of 574 permits) issued by Bastrop County in the Plan Area between 2000 and early 2002 were for non-residential development projects. This analysis assumes that these non-residential permits represent commercial or multi-family residential development (see Section 2.7.3). The distribution of commercial and residential lots in the Plan Area as of early 2002, based on land use data from BCAD, also estimates that approximately one percent of developed parcels are used for commercial or multi-family purposes (see Table 2-12). The LPHCP projects that same ratio of development type will continue during the term of the permit. Large, national retailers have begun to enter Bastrop County; however, these large commercial developments have located along the State Highway 71 corridor outside of the Plan Area. Further, the LPHCP does not provided incidental take coverage for large scale commercial and multi-family developments.

Assuming the number of new households expected for the Plan Area (6,340 households) represents approximately 99 percent of the total amount of anticipated development, approximately 64 new commercial or multi-family developments (of a size that the LPHCP incidental take permit would cover)

can be expected to occur in the Plan Area by 2030 (Table 5-2). Further, the LPHCP assumes that one acre per site will be directly impacted by this new development activity (the maximum amount allowed per development project under the LPHCP). Finally, the LPHCP assumes that the indirect impacts from multi-family and commercial developments are the same as those associated with single-family development. Therefore, approximately 64 acres may be directly impacted by new commercial or multi-family development in the Plan Area over the term of the LPHCP (Table 5-2).

Table 5-2. Expected Amount of New Commercial or Multi-family Development to be Covered by the LPHCP and the Approximate Acreage Impacted by this Development.

Category	2010	2020	2030	Total Change (2000 - 2030)
Total Number of Septic Permits Expected Within the Plan Area	2,182	2,220	2,002	6,404
Number of Commercial or Multi-Family Developments Expected Within the Plan Area	22	22	20	64
Expected Acreage Impacted by Commercial or Multi-Family Development	22	22	20	64
Expected Acreage Impacted by expansion of Existing Commercial or Multi-Family Developments	5.6	5.6	5.6	17

Expansion of Existing Commercial and Multi-Family Development

The LPHCP also covers the expansion of existing commercial or multi-family residential developments, such that the total area covered by each development does not exceed one acre after expansion. BCAD land use data for 2002 shows that approximately 173 parcels in the Plan Area contained commercial or multi-family residential improvements (See Table 2-12). Assuming that each of these existing developed parcels expanded the area directly impacted by improvements by an average of 0.1 acre (0.04 hectare) over the term of the LPHCP, a rough estimate of the amount of incidental take likely to occur from the expansion of existing commercial or multi-family residential sites is approximately 17 acres (6.9 hectares). The assumption that all existing commercial and multi-family developments will expand may not be completely valid, but this estimation represents a maximum amount of incidental take that could be associated with such expansions under the LPHCP.

The total amount of incidental take expected to occur from new Commercial/Multi-Family and expanded Commercial/Multi-Family is estimated to be 81 acres (32.8 hectares).

5.1.3 Conservation Subdivision Development

The LPHCP covers incidental take that may result from the development of conservation subdivisions in the Plan Area. These subdivisions incorporate green space protection and management into their design and enlist individual property owners in the conservation of Houston toad habitat. The LPHCP estimates the number of new subdivisions that may be developed within the Plan Area from the platting history of the subdivisions included in the 46-Subdivision EA/HCP. The platting year, acreage, and number of lots for each of these subdivisions were listed in the 46-Subdivision EA/HCP and are shown in Table 5-3.

Approximately 30 subdivisions were platted within the Plan Area between 1960 and 1999. These subdivisions encompassed approximately 10,860 acres and added approximately 11,816 new lots to the Plan Area. An average of eight new subdivisions per decade, spanning an average total of 2,715 acres (1,099 hectares), were added to the Plan Area between 1960 and 1999 (Table 5-3).

Table 5-3. Number, Acreage, and Lot Totals of the Platted Subdivisions in the 46-Subdivision EA/HCP by Decade (Service 2001).

Category	1960-1969	1970-1979	1980-1989	1990-1999	Decade Average
Number of New Platted Subdivisions	7	12	8	3	8
Number of Acres within New Platted Subdivisions	2,618	5,856	1,991	395	2,715
Number of Lots within New Platted Subdivisions	1,850	9,272	655	39	2,954

Based on the historical trends discussed above, the LPHCP assumes that eight new subdivisions will be added to the Plan Area each decade for the term of the requested incidental take permit. Therefore, approximately 24 new, platted subdivisions should be added to the Plan Area during the term of the LPHCP, and cover approximately 8,145 acres (3,296 hectares). For the purposes of this analysis, the LPHCP also assumes that all new platted subdivisions in the Plan Area will seek incidental take coverage through the LPHCP. The assumption that all new subdivisions will be conservation subdivisions may not be completely valid, but this estimation represents a maximum amount of incidental take that could be associated with such developments under the LPHCP. New subdivision that are not conservation subdivisions will, if appropriate, have to seek incidental take authorization by means other than the LPHCP.

The *Conservation Subdivision Development Guidelines* (Appendix C) specify that no more than 30 percent of the subdivision area will be developed (e.g., all structural and infrastructure improvements must be contained within 30 percent of the subdivision acreage, unless the infrastructure improvements are maintained to Houston toad habitat standards). Therefore, a minimum of 70 percent of the acreage covered by these new subdivisions will be permanently protected and managed for the Houston toad. The maximum amount of acreage that will be directly impacted by development activities within conservation subdivisions will be approximately 2,444 acres (989.0 hectares) by 2030 at full build-out (i.e., all available lots are developed) (Table 5-4). Conversely, an estimated 5,701 acres will be set aside and managed for the benefit of the toad. If more conservation subdivisions are proposed than currently estimated, then Bastrop County will consult with the Service.

Table 5-4. Projected Number of New Conservation Subdivisions to be Built in the Plan Area Between 2000 and 2030.

Category	2010	2020	2030	Total Change (2000 - 2030)
Number of New Subdivisions	8	8	8	24
Acres within New Subdivisions	2,715	2,715	2,715	8,145
Acres Impacted by Development within New Conservation Subdivisions at Full Build-Out	816	816	816	2,444
Acres of Protected Green space within New Conservation Subdivisions	1,899	1,899	1,899	5,701

5.1.4 Agricultural Management

Incidental take resulting from the continuation of agricultural activities following the *Agricultural Management Guidelines* in Appendix D in the Plan Area is covered by the LPHCP. These include

agricultural activities on (1) cultivated land, (2) improved pasture or hayland (not cropland), and (3) rangeland/native grazing lands/grazable woodlands/native pasture. Activities occurring on theses lands include controlling brush and weeds, installing and maintaining fences, grazing livestock and horses within recommended limits, dispersing animal wastes on fields and pastures, constructing stock tanks, and planting and harvesting crops or forage in areas dedicated to these uses prior to the approval of the LPHCP. Also, application of pesticides and herbicides, mowing fields and pastures, constructing and maintaining farm and ranch roads or trails, constructing water crossings for livestock or equipment, and any similar activities are addressed herein. Not covered under the LPHCP are impacts to toad habitat as a result of the conversion of native vegetation communities to intensive agricultural uses. This includes creation of new crop fields, seeding native grasslands with sod grasses, clearing woodlands or overstocking grazing/stocking to levels not consistent with the guidelines of the NRCS for the type of vegetation and use.

Projections of changes in the acreage of various types of agricultural land uses were developed from USDA agricultural census data for 1987 and 1997, and 2002 land use data from BCAD (see Section 2.8.2). The LPHCP assumes that agricultural management activities will regularly occur over most of the acreage in the "Undeveloped" category which includes, "Acreage", native pasture, improved pasture, row crop, and orchard land use categories. See Table 2-12. Therefore, there is a potential for incidental take to occur in some of the undeveloped acreage throughout the term of the LPHCP.

Agricultural land in the "Acreage" and native pasture categories is likely to represent potentially occupied Houston toad habitat, since both primarily contain native vegetation and are generally subjected to relatively low-impact management practices. In each decade over the term of the LPHCP, all of the available acreage in these two agricultural land use categories is likely to be impacted by the low-impact land management practices that are covered by the *Agricultural Management Guidelines* (Appendix D) and for which incidental may occur.

The LPHCP estimates that short term incidental take might occur on approximately 41,592 acres (16,831 hectares) of "Acreage" and native pasture lands from the implementation of covered management practices by 2012, approximately 33,752 acres (13,659 hectares) by 2022, and approximately 27,128 acres (10,978 hectares) by 2032 (Table 5-5).

Table 5-5. Projected Acres of "Acreage" and Native Pasture in the Plan Area by Decade on which Incidental Take May Occur.

BCAD Agricultural Land Use Category	2012	2022	2032
"Acreage"	13,580	8,988	5,796
Native Pasture	28,012	24,764	21,332
Combined Acreage	41,592	33,752	27,128

The more intensive agricultural land use categories, such as improved pasture, row crops, and orchards, are projected to increase in acreage over the term of the LPHCP (see Table 2-15). However, the LPHCP does not cover incidental take resulting from the conversion of land from native vegetation (e.g., "Acreage" or native pasture) to these more intensive agricultural uses. Therefore, the estimate of land that is likely to be impacted by the continuation of intensive agricultural uses under the LPHCP is based on the amount of acreage in these categories in 2002 (a total of 47,359 acres (19,165 hectares), see Table 2-15). Incidental take is unlikely to occur on these intensely managed agricultural lands, since they do not generally represent Houston toad habitat (see Section 3.0).

5.1.5 Forest Management

Forest management activities may occur on land with forest cover, regardless of the primary use of the property (e.g., residential, agricultural, or timber land uses). The LPHCP covers incidental take resulting from low-impact forest management practices that follow the *Forest Management Guidelines* in Appendix E. These practices relate to management planning, road construction and maintenance, timber harvesting, **site preparation**, planting, **prescribed burning**, chemical applications, and the use of **streamside management zones**.

There were approximately 69,571 acres (28,154 hectares) in treed or forested cover in the Plan Area in 2000 (see Table 2-16). This forested land cover is expected to decrease to approximately 65,595 acres (26,545 hectares) by 2010, approximately 61,619 acres (24,936 hectares) by 2020, and approximately 57,643 acres (23,367 hectares) by 2030 (see Table 2-17). The LPHCP assumes that some type of forest management activity will occur over all of the forested land cover in the Plan Area at least once each decade. Incidental take is likely to occur as a result of forest management practices, at least in the short term, since forests generally represent high quality habitat for the Houston toad in Bastrop County.

5.1.6 Wildlife Management

The LPHCP covers incidental take that may occur from wildlife management activities conducted according to the *Wildlife Management Guidelines* in Appendix F within the Plan Area. These activities include brush management, reforestation, prescribed burns, generation of supplemental food sources, fire ant control and construction of Houston toad ponds. Wildlife management may occur on any undeveloped land in the Plan Area, regardless of its primary use (e.g., residential backyards or agricultural lands). There were approximately 122,472 acres (49,418 hectares) of undeveloped land in the Plan Area in 2000 (see Table 2-16 for undeveloped treed, undeveloped non-treed, open water, and wetland land cover categories). This undeveloped acreage is projected to decrease to approximately 121,760 acres (49,274 hectares) by 2010, to approximately 121,048 acres (48,986 hectares) by 2020, and to approximately 120,335 acres (48,699 hectares) by 2030 (see Table 2-17).

The LPHCP assumes that the undeveloped acreage in the Plan Area will undergo some type of wildlife management activity at least once. The LPHCP is reasonably assured that the amount of acreage actively managed for the toad would increase beyond initial projections due to the 2007 amendment to Section 23.51 of the Texas Tax Code that makes it easier for landowners to qualify for a wildlife management exemption. See Section 6.2.3. This assumption is a generalization, since some areas may never be managed for wildlife, while other areas may be managed for wildlife on a yearly basis. The actual amount of incidental take associated with wildlife management activities conducted under the LPHCP will depend on the management practices used and the type of habitat they are applied to. For example, a prescribed burn in a forested area may result in more short-term incidental take than a prescribed burn in an open pasture. However, it is impossible to predict precisely what type of activity may occur on every acre of undeveloped land in the Plan Area.

5.1.7 Local Public Infrastructure Maintenance and Improvement

The LPHCP covers incidental take resulting from the maintenance, improvement, and use of all existing County of Bastrop infrastructure in the Plan Area, including roads, offices, parks, schools, police stations, fire stations, and libraries. Bastrop County maintains more than 150 miles (241 kilometers) of road within the Plan Area. Many roads are substandard because of insufficient right of way and inadequate drainage facilities. Bastrop County intends to begin a program that will widen the rights of ways of many of these roads, construct wider roads and install effective drainage adjacent to the roads, to meet current

road standards. For safety reasons, public roads should have clear zones adjacent to the road surface as well as adequate drainage components so that water does not stand in or cross the road or stand in ditches along the road. The widening of the right of ways will cause some loss of toad habitat on the margins. The installation of effective drainage facilities will reduce the number of ephemeral ponds within public rights of way that frequently function as breeding sinks for the Houston toad. As discussed in Section 3.4, ideal breeding ponds are adjacent to treed areas. The removal of the roadside breeding sinks will increase the use of more viable and, thus more productive, breeding ponds by Houston toads. Bastrop County anticipates that 120 acres (48.6 hectares) of Houston toad habitat will be disturbed by the widening of rights of ways during the term of this permit. It is anticipated that the removal of roadside breeding sinks should result in a net benefit to the Houston toad through increased productive breeding in less hazardous habitat.

5.1.8 Emergency Services

The LPHCP covers incidental take resulting from governmental agencies responding to public health or safety emergency situations within the Plan Area, including law enforcement, fire fighting, ambulance service, and rescue. These activities are not expected to cause any permanent loss of Houston toad habitat. The use of fire breaks by emergency services personnel to control forest or grass fires is covered by the LPHCP. Controlled burns as part of forest management are not covered by this specific activity category but by the forest management guidelines in Appendix E. The Applicant believes that the potential for death of, or injury to, Houston toads resulting from emergency services vehicles traveling in the Plan Area is very low because of the low occurrence of Houston toads on roads. The Applicants also believe the potential for significant long-term impacts to Houston toad habitat resulting from emergency services activities is very low because emergency services, other than fire control, do not require the modification of land. The amount of Houston toad habitat adversely affected by emergency services activities authorized under the requested permit cannot be quantified.

5.1.9 Ongoing Use of Previously Developed Land

While participation in the LPHCP is voluntary, initial and continued incidental take authorization from the ongoing use of property developed prior to the approval of the LPHCP for a given activity is dependent upon on-going compliance with applicable avoidance, minimization, and mitigation obligations set forth in Section 6 of this HCP and the land-use guidelines (appendices C, D, E, and F). Land cover data shows that approximately 1,533 acres (620.4 hectares) of the Plan Area had developed land uses in 2000 that were discernible from satellite imagery (see Table 2-16). Unlike other covered activities, this activity does not cause the direct loss of potential Houston toad habitat, since it only applies to the use of previously developed land. The primary possibility for incidental take from this activity lies in the potential to harm individual Houston toads that may be found on previously developed land. However, the loss of an individual Houston toad due to the use of previously developed land is not likely to be a common occurrence, since developed lands are not generally considered habitat for the Houston toad, although there is a greater potential for take on larger properties where the toad can use undeveloped portions. It is anticipated that implementation of the land-use guidelines will reduce the incidental take associated with ongoing use of such lands.

Further, the LPHCP does not cover incidental take of Houston toads on federal or state highways, which are known to be major barriers to Houston toad dispersal and result in the loss of numerous individuals.

5.2 Estimated Impacts

This analysis evaluates the anticipated impacts to the Houston toad resulting from the activities that can be covered by the LPHCP. The activities discussed above will have direct and indirect impacts on the Houston toad and its habitat. Direct impacts, for the purpose of this analysis, occur on land directly subjected to the construction of subdivision infrastructure, structures, or the implementation of land management activities receiving incidental take authorization under the LPHCP. Indirect impacts arise from the continued use of modified land or changes that may occur after the implementation of management activities. Indirect impacts may occur on or off the site of direct impact, and are potentially magnified by habitat fragmentation.

The direct and indirect impacts associated with the covered activities may occur over a variety of spatial and temporal scales. For example, negative impacts at one scale may produce a positive impact at another scale (i.e., prescribed burning may kill individual toads in the short term but may improve the habitat in the long-term). The impacts at different spatial and temporal scales are considered in the following analysis.

The overall design of the LPHCP attempts to avoid or minimize the negative impacts from incidental take, and mitigate to the maximum extent practicable for anticipated take. By limiting the type of activities covered by the LPHCP to relatively small-scale or low-intensity activities, the LPHCP seeks to encourage the continuation and expansion of low intensity activities within the Plan Area that are both compatible with the Houston toad and economic growth throughout the term of the permit. Large-scale developments and the creation of high-intensity agricultural land uses that would cause widespread habitat loss, degradation, and fragmentation in the Plan Area can not receive incidental take authorization under the LPHCP and must obtain such authorization through independent consultation or permitting by the Service.

5.2.1 Development Activities

The construction of single-family homes, multi-family residences, commercial buildings, and related structures (including construction in conservation subdivisions) has similar impacts on Houston toad habitat. Land development activities also include public infrastructure improvements and maintenance. Land development involves removing naturally occurring vegetation, reshaping the ground surface, adding impervious cover (e.g., buildings, roads, driveways, and parking lots), and may result in the planting of non-native vegetation. Other direct consequences of development include soil compaction by heavy equipment, erosion from disturbed soils, and the alteration of drainage patterns. Finally, direct on-site impacts include the potential to kill individual Houston toads with construction equipment and vehicles.

The primary direct impact to the Houston toad from land development activities is habitat loss. Habitat loss is likely to occur from the removal of natural vegetation (particularly forest cover), construction of buildings and other types of impervious cover, and the addition of non-native vegetation to the landscape that does not provide suitable habitat for the species (e.g., turf grass). The loss of breeding habitat may also occur if natural drainage patterns are altered, or ponds or wetlands are destroyed. Depending on the extent of impervious cover, vegetation planted, and post-construction land management, habitat loss from development can be permanent.

Habitat degradation from land development activities may extend past the actual construction site if temporary erosion controls are not properly installed or maintained. Erosion from the construction site could clog natural drainages or ponds or contaminated runoff may degrade water quality in breeding

ponds; however the LPHCP is premised in part on compliance with other federal and state environmental laws, including temporary erosion controls during construction. The continued use of developed land often involves the application of chemical pesticides and fertilizers, the mechanical maintenance of vegetation, an increase in vehicular traffic, and changes in the abundance and composition of predator and competitor populations (e.g., fire ants and other amphibians). Other indirect effects of development include the contamination of runoff from roads, driveways, rooftops, lawns, gardens, and other areas. Each of these vectors is presumed to be harmful to the Houston toad (see Section 3.0).

Habitat fragmentation will occur as a result of land development in the Plan Area, and will likely increase the impact of the indirect effects on the Houston toad by increasing the exposure of previously undisturbed habitat to development related threats.

The extent to which indirect impacts from residential land use affect Houston toads, in terms of both how far away from the source these impacts are and the degree of impact caused by development is unknown. Residential development is likely to have played a part in the extirpation of Houston toads from Harris County, and other previously known Houston toad locations (Service 1984). However, recent work in Bastrop County has shown the toad to occur within mostly developed (approximately two-thirds of lots were built on), low-density residential areas (Forstner 2002). Nevertheless, the direct and indirect effects of land development are likely to have a lasting, negative impact on the Houston toad by destroying and degrading already fragmented habitat within and immediately adjacent to developed sites (see Section 3.0).

In general, the impacts to the Houston toad from development activities are likely to be highly negative and long lasting. Direct habitat loss from the construction of buildings and other structures will occur on individual construction sites. This habitat loss will fragment remaining Houston toad habitat in the vicinity of the construction site, and will indirectly result in the further degradation of additional habitat surrounding these sites.

The take analysis above estimates that permanent, direct, negative impacts will occur on 5,736 acres (2,321 hectares) of the Plan Area during the term of the LPHCP. This estimate includes areas surrounding actual construction sites that are expected to experience significant habitat degradation (a maximum of one acre per development project). It is likely that 5,736 acres is an overestimate of the amount of direct take likely to occur from covered land development activities because some land development activities will occur in non-habitat areas. See Table 2-17. In 2000, the Plan Area contained 52,269 acres of non-treed undeveloped land. Treed areas immediately adjacent to breeding ponds are critical for the survival of emerging toadlets. Therefore, this estimate should encompass the total area to be subjected to habitat loss and significant habitat degradation over the term of the LPHCP. The above estimate also assumes that all new subdivisions will be developed under the conservation subdivision provisions of the LPHCP and are at full build-out. Conservation subdivisions are considered superior for protecting the Houston toad because of the identification and protection of key toad habitat areas as well as low density development. Conservation subdivisions will provide long-term net benefits to the Houston toad by permanently setting aside and protecting key toad habitat areas as part of the platting and development process. In contrast, new housing starts within the 46 subdivisions can provide mitigation through the payment of fees but have less ability to avoid and minimize impacts on the Houston toad because of the size and configuration of lots.

The negative impacts of the ongoing use of previously developed land in the Plan Area are assumed to be minimal, due to the relatively small possibility for Houston toads to be present in these areas. Some acreage may be subject to the indirect impacts of the continued use of previously developed lands. Although ongoing use is unlikely to cause a substantive amount of take on already developed properties, there is the possibility that take of individual toads may occur. However, such take is generally rare in

already developed areas and it would be highly unlikely to increase after approval of the LPHCP. Incidental take should be offset by implementing the applicable avoidance, minimization, and mitigation obligations set forth in Section 6 of this HCP and the land-use guidelines (appendices C, D, E, and F)

While land development activities are likely to have high-impact, long-term, negative consequences to the Houston toad on an estimated 5,736 acres, this area represents less than five percent of the total acreage of the Plan Area and less than eight percent of the land within the Plan Area containing undeveloped treed land, wetlands, and open water. Minimization and mitigation measures to offset these impacts are described in Section 6.0.

5.2.2 Land Management Activities

Agricultural, forestry, and wildlife management practices that could result in incidental take of the Houston toad include grazing management, weed and brush control, pond construction, prescribed burning, the use of heavy equipment, the construction and maintenance of farm and ranch improvements, harvesting crops and trees, and similar practices. These land management practices, even those conducted in accordance with the guidelines developed by the LPHCP, are likely to impact the Houston toad and its habitat in a variety of ways. It is also likely that these impacts will differ depending on the scale at which they are considered.

Direct impacts from land management practices include the potential to kill individual toads with vehicles or equipment, permanent habitat loss from the construction of farm and ranch improvements (e.g., buildings and access roads), and temporary habitat loss from the disturbance of naturally occurring vegetation and the soil surface. The acreage of permanent habitat loss from land management activities is unknown, but is assumed small over the term of the LPHCP since most active farming or ranching operations already have much of the necessary infrastructure in place.

Direct degradation of Houston toad habitat may occur from the presence of livestock at sensitive breeding habitats, the application of chemicals to naturally occurring vegetation in the Plan Area, the erosion of disturbed soils, and the sedimentation in drainages and other potential breeding habitats (see Section 3.0). Depending on the type of management practice, potential habitat degradation may be temporary or long-term, if the practice reoccurs regularly over time.

Indirect impacts to the Houston toad and its habitat are also likely to result from land management practices conducted within the Plan Area. These indirect impacts may include the alteration of predator and competitor populations, such as soil disturbances that facilitate the invasion of red imported fire ants or the thinning of forest cover that could increase opportunities for competition from and hybridization with Woodhouse's toads. Contaminated runoff carrying pesticides, fertilizers, excess nutrients, and other chemicals can degrade water quality in breeding habitat (see Section 3.0). As with direct impacts, these indirect impacts may be temporary or long-term, depending on the management program applied to a tract of land.

The land management activities covered by the LPHCP encompass a very diverse set of potential practices that are a regular part of conducting agricultural, forestry, or wildlife management operations. Given the scope of these practices and the geographic scale of the undeveloped land in the Plan Area (over 108,000 acres in 2002; Table 2-12), it is difficult to determine precisely how they will impact the Houston toad over time. In general, the guidelines proposed by the LPHCP for conducting these land management activities describe ways to minimize incidental take and any potential negative impacts to the species. Further, the LPHCP does not cover incidental take arising from activities conducted in a manner that does not conform to these guidelines or results in the loss of native vegetation (such as the conversion of native pasture or woodland to improved pasture).

The impacts of various types of land management practices on the Houston toad will also differ depending on the type of land upon which the practices are implemented. Management practices implemented on existing cropland or improved pastures are likely to have less direct, negative impacts on the Houston toad because these lands are not considered habitat (even if the practices are more intensive, such as tilling, spraying, or harvesting) than practices implemented on forestland or native pasture. The land management guidelines in the LPHCP take this distinction into account by prescribing more stringent conservation measures for areas that are more likely to be occupied by Houston toads (e.g., forests and potential breeding sites).

Short-term, negative impacts from temporary habitat loss or degradation are likely to occur as a result of most land management activities, since they often result in the disruption of naturally occurring vegetation and the soil surface. Long-term negative impacts from certain types of land management practices are possible, but should be reduced from existing levels and minimized if implemented according to LPHCP guidelines. However, many of these management practices, such as prescribed burning and rotational grazing, are necessary to maintain or enhance the quality of natural vegetation communities in the long-term. The long-term benefits of responsible land management include preventing crown-fires, large-scale invasion by non-native species, widespread plant diseases, and other catastrophic events that can severely degrade or eliminate Houston toad habitat. Therefore, the Houston toad will likely benefit from responsible land management activities in the long-term, particularly if they are implemented according to guidelines in the LPHCP.

Minimization and mitigation measures to offset any negative impacts incurred under the LPHCP are described in Section 6.0.

5.3 Cumulative Take and Impacts

Land development activities conducted under the LPHCP are estimated to result in permanent habitat loss and degradation on approximately 5,736 acres of the Plan Area. Land management activities conducted under the LPHCP guidelines could result in short-term habitat loss or degradation (with likely long-term benefits to the toad) on any undeveloped land in the Plan Area (more than 107,000 acres in 2000) over the term of the Plan.

The potential for incidental take and negative impacts to the species from land development activities is limited by the scope of the LPHCP, and is only expected to occur on approximately less than 5 percent of the acreage of the Plan Area (5,736 acres out of 124,000 acres) and eight percent of land more likely to contain toad habitat. See Section 3.4 and Section 5.2.1. This amount of incidental take is unlikely to cause jeopardy of the Houston toad and will be offset by the minimization and mitigation measures described in Section 6.0.

Land management activities, as implemented according to the guidelines in the LPHCP, may cause a limited amount of incidental take, but are likely to have only minor, if any, long-term negative impacts on the species. The potential for incidental take during the implementation of land management activities is also limited by the scope of the LPHCP (e.g., the LPHCP does not provide incidental take authorization for the conversion of forests and native pastures to high-intensity agricultural land by not offering incidental take coverage for the habitat loss that is likely to occur as a result of the conversion). Since these management practices are designed to encourage responsible land management by residents of the Plan Area, long-term benefits to the Houston toad are likely when compared to the current management of undeveloped land in the Plan Area.

The general impacts of activities addressed by the LPHCP are summarized in Table 5-6.

Table 5-6. Summary of Anticipated Take and Impacts from Covered Activities.			
Covered Activity	Acres Impacted	Primary Type of Impact	Relative Degree of Impact
New Single-family Residential Construction and Use Outside of 46 Subdivisions			
Developed areas	1,015 acres	Habitat loss at construction site and degradation of adjacent areas	Strong negative impacts; localized geographic scale; long-term effects
Protected Set Aside	9,135 acres	Temporary habitat degradation or loss associated with the implementation of land management activities	Mild negative short-term impacts; positive long-term impacts
Expansion of Single Family Sites Outside of 46 Subdivisions	102 acres	Habitat loss at construction site and degradation of adjacent areas	Strong negative impacts; localized geographic scale; long-term effects
Single-family Residential Construction and Use Within 46 Subdivisions			
Developed areas	1,825 acres	Habitat loss at construction site and degradation of adjacent areas	Strong negative impacts; localized geographic scale; long-term effects
Protected Set Aside	7,300 acres	Temporary habitat degradation or loss associated with the implementation of land management activities	Mild negative short-term impacts; positive long-term impacts
Expansion of Single Family Sites Inside of 46 Subdivisions	149 acres	Habitat loss at construction site and degradation of adjacent areas	Strong negative impacts; localized geographic scale; long-term effects
New Commercial and Multi-Family Residential Construction and Use	64 acres	Habitat loss at construction site and degradation of adjacent areas	Strong negative impacts; localized geographic scale; long-term effects
Expansion of Commercial and Multi-Family Residential Construction and Use	17 acres	Habitat loss at construction site and degradation of adjacent areas	Strong negative impacts; localized geographic scale; long-term effects
Conservation Subdivision Development			
Developed Areas	2,444 acres	Habitat loss at construction site and degradation of adjacent areas	Strong negative impacts; localized geographic scale; long-term effects
Protected Set Aside	5,702 acres	Temporary habitat degradation or loss associated with the implementation of land management activities	Mild negative short-term impacts; positive long-term impacts
Agricultural Management	97,943 acres in 2002 – 74,487 acres in 2032	Temporary habitat degradation or loss associated with the implementation of land	Possible negative short-term impacts

		management activities	
Forest Management	69,571 acres in 2000 – 57,667 acres in 2030	Temporary habitat degradation or loss associated with the implementation of land management activities	Negative short-term impacts likely positive long-term impacts
Wildlife Management	122,117 acres in 2000 – 120,340 acres in 2030	Temporary habitat degradation or loss associated with the implementation of land management activities	Mild negative short-term impacts; positive long-term impacts
Public Infrastructure Maintenance and Improvement	120 acres	Habitat loss at construction site and temporary degradation of adjacent areas	mild short term negative and likely positive long-term impacts
Ongoing Use of Previously Developed Land	1,533 acres	Negligible	Negligible; activities conducted on previously developed land

The LPHCP does not cover incidental take for all development and land management activities that are expected to occur in the Plan Area over the term of the LPHCP. Some residential, commercial, agricultural, and forestry practices are not within the scope of the LPHCP. Large-scale commercial development is not covered by the LPHCP. It is unknown how much, if any, of this type of development will occur in the Plan Area over the next 30 years. However, large-scale projects, such as new high density subdivisions or large commercial developments, are likely to seek incidental take authorization from the Service or other Service approved mechanism, and will likely mitigate for any unavoidable impacts to the Houston toad.

Land management practices that result in the large-scale destruction of naturally occurring vegetation (particularly large tracts of forest and native pasture) are not covered by the LPHCP. Agricultural land use projections estimate that approximately 14,903 acres (6,030.9 hectares) of "Acreage" or native pasture land will be converted to more intensive agricultural land uses, such as improved pasture, row crops, or orchards (See Table 2-15). This represents a potential loss of Houston toad habitat on approximately 12 percent of the acreage of the Plan Area, for which landowners are not likely to seek incidental take authorization. While the LPHCP does not cover clear-cutting as a forest management practice without the approval of the Service, an unknown acreage of this type of management practice may also occur in the Plan Area over the term of the LPHCP.

A cumulative estimate of the amount of long-term habitat loss and associated habitat degradation that may occur in the Plan Area during the term of the LPHCP, for which estimates are available, is shown in Table 5-7. The LPHCP might cover incidental take from long-term habitat loss or degradation on an estimated maximum of 5,736 acres (less than five percent of the Plan Area). This habitat loss would occur in addition to the 1,533 acres of previously developed land cover (or approximately 4,000 acres (1,619 hectares) used for non-vacant residential or commercial purposes, based on BCAD land use data) and 47,359 acres in intensive agricultural use contained within the Plan Area prior to approval of the LPHCP.

The Service issued an incidental take permit to the Capitol Area Council #564 of the Boy Scouts of America (BSA) on November 5, 2003. The EA/HCP covers the proposed development of a "high adventure" Boy Scout camp on the 4,848-acre Griffith League Ranch (GLR) located within the Plan Area.

The proposed "high adventure" camp (the Preferred Alternative identified in the EA/HCP) would feature the phased development of a conference center, museum, ranch headquarters, chapel, computer lab, dormitories, three-hole golf course, lakes, camping areas, wrangler's quarters, ranger's residence, horse stable, livestock pastures, trails, and other improvements. The proposed camp will subject approximately 19 percent of the property (914 acres (370 hectares)) to high- or medium-impact land uses (BSA and Service 2002). The remaining 81 percent will have low impacts and be managed for ecosystem health and preservation of the toad. The Utilities' EA/HCP affects approximately 6,792 acres (2,749 hectares) of Bastrop and Lee counties to utility-related activities, including the maintenance, repair, upgrade, and installation of utility facilities.

The Utilities' EA/HCP does not estimate the precise amount of incidental take that is likely to occur in each county as a result of their permitted activities. However, approximately 75 percent of the Utilities' permit area lies within Bastrop County; therefore, a rough estimate of the acreage in Bastrop County likely to be impacted by covered activities is approximately 5,094 acres (2,061 hectares). Houston toads may still occur on some lands impacted by actions covered by the Utilities' EA/HCP, particularly those rights-of-way and similar areas revegetated with native plants.

Table 5-7. Cumulative Estimate of Habitat Loss and Associated Degradation in the Plan Area Over the Duration of the LPHCP.

Activity	Total Acreage Impacted	Potential Habitat Loss Covered by the LPHCP
Expected New Habitat Loss/Degradation		
Single-family Residential Construction (includes new homes inside the 46-subdivisions and large non-platted parcels)	2,840 acres	2,840 acres (exclusive of construction in conservation subdivisions)
Expansion of Single-family Residential Construction	Unknown	251 acres
Small-Scale Commercial and Multi-Family Construction	64 acres	64 acres
Expansion of existing Commercial and Multi-Family Construction	17 acres	17 acres
Large-Scale Commercial and Multi-Family Residential Construction	Unknown	0 acres
Conservation Subdivision Development (at full build out)	2,444 acres	2,444 acres
Public Infrastructure Maintenance and Improvement	Unknown	120 acres
Conversion to Intensive Agricultural Uses	14,903 acres	0 acres
Clear-Cutting in Forests	Unknown	0 acres
Development on GLR	914 acres	0 acres
Utility-Related Activities in Bastrop County	6,792 acres	0 acres
New Source Sub-Total	27,974 acres (22.5 % of the Plan Area)	5,736 acres (5% of the Plan Area)
Previous Habitat Loss/Degradation*		
Developed Land Cover	1,533 acres	1,533 acres
Intensive Agricultural Land Uses	47,359 acres	47,359 acres
Previous Source Sub-Total	48,892 acres	48,892 acres
Cumulative Habitat Loss	76,866 acres (62 % of the Plan Area)	54,628 acres (44% of the Plan Area)

*Incidental take from previous habitat loss and degradation is not retroactively authorized by the LPHCP. Estimates of previous habitat loss are included for comparisons of cumulative habitat loss in the Plan Area.

5.4 Requested Amount of Incidental Take

Bastrop County requests incidental take authorization to cover all potential incidental take that may occur as a result of the activities addressed in the LPHCP. An estimated 5,736 acres may be subject to high-impact, long-term habitat loss and related habitat degradation resulting from covered land development activities, including, an estimated 120 acres resulting from the expansion and improvement of infrastructure maintained by Bastrop County. A negligible amount of additional incidental take may occur as a result of the ongoing use of previously developed land. Therefore, Bastrop County requests incidental take authorization for land development activities on 5,736 acres of Houston toad habitat, previously developed lands, and Bastrop County owned and operated infrastructure.

Additionally, the take and impacts assessment estimates that approximately 108,000 acres (all undeveloped land within the Plan Area, regardless of use) could be subject to agricultural, forestry, or wildlife management activities. The impact of these activities on the Houston toad, if conducted according to guidelines provided by the LPHCP, is expected to be minimal and is likely to provide long-term benefits to the species through responsible and appropriate habitat management. See Appendices C, D, E, and F. .However, since take of individual toads and short-term habitat disturbances are possible as a result of these land management activities, Bastrop County also seeks incidental take authorization for low-impact land management activities on 108,000 acres. Bastrop County will extend incidental take coverage for land development activities to individual landowners in the Plan Area through the issuance of Certificates of Participation. Bastrop County will automatically extend incidental take authorization to landowners using previously developed lands, infrastructure maintenance and improvements, and emergency services. Those following the *Agricultural Management Guidelines* of the LPHCP must submit an annual Notice of Intent to implement these guidelines (see Section 6.2.1) to Bastrop County in order to receive coverage under the LPHCP. Those following the *Forest Management Guidelines* of the LPHCP that intend to harvest must submit a copy of their harvest plan to Bastrop County to receive coverage under the LPHCP. Those following the *Wildlife Management Guidelines* must submit a copy of their management plan (See Section 2.0 of *Wildlife Management Guidelines*, Appendix F) to Bastrop County to receive coverage under the LPHCP. Bastrop County will extend incidental take coverage for conservation subdivision development through the issuance of Subdivision Certificates.

6.0 LPHCP CONSERVATION PROGRAM

The LPHCP conservation program addresses the expected negative impacts from the covered incidental take of Houston toads in the Plan Area. The conservation program accomplishes this in a manner that is consistent with the biological and community-based goals and objectives stated in Section 6.1.

The conservation program helps avoid and minimize the impacts from incidental take, where possible, and mitigates for unavoidable negative impacts to the maximum extent practicable. The primary theme of the conservation program is establishing partnerships with private landowners to help conserve and manage Houston toad habitat in the Plan Area. Encouraging low-impact uses of privately owned land will help retain a degree of connectivity to the landscape, which is essential to the long-term survival of the Houston toad in Bastrop County and elsewhere across its range. Specific conservation strategies of the LPHCP are described in Section 6.2 and include:

- Distribution and promotion of land management guidelines to avoid and minimize incidental take;

- Partnerships with existing residential communities to increase awareness about the Houston toad and manage common areas for the benefit of the species;
- Grants to private landowners for Houston toad habitat improvement and management;
- Promotion of existing habitat management incentives, including special property tax appraisals and agency assistance programs consistent with state law;
- Purchase land, conservation easements, or development rights to permanently protect Houston toad habitat, when funds are available;
- Conduct community workshops on the Houston toad and endangered species issues to increase awareness about the LPHCP and encourage participation; and
- Collect and manage data on Houston toad habitat and survey results to help researchers and landowners better manage land in the Plan Area.

6.1 Goals and Objectives

The overall biological goal of the LPHCP is to contribute to the enhancement and protection of a self-sustaining, viable population of Houston toads. The approved LPHCP must also provide regulatory certainty (no Surprises) under the ESA for anticipated impacts to the Houston toad resulting from a variety of land use and development activities in Bastrop County. Therefore, to be a successful conservation effort, the LPHCP must contribute to the long-term conservation of the Houston toad in Bastrop County in a manner that is consistent with the needs, values, and resources of the local community.

Direction for the development of the LPHCP goals and objectives came from a variety of sources. The Bastrop County Commissioners' Court and the Workgroup, representing a cross-section of community interests, identified several policies and principles for the LPHCP (described in Section 1.7.3). These policies and principles define local community needs and values as they relate to Houston toad conservation in Bastrop County. The community desires to emphasize and support the voluntary management of private lands for Houston toad conservation. Other guidance came from Service policy, experts on the biology of the species, and the recommendations of the 1984 Houston Toad Recovery Plan. These sources helped identify actions that are necessary to achieve the long-term conservation of the Houston toad in Bastrop County.

The Service's five-point policy addendum to the Habitat Conservation Planning Handbook states that biological goals and objectives must be included in all HCPs to "clearly and consistently define the expected outcome" of the conservation program (65 FR 35242). They should clarify the purpose and direction of the conservation program, create parameters and benchmarks to evaluate progress, promote effective monitoring, and focus adaptive management strategies.

The critical habitat designation in Bastrop County (43 FR 4022) also guided development of the LPHCP goals and objectives. The Plan Area includes nearly the entire region designated as critical habitat for the toad in Bastrop County. The Service can issue incidental take permits provided that the permitted action does not "appreciably reduce the likelihood of survival and recovery of the species in the wild" (ESA section 10(a)(2)(B)). When operating in critical habitat, the permitted activity must also not produce an overall adverse impact on the essential habitat elements contained within the critical habitat (Service and NMFS 1996).

The Service approved the current Houston Toad Recovery Plan in 1984 (Service 1984). Although the recovery plan is currently being revised, a public draft is not available and has not been provided to the

Workgroup or the authors of this HCP. While recovery of the species is not a requirement of this or any other HCP, the Service encourages supporting recovery plan goals and providing a net benefit to the species (Service and NMFS 1996).

The goals and objectives listed below follow Service guidelines for identifying clear conservation targets, considering critical habitat designations, and coordinating with the goals of the 1984 Houston Toad Recovery Plan. The goals and objectives also observe the stated needs and values of the local community. Together, these goals and objectives frame a conservation program that avoids jeopardizing the species and adversely impacting its habitat, while giving the local community an alternative permitting methods (individual Section 10a and 46-subdivision HCP) for complying with the ESA. The goals and objectives also provide for a plan that will effectively unify management strategies, monitoring programs, and private landowner involvement for Houston toad conservation throughout Bastrop County. These goals and objectives are consistent with the conservation measures needed to adequately minimize and mitigate for impacts to the toad to the maximum extent practicable.

The LPHCP for the Houston toad seeks to achieve the following goals:

1. Protect and enhance a self-sustaining, viable population of the Houston toad;
2. Create a simple, fair, certain, and efficient process for gaining authorization for incidental take of the Houston toad in the Plan Area under the LPHCP section 10(a)(1)(B) permit;
3. Reduce the amount of take that could occur over the term of the LPHCP by avoiding, minimizing, or mitigating for impacts to the Houston toad to the maximum extent practicable;
4. Support habitat management activities on lands dedicated to the protection of the Houston toad in Bastrop County;
5. Support Bastrop SP as a permanent core conservation area for the Houston toad;
6. Bring additional land under voluntary management for the Houston toad through conservation agreements, conservation bank credits, safe harbor agreements, and other conservation tools for private lands;
7. Increase public awareness and support for the conservation of the Houston toad in Bastrop County; and.
8. Improve the state of knowledge on the biology of the Houston toad by encouraging and facilitating research on the species and its habitat requirements (see 7.3.2).

The objectives to help achieve the LPHCP goals are:

1. Develop a streamlined process for including private landowners, developers, and other community interests as voluntary sub-permitees under this HCP through the issuance of Certificates of Participation and other means of participation;
2. Assist managing partners, including private landowners, in the development and implementation of a management program on lands to maintain, enhance, or restore high quality habitat for the Houston toad;
3. Provide funding to support management programs on conservation lands for the Houston toad. See Chapter 8;
4. Support research to better understand the biology and habitat requirements of the Houston toad and the effectiveness of management practices to enhance habitat for the species;

5. Establish and implement a scientifically sound monitoring program to track the status of toad populations in Bastrop County and make this information available to the public;
6. Provide clear and consistent guidelines for implementing activities covered by the LPHCP to avoid or minimize the impacts of take on the Houston toad;
7. Coordinate and leverage available resources in Bastrop County, including the resources of private landowners, to maximize conservation efforts for the Houston toad by providing incentives for private landowners to voluntarily implement toad habitat conservation or restoration practices;
8. Support the use of mitigation credits, special property tax appraisals, safe harbor agreements, and other term conservation agreements with private landowners to conserve habitat for the Houston toad;
9. Increase the size of existing areas of protected habitat for the Houston toad by acquiring development rights, conservation easements, or land from willing partners on suitable neighboring tracts, as resources allow;
10. Retain flexibility in the LPHCP conservation program by employing adaptive management procedures and a regular review process to incorporate new data on the species and its management;
11. Develop public education and outreach efforts to increase support for the conservation of the Houston toad among landowners in the Plan Area and the general public; and
12. Maintain records relating to all activities authorized under the LPHCP to be used in the annual report to the Service on the LPHCP.

6.2 Mitigation Strategies

The conservation framework and mitigation strategies in this Section detail how landowners, developers, and other interested parties may participate in the LPHCP and the specific strategies that they can implement that will avoid, minimize, and mitigate for the negative impacts of incidental take.

6.2.1 Methods of Participation

Bastrop County will extend incidental take coverage under the LPHCP to participants by issuing Certificates of Participation, Subdivision Certificates, or by issuing a Notice of Receipt of Notice of Intent for certain activities. Certificates of Participation (Certificates) will be issued for covered activities that are expected to result in permanent habitat loss. Parties seeking incidental take authorization for land management activities that do not cause permanent habitat loss, including the continued use of previously developed land so long as the foot print of the previously disturbed area does not increase, must submit or file a Notice of Intent (NOI) to implement the applicable land management guideline with the LPHCP Administrator on an annual basis, and describe the avoidance, minimization, and mitigation required for such land management activities. Incidental take coverage will be extended upon the LPHCP Administrator issuing a Notice of Receipt (NOR) of the party's properly completed NOI and so long as the party seeking incidental take authorization complies with the applicable land management guidelines. Automatic incidental take coverage will be extended for emergency services. The will also cover incidental take from the maintenance and improvement of County roads and facilities. Bastrop County, as the holder of the requested incidental take permit, has committed funding and other resources for the implementation of the LPHCP. See Chapter 8. Table 6-1 shows how the LPHCP will extend incidental take coverage for covered activities.

Table 6-1. Mitigation Strategies Under the LPHCP for Covered Activities.

Covered Activity	Method of Participation	Mitigation Requirements
Single-family Residential Construction and Use	Construction Certificate	Fee and Implementing Agreement or Conservation Easement
Expansion of Single-family Residential Construction and Use	Construction Certificate	Fee or Conservation Easement
Commercial and Multi-family Construction and Use	Construction Certificate	Fee or Conservation Easement
Expansion of Commercial and Multi-family Construction and Use	Construction Certificate	Fee or Conservation Easement
Conservation Subdivision Development	Subdivision Certificate	Subdivision plat consistent with LPHCP Conservation Subdivision Development Guidelines
Agricultural Management	NOI/NOR	Implementation of LPHCP Agricultural Management Guidelines
Forest Management	NOI/NOR	Implementation of LPHCP Forest Management Guidelines
Wildlife Management	NOI/NOR	Implementation of LPHCP Wildlife Management Guidelines
Local Public Infrastructure Maintenance and Improvement	Automatic Coverage	County implementation of LPHCP
Ongoing Use of Previously Developed Land	NOI/NOR	Implementation of Management Guideline identified in NOR
Emergency Services	Automatic Coverage	None

The methods of participation and mitigation options offered under the LPHCP help to meet several of the goals and objectives of the LPHCP. Certificates and automatic coverage simplify and streamline the process, thereby lessening the burden of obtaining authorization for incidental take on individual landowners. The ability to reduce or eliminate mitigation fees in favor of providing Conservation Easements on their property gives landowners options for complying with the ESA and makes use of the management capabilities and resources of private landowners. The use of mitigation options also provides incentives to landowners to keep property in large tracts and encourages the conservation and management of these large open spaces for the Houston toad. These types of mitigation strategies are consistent with the values and needs of the local community.

Construction Certificates

Construction Certificates provide authorization for incidental take of the Houston toad resulting from single-family residential construction and use and commercial or multi-family residential construction and use activities, as described in Section 4.0. A Construction Certificate may authorize incidental take on 0.5 acre or one acre. Within the 46 subdivisions, lots or tracts less than five acres are limited to 0.5 acre of authorized disturbance and lots five acres or larger may obtain authorization to disturb up to one acre, as requested by the participant. However, Construction Certificates may only be issued for land development projects (e.g., the construction or expansion of a residential home site, multi-family dwelling, or commercial development) that cover one acre or less.

In addition to the payment of a fee, the applicant must sign and record an implementing agreement similar to the form used by the Service under the 46 Subdivision EA/HCP that limits the use of the remainder of the lot or tract. An example of the implementing agreement is attached as Appendix H. For legal, non-platted tracts, the applicant must include a Natural Resources Inventory, as described in Section 2.0 of the Conservation Subdivision Guidelines, or the applicant must otherwise provide sufficient evidence to the LPHCP Administrator that the one-acre development site will not, to the greatest extent practicable, adversely affect primary habitat as described in Section 2.0 of the Conservation Subdivision Guidelines.

Potential LPHCP participants seeking a Construction Certificate must submit an application to the LPHCP Administrator. The application for a Construction Certificate must include a site plan or other attachment delineating the area to be covered for incidental take as well as documentation that the tract or lot was legally subdivided prior to October 1, 2003.

Mitigation fees for Construction Certificates for new construction are $1,500 for each 0.5 acre for which incidental take is requested (up to a maximum of one acre). Mitigation fees for Construction Certificates for the expansion of existing home sites, multi-family dwellings, and commercial development will be based on the area of expansion as a percentage of $1,500.00 for 0.5 acres. An application processing fee of $120 per Certificate is also required. Construction Certificate fees are subject to change annually upon approval of Bastrop County and the Service. Fees generated by the sale of Construction Certificates will be collected by the LPHCP Administrator and used to fund the LPHCP and its conservation and management programs (exclusive of personnel and overhead. See Table 8-4). The criteria for adjusting the fee rates include inflation, rate of participation, and LPHCP operating costs. Fee rates will be reviewed on an annual basis.

For Construction Certificates issued for projects on single tracts or adjoining tracts under common ownership that contain at least five acres, participants have the option of:

1. Paying the mitigation fee and recording an executed implementing agreement; or
2. Waiving the mitigation fee by conveying a Conservation Easement on at least four acres to protect and manage habitat for the Houston toad in perpetuity.

To qualify for waived mitigation fees, the conservation easement must specify that the protected land be under active management directed by a wildlife management plan that is consistent with the recommendations of the *Wildlife Management Guidelines*. The conservation easement must also provide for the implementation of management activities by the landowner to ensure the property is managed as habitat for the Houston toad. LPHCP and/or TPWD staff will be available to assist participants with the development of appropriate wildlife management plans for the Houston toad.

The Conservation Easement must be recorded and held by Bastrop County or a third party that is approved by the Service, and it must allow for entry by a Service approved entity (or biologist) for the

purpose of monitoring the easement area. A portion of the conservation easement may be released in limited circumstances when the tract receiving the Construction Certificate is ten (10) acres or larger. Such limited circumstances include an application and approval of a Conservation Subdivision pursuant to the terms of the LPHCP or an unplatted subdivision of land meeting the ten acre requirements of state law and the terms of the LPHCP (see Section 5.1.1), and a division and use of land that benefits the Houston toad, as determined jointly by the Service and the LPHCP Administrator. The Conservation Easement will not be released until mitigation fees for the previously permitted construction are paid in an amount equal to the rate applicable at the time of release.

Subdivision Certificates

Subdivision Certificates authorize incidental take associated with the installation of streets, utilities, and end-use structures (e.g., homes and local service businesses) in new residential developments that adhere to the *Conservation Subdivision Development Guidelines* (Appendix C). The application for a Subdivision Certificate must include a subdivision plat approved by Bastrop County that meets the development guidelines in Appendix C (and all other applicable subdivision requirements of Bastrop County or other applicable entities). The LPHCP Administrator will be available to assist landowners and developers with understanding the requirements of the *Conservation Subdivision Development Guidelines* throughout the subdivision design process.

The LPHCP Administrator will review all Subdivision Certificate applications and determine if a submitted subdivision plat meets the requirements of the *Conservation Subdivision Development Guidelines*. Applications that are rejected by the LPHCP Administrator on the grounds that they do not meet the *Conservation Subdivision Development Guidelines* may be appealed to the Bastrop County Commissioners' Court or the Service.

There is no mitigation fee for a Subdivision Certificate, since the *Conservation Subdivision Development Guidelines* specify the protection and management of green space within the subdivision for the benefit of the Houston toad. However, an application processing fee of $1,500 per Certificate will be required. Fees generated by the issuance of Subdivision Certificates will be collected by the LPHCP Administrator and used to fund the LPHCP and its conservation programs. In addition, the developer of a conservation subdivision must agree that Bastrop County has the right to enter mitigation land for biological monitoring purposes.

Coverage By Notice of Receipt

The LPHCP will extend incidental take coverage to landowners implementing land management activities in accordance with LPHCP land management guidelines for forest, agricultural, and wildlife management practices. Incidental take coverage by the LPHCP is only available for eligible land management practices implemented within the Plan Area, as described in Section 4.0 and Appendix D, E, and F. Landowners must also agree that Bastrop County has the right to enter mitigation land for biological monitoring purposes. Landowners may obtain copies of LPHCP land management guidelines from the LPHCP Administrator.

Anyone seeking incidental take authorization for agricultural activities that do not cause permanent habitat loss must submit a Notice of Intent (NOI) to implement and must comply with the Agricultural Management Guidelines with the LPHCP Administrator on an annual basis. Participating landowners will be required to submit a signed Notice of Intent to comply with the pertinent land management guideline to the LPHCP Administrator. For coverage of wildlife management activities, the landowner must also submit to the LPHCP Administrator on an annual basis documentation that:

1. Landowner is a member of a Wildlife Management Association with a TPWD Wildlife Management Plan that incorporates these guidelines;
2. Landowner receives the 1-D-1 open-space agricultural property tax appraisal for wildlife management use on their property, and at least one of the three required activities in the required wildlife management plan specifically addresses the Houston toad; or
3. Landowner has any other type of agreement w/TPWD or other conservation organization, agency, or professional wildlife management consultant that incorporates these guidelines.

For coverage of timber harvesting, the landowner or applicant must submit a copy of a timber harvesting plan that meets applicable state and federal timber harvesting requirements. The landowner must also submit to the LPHCP Administrator on an annual basis a report of the activity conducted under the landowner's forest management plan.

The LPHCP will extend incidental take coverage for activities associated with the ongoing use of previously developed land in the Plan Area, as described in Section 4.9, if 1) the foot print of the previously developed land does not increase; 2) the Landowner submits an Notice of Intent to the LPHCP Administrator; and 3) the Landowner complies with the applicable land management guidelines described in the Notice of Receipt issued by the LPHCP Administrator.

Any incidental take that may occur as a result of management practices that are not implemented in accordance with the LPHCP guidelines is not covered by the LPHCP.

Automatic Coverage

The LPHCP will automatically extend incidental take coverage for Bastrop County Infrastructure Maintenance and Improvement activities as described in Section 4.7 because of the removal of breeding sinks which is mitigation for the disturbances to toad habitat. The mowing of rights of way that do not have drainage facilities meeting current standards (more likely to have standing water in the right of way) and the clearing of right of way will not occur from the beginning of December through the end of May. New drainage facilities to be constructed out side of rights of way existing on the effective date of the LPHCP permit may only be initiated outside of the Houston toad breeding season. Maintenance of existing road surfaces may occur at any time of the year.

The LPHCP will automatically extend incidental take coverage for emergency services as described in Section 4.8

6.2.2 Guidelines to Avoid or Minimize Incidental Take

The LPHCP includes a set of guidelines to direct conservation subdivision development and low-impact land management activities covered by the LPHCP (Appendices C through F). The use of guidelines by participants in the LPHCP will help avoid or minimize incidental take associated with the implementation of certain activities. The guidelines provide guidance on how to limit the impact of common land management activities on the Houston toad and describe a mechanism by which land development may occur that is compatible with Houston toad conservation. The guidelines are an important part of the LPHCP conservation program, since their use will help reduce the total amount of incidental take expected under the LPHCP and in the Plan Area.

The LPHCP Administrator, and other relevant County staff, will distribute LPHCP guidelines to interested persons, upon request. The guidelines will also be shared with other organizations, as appropriate, to facilitate their incorporation into management plans and conservation agreements that help

landowners qualify for habitat management incentive or assistance programs. The LPHCP Administrator will coordinate with relevant agencies and organizations to help ensure that the guidelines effectively reduce the impact of covered activities and are practicable to implement. Relevant agencies and organizations may include a variety of potential partners, such as TPWD, Texas Forest Service, Texas Cooperative Extension Service, Texas Department of Agriculture, Texas Farm Bureau, Natural Resources Conservation Service (NRCS), National Wildlife Federation, Environmental Defense, Texas State University, Texas A&M University, private individuals, and others. Many of these agencies and organizations are actively involved with private landowners and can help encourage the use of these guidelines. Additionally, input from these agencies and organizations will provide valuable feedback on the effectiveness of the guidelines, which may be used to refine the guidelines over the term of the LPHCP.

6.2.3 Grants and Partnerships for Conservation on Private Lands

Ensuring that lands dedicated to or managed for Houston toad conservation are biologically connected is essential to providing for the long-term conservation of the species (Semlitsch 2002; Forstner 2002). Without these connections, core conservation areas will become increasingly isolated as land around them becomes developed or is converted to uses that removes it suitability as habitat for the Houston toad. Without the ability to disperse among habitat patches, natural fluctuations in Houston toad numbers may result in the continual loss of subpopulations. The LPHCP must help maintain a functioning biological system for the Houston toad where dispersal from robust subpopulations can balance periodic declines in other subpopulations.

Enlisting private landowners in conservation efforts is key to maintaining good quality toad habitat between core conservation areas, such as Bastrop SP and Buescher SP, and to connect Bastrop County toad subpopulations with others in adjacent counties. Private landowners are essential to creating these connections; therefore, the LPHCP Administrator will seek grant funding to support efforts to enlist private landowners to manage their property in accordance with one of the land management guidelines, including construction of toad ponds.

Management of Open Space in Existing Residential Subdivisions

Through annual authorizations by Bastrop County's Commissioners Court, it is anticipated that Bastrop County will create partnerships through the LPHCP with the property owner's associations of existing subdivisions in the Plan Area to manage open-space in these communities for the benefit of the Houston toad. These partnerships will encourage voluntary habitat management in areas often overlooked by natural resource management programs. The LPHCP Administrator will assist partner communities with educating and motivating landowners to implement actions that help conserve the Houston toad, such as reducing the impacts of residential land use and enhancing potential habitat within the community. Bastrop County, through the LPHCP, will also help partner communities to gain funding through grants and other assistance from outside sources.

Bastrop County is currently pursuing partnerships with the Circle D County Acres and Tahitian Village communities, and will offer similar partnering agreements to other existing residential communities. The management of open-spaces in the Circle D County Acres community is of particular importance to the Houston toad in the Plan Area since breeding choruses were observed near this area in 2002 (Forstner 2002) and the community connects toad habitat on the GLR with toad habitat in Bastrop SP.

Support the Formation of the Alum Creek Wildlife Management Association

Through annual authorizations by Bastrop County's Commissioners Court, it is anticipated that the LPHCP Administrator, with the assistance of TPWD, will support the formation of an Alum Creek Wildlife Management Association. This association will help organize and coordinate management practices for the Houston toad and other wildlife on lands within the Alum Creek watershed. The Alum Creek watershed is one of the primary drainage systems crossing the Plan Area and connects potential Houston toad habitat in Bastrop SP and Buescher SP with forested areas to the north, including the GLR. The LPHCP Administrator will assist the formation of this association by contacting and encouraging landowners to join the association, as well as help the association find sources of grant funding or technical assistance.

LPHCP Private Landowner Grant Funding

Through annual authorizations by Bastrop County's Commissioners Court, it is anticipated that the LPHCP will budget to fund at least one habitat creation or enhancement project on privately owned land each year. The funds will come from mitigation fees generated by the issuance of Construction Certificates and may be supplemented with grant money obtained by the LPHCP. Additional projects may be funded as grant dollars become available. LPHCP staff will identify private landowners willing to partner with Bastrop County and provide grant funds to help implement habitat improvement projects on their property. Priority will be given to projects that have obtained matching funds or in-kind services from other sources. Other priorities include projects that restore degraded habitat and that are located in or near occupied Houston toad habitat. Potential habitat improvement projects include installing breeding ponds, reforesting open fields, fencing ponds to prevent access by livestock, conducting prescribed burns, and similar activities.

Criteria for projects eligible to receive LPHCP funding include:

1. The project must provide an overall net benefit to the Houston toad;
2. The project cannot be part of any required mitigation for incidental take authorized by another HCP or other natural resources restitution activity;
3. The landowner must be a part of a conservation or management agreement with the LPHCP or other sponsoring agency or organization to ensure that the project is maintained or continued for at least five years after the start of the project;
4. The project must include measures that result in the creation, conservation, or enhancement of Houston toad habitat; and
5. The landowner must allow LPHCP-contracted biologists to access the project area and monitor Houston toad populations for at least five years.

Landowners may apply for LPHCP grant funds by contacting the LPHCP Administrator. Applications must include a description of the proposed project, a project budget that includes itemized costs and any proposed cost-sharing measures, a statement identifying the anticipated benefits to the Houston toad as a result of the project, and any other information needed to help rank applications. Grants will be awarded and administered by the LPHCP Administrator.

Expanding Access to Existing Assistance Programs

Supporting existing landowner incentive programs to further the voluntary conservation of the Houston toad in Bastrop County is consistent with the goals and objectives of the LPHCP. Bastrop County,

through the LPHCP Administrator, will help promote landowner participation in these programs, many of which involve short or medium-term conservation or management agreements in return for financial assistance with management activities. Property tax incentives can also help encourage landowners to keep property in uses that are compatible with the conservation of the Houston toad and to help prevent irretrievable loss and fragmentation of the Lost Pines ecosystem.

Financial and Technical Assistance Programs

Bastrop County partnered with the Pines and Prairies Land Trust (PPLT) to produce a guide to existing cost-sharing grant and technical assistance programs available to private landowners (Appendix G). Bastrop County (through the LPHCP) and the PPLT will continue to advise landowners on available opportunities and help find matching funds for cost-sharing grants.

Many of the existing incentive programs listed in Appendix G require that landowners develop and implement a written management or conservation plan. To maximize the benefit of these programs for the Houston toad, the LPHCP Administrator will coordinate with these agencies and organizations to help ensure that projects developed for privately owned lands in the Plan Area are consistent with Houston toad conservation. The LPHCP Administrator will provide the sponsoring agencies and organizations with copies of the LPHCP guidelines, and work with these groups to help ensure that they are incorporated into management or conservation agreements for land in the Plan Area, as appropriate.

Texas Property Tax Incentives

The Texas Property Tax Code (Tax Code) provides several incentives to landowners for managing their land for wildlife or by allowing colleges or universities to use the property as an ecological laboratory. The Tax Code also contains provisions to help landowners reforest their property and manage timber stands for endangered wildlife. Bastrop County, through the LPHCP Administrator, will work with landowners to help identify potential property tax incentives that may be applicable for land managed for the Houston toad.

Wildlife Management Use Appraisal

The wildlife management use appraisal, provided for by Chapter 23, Subchapter D of the Tax Code, identifies wildlife management as a type of qualified open-space agricultural use. Generally, property owners with land in traditional agricultural uses, such as grazing cattle or raising crops, may convert their open-space agricultural land to wildlife management use, if they meet the requirements of the wildlife management use appraisal. After converting to wildlife management use, the property has the same appraised value as it had under its previous traditional agricultural use (Texas Comptroller of Public Accounts 2000).

In 2007, the Texas Legislature adopted House Bill 604 that amended Section 23.51, Subchapter D of the Texas Tax Code to assist property owners who manage their property for the benefit of an endangered species. Specifically, the Legislature eliminated, in certain limited circumstances, the requirement that land receiving a wildlife management exemption must have had an agriculture exemption the year prior to converting to a wildlife management exemption. In order to qualify for a wildlife management exemption under the new legislation, the land must be actively used to protect federally listed endangered species under a federal permit. The LPHCP would be a qualifying "federal permit." The LPHCP anticipates that this amendment to the Texas Tax Code will create a significant incentive to property owners to manage their property for the benefit of the Houston toad.

Land must meet criteria specified by Chapter 23, Subchapter D of the Tax Code and amended by rules adopted by the Texas Comptroller of Public Accounts on June 24, 2002 to be qualified for the wildlife management use appraisal (Texas Comptroller of Public Accounts 2000; Texas Comptroller of Public Accounts 2002; 27 TexReg 2421). These requirements currently include:

1. The land must be appraised as qualified open-space land under Chapter 23, Subchapter D of the Tax Code. Land meeting this criterion must be used primarily for agricultural purposes to the degree of intensity typical of the area. The land must also have been principally devoted to agricultural use or for the production of timber or forest products for five of the preceding seven years. Additionally, the land must have been appraised as qualified open-space land in the year prior to conversion to wildlife management use, and the property must sustain the primary use and degree of intensity requirements of an agricultural appraisal after conversion. A written wildlife management plan prepared on a form supplied by TPWD and consistent with TPWDs regional wildlife management plans is required to support the primary use and degree of intensity requirements;
2. The land must be used to "propagate a sustaining breeding, migrating, or wintering population of indigenous wildlife" (Texas Comptroller of Public Accounts 2002). This restricts the application of the wildlife management use appraisal to the management of native Texas wildlife species. However, the species do not need to be present on the property at all times, as long as they regularly use the land at some point during the year;
3. The wildlife produced must be used for human purposes, including active and passive recreation. The simple enjoyment of managing for wildlife is considered a form of passive recreation;
4. The land must be used for at least three of seven different kinds of wildlife management activities each year. The seven types of wildlife management activities include habitat management, erosion control, predator management, providing supplemental water, providing supplemental shelter, providing supplemental food, and making counts and censuses; and
5. In most cases, tracts of land or multiple adjacent tracts under common ownership must include at least 11 acres (4.5 hectares) to qualify for the wildlife management use appraisal in Bastrop County when an endangered species is the target of the management program.

Ecological Laboratory Appraisal

The appraisal of land as an ecological laboratory is another type of qualified open-space use under Chapter 23, Subchapter D of the Tax Code. To qualify for an ecological laboratory appraisal, an agreement with a public or private college or university is required to establish that the land is actively used for educational or scientific purposes. Unlike the wildlife management use appraisal, a history of prior agricultural use is not required for land to qualify as an ecological laboratory. Property appraised as an ecological lab is entitled to a low appraised value, similar to that of agricultural lands. The appraisal also provides an incentive for landowners to allow Houston toad research on their property.

Bastrop County, through the LPHCP Administrator, will help landowners interested in allowing Houston toad research on their property find an appropriate college or university to work with and help initiate a relationship.

Restricted-use Timber Appraisal

The restricted-use timber appraisal authorized by Chapter 23, Subchapter H of the Tax Code allows landowners to restrict harvesting timber on timber lands within a critical wildlife habitat zone. To qualify for this appraisal, land in a critical wildlife habitat zone must provide at least three of seven different types of activities for the protected species. The seven types of activities include habitat control, erosion

control, predator control, providing supplemental water, providing supplemental shelter, providing supplemental food, and making counts and censuses. The restricted-use timber appraisal is also available for land that is being reforested following a harvest. Under this provision, the land must have been harvested while appraised under Chapter 23, Subchapter E of the Tax Code. It must also be regenerated to a degree of intensity generally accepted for land under commercial timber management.

The restricted-use timber appraisal allows the property to be appraised at one-half of the appraised value of the land as determined under Section 23.73 (Subchapter E regarding the appraisal of timber land) of the Tax Code.

As with the wildlife management use appraisal, Bastrop County, will assist landowners with the development of wildlife management and forest management plans that target habitat improvements for the Houston toad and identify best management practices to reduce impact on toad habitat. Forest and wildlife management guidelines are included in Appendix E and Appendix F. The LPHCP Administrator can also help landowners find funding through existing incentive programs to help offset the costs of management, and may also provide additional funding to assist management programs.

6.2.4 Purchase of Development Rights, Conservation Easements, and Land Acquisition

While the primary component of the LPHCP conservation program is encouraging and supporting the voluntary management of private lands for the Houston toad, the LPHCP also provides for the limited acquisition of development rights, conservation easements, or land from willing partners. Land permanently protected and managed for the Houston toad can be used to mitigate for some of the permanent impacts that are likely to arise from development activities covered by the LPHCP. Bastrop County will focus any acquisition efforts on using conservation tools that leave property in private ownership and on the local tax rolls, such as the purchase of development rights or conservation easements. This strategy will not only lower the cost of permanently protecting land, but also engage private landowners in the conservation of the Houston toad.

Bastrop County does not anticipate having access to sufficient funds to purchase a large amount of acreage in Bastrop County for Houston toad conservation. Therefore, Bastrop County will prioritize the use of any available acquisition funds for the purchase of development rights or conservation easements. Available funds will also be targeted on acquiring land or property rights that fulfill criteria identified by the Workgroup (see below).

The Workgroup identified a set of minimum and preferred criteria to evaluate tracts in the Plan Area that may be available for acquisition to benefit the Houston toad (Houston Toad Community Conservation Project 2000). The criteria were developed to help objectively assess potential purchases and focus limited resources on properties that satisfied multiple environmental goals. While the criteria were initially developed to help evaluate potential fee-simple land purchases, they may also be used to evaluate the purchase of development rights or conservation easements from willing sellers.

Minimum criteria identified by the Workgroup for potential land acquisitions include (Houston Toad Community Conservation Project 2000):

1. The tract must have a willing seller;
2. The tract must have water present, preferably intermittent water bodies, or it must have the potential to sustain created water bodies;

3. The tract must have at least 30 percent of its acreage in deep sandy soils, and these areas must be within one mile of a water body;
4. The tract must be connected to other areas managed for the Houston toad; and
5. The tract must be within the same watershed as other areas managed for the Houston toad.

Preferred natural characteristics of potential land acquisitions include factors such as forest cover, known presence of Houston toads on the property, type of water bodies present on the tract, proximity to other types of land use and roadways, and acreage. Policy factors influencing the evaluation of a potential purchase include cost, identification of a willing partner to hold title to the land, public accessibility, imminent use of the property for development, and the number of owners to work with. The Workgroup also developed a ranking system to score potential purchases in terms of their suitability for Houston toad conservation (Houston Toad Community Conservation Project 2000).

Bastrop County also does not anticipate having sufficient funds or staff to adequately provide for the continued operation and maintenance of conservation land, in perpetuity, for the Houston toad. Therefore, Bastrop County, through the LPHCP, will seek partnerships with agencies and organizations to hold title or easements on future potential purchases (either fee-simple acquisitions or the purchase of development rights or easements) and to help fund the operation and maintenance of preserve land or to monitor the terms of conservation easements or other agreements with landowners. Bastrop County has previously partnered with TPWD and Texas State University to purchase and manage acreage adjacent to Bastrop SP and the GLR. Bastrop County will continue to seek partners with these and other organizations to help permanently protect and manage habitat for the Houston toad.

6.2.5 Community Education and Outreach

Bastrop County, through the LPHCP Administrator, will develop and distribute information about the ESA, the LPHCP, and conduct annual workshops about Houston toad habitat management and similar topics for Plan Area residents. The LPHCP Administrator will also develop an Integrated Pest Management Plan (IPM Plan) for the Plan Area that focuses on reducing the impacts of pest control practices on the Houston toad. These programs will help offset some of the direct and indirect impacts associated with land development in the Plan Area.

Distribute Forestry, Wildlife, and Agriculture Guidelines

Copies of the *Forest Management Guidelines* will be distributed to: (1) all landowners within the Plan Area that have forestry based tax exemption on their property; (2) Texas Forest Service; and (3) Forestry industry groups in Texas. Copies of summaries of the Agricultural Management and Wildlife Management guidelines will be sent to landowners within the Plan Area that have land with an agricultural tax exemption.

Distribute ESA and LPHCP Fact Sheet

Bastrop County, through the LPHCP Administrator, will develop and distribute a flier or fact sheet about the ESA and the LPHCP to all individuals within Bastrop County who inquire about septic permits from Bastrop County. The fact sheet will briefly describe the responsibilities of private landowners under the ESA, the habitat needs of the Houston toad, the role of the LPHCP, and methods of participation in the LPHCP. This fact sheet will be developed within one year of the issuance of the requested incidental take permit.

Conduct Annual Houston Toad Workshops

Through annul authorizations by Bastrop County's Commissioners Court, it is anticipated that Bastrop County will provide for an annual workshop to help landowners access information regarding Houston toad habitat conservation and protection on privately owned lands. Bastrop County proposes to partner with PPLT, or a similar organization, to conduct the annual workshops, with Bastrop County providing at least $3,240 each year to fund the events (Bastrop County's contribution may be in the form of in-kind services). Potential topics or themes for the workshops include an overview of the LPHCP and its conservation programs, grant opportunities through the LPHCP and other organizations for habitat enhancement projects, conservation easements and the purchase of development rights, and native plant landscaping and organic gardening/landscape maintenance. In the event that PPLT is unavailable to conduct these workshops, Bastrop County will seek another partner, such as the BSA or TPW, or conduct the workshops using LPHCP staff.

The workshops will help off-set some of the potential, indirect, negative impacts to the Houston toad from habitat fragmentation by helping landowners gain knowledge and modify their land use practices to maintain and enhance woodland habitat for the Houston toad. Education programs, such as the workshops proposed by Bastrop County, can help minimize the threat of impact from red imported fire ants, chemicals, and barriers to toad dispersal.

Integrated Pest Management Plan

The LPHCP Administrator, after consulting with the BAT and the Service, will develop an IPM Plan for the Plan Area that addresses pesticide use in the Plan Area by providing landowners information regarding non-toxic or least toxic methods of pest control. The goal of the IPM Plan will be to reduce the reliance on, and use of, chemicals, especially in Houston toad habitat. The IPM Plan will stress the proactive use of appropriate and efficient non-chemical and mechanical pest control methods to prevent, reduce, or eliminate pest problems before they require the use of chemical controls. The IPM Plan will also identify appropriate chemical control products for specific pest problems.

Specific provisions of the IPM Plan will include:

1. Encourage the use of non-chemical and mechanical pest control methods, where practical, to prevent, reduce, or eliminate pest problems
2. Recommend the use of specific pesticides;
3. Encourage landowners not to use any type of pesticide in a manner not in strict accordance with the manufacturer's directions;
4. Encourage the use of non-toxic or least-toxic pest control practices, in accordance with Integrated Pest Management planning principles, where possible; and
5. Recommend the control of red imported fire ants using non-toxic or least-toxic methods (e.g., boiling water or chemical bait products containing the active ingredients hydramethylnon, such as Amdro®, or fenoxycarb, such as Award® or Logic®).

The LPHCP Administrator will develop the IPM Plan within two years of the approval of the LPHCP and will distribute the IPM Plan to interested landowners and purveyors of chemicals in Bastrop County, with other LPHCP guidelines.

6.2.6 Support for Houston Toad Research

Houston Toad GIS and Survey Databases

It is anticipated that Bastrop County, will, through annual authorizations by Bastrop County Commissioners Court, and under the LPHCP, support research on the Houston toad by maintaining and distributing databases of compiled spatial data and Houston toad survey data to interested parties, upon request. The LPHCP Administrator will also update these databases as new or revised data become available. The two databases were developed with the assistance of grant funds from the EPA to assist the development of the LPHCP and associated NEPA documentation (EPA Grant No. X-97626101-0 awarded to Bastrop County). However, the databases will also assist future land management, conservation planning, and Houston toad research efforts in the Plan Area.

The spatial, Geographic Information System (GIS) database updates a previous database compiled by Texas A&M University for the Houston Toad Community-based Conservation Project. Spatial data in the updated GIS database includes soil types, land use, land cover, parcel boundaries, roadways, streams, jurisdictional boundaries, Houston toad survey locations and known occurrences, and similar data. The spatial data is compiled in ESRI shapefile format (or other compatible formats), and landowners, land developers, researchers, and other will be able to view, query, and map spatial data in the database with free GIS software.

Bastrop County also compiled Houston toad survey results from all known, publicly available surveys conducted to date. The database was developed in Microsoft Access format and compliments the GIS database. The Houston toad survey database standardizes the information contained in previous surveys, where possible, by identifying the source of the original survey data, locating surveyed areas (including those where no Houston toads were observed), estimating the accuracy and reliability of known Houston toad locations, identifying survey conditions, and standardizing the reporting of similar attributes. The survey database facilitates the use and accessibility of historical data and creates a cumulative view of Houston toad distribution over time.

Houston Toad Habitat Management Research

The LPHCP Administrator will seek out and work with private landowners interested in allowing researchers to access their property to conduct studies on the effectiveness of Houston toad habitat management practices and similar topics. The LPHCP Administrator will help landowners interested in allowing Houston toad research on their property find an appropriate college or university to work with and help initiate a relationship. These landowners may be eligible to receive the Ecological Laboratory property tax appraisal (see Section 6.2.3 – Expanding Access to Existing Assistance Programs).

7.0 MONITORING, ADAPTIVE MANAGEMENT, AND REPORTING

Monitoring is a required part of an HCP and must provide information to help assess impacts on the Houston toad. Reporting is also a required part of an HCP and must provide information that includes an evaluation of the implementation and effectiveness of the of the terms of the HCP (including financial responsibilities and management obligations), an accounting of the amount of incidental take that has occurred under the HCP, an assessment of the status of the species and its habitat, and any data necessary for adaptive management purposes. Bastrop County and the LPHCP advisory committees will use the results of monitoring efforts as described below to assess management strategies and develop more effective alternatives, as necessary, through the adaptive management procedures described in Section 7.3. The LPHCP will provide compliance and biological monitoring results and recommended

changes to the conservation program, if applicable, to the Service on an annual basis, as described in Section 7.4.

7.1 Administrative and Compliance Monitoring and Reporting

Compliance monitoring, described below, is conducted to ensure that the permittee and participating landowners are complying with the terms of the HCP and permit. The LPHCP Administrator must ensure that the terms and conditions of the permit and HCP are being adhered to, and that incidental take of the covered species does not exceed that authorized under the permit. If the take does exceed that forecast, then the Administrator must work with the landowner to correct the situation. If the Administrator cannot remedy the situation, it will be reported to the Service for further action because the Service must ensure that the taking does not "appreciably reduce the likelihood of the survival and recovery of the species in the wild."

The Service has the authority to impose terms and conditions in an incidental take permit necessary to ensure the permittee's compliance with the permit and the HCP. This authority allows the Service to establish reporting requirements in the permit for the HCP monitoring program. The Service's regulations (50 CFR 13.45) require annual reports unless otherwise specified by the permit. Most reports are required on an annual basis based on the anniversary date of permit issuance. These reports are helpful in determining whether the terms and conditions of the HCP and Permit are properly implemented by the permittee, as well as providing a long-term administrative record documenting progress made under the permit. The monitoring program should include reporting requirements necessary to track authorized incidental take levels occurring under the permit and to ensure the conservation program is being properly implemented. The following will be gathered and included in annual reports to the Service:

A. Track participation under the LPHCP.

Participation Database – to track certificates issued to participants; to include information on owner contact data, land data, activity covered, responsibilities/management agreements, monitoring needs/history, compliance history, etc.; updated at least annually; kept by the LPHCP Administrator.

B. Track the conversion of land within the Plan Area from an agriculture tax exemption status to a wildlife management tax exempt status.

On an annual basis, Bastrop County will consult with the Bastrop Central Appraisal District and review the database maintained by the Bastrop Central Appraisal District regarding land status.

C. Track the application for and approval of Conservation Subdivisions in accordance with the LPHCP.

Track applications for subdivisions within the Plan Area to include information on: owner contact data, land data, activity covered, responsibilities/management agreements, monitoring needs/history, compliance history, etc.; updated at least annually and kept by the LPHCP Administrator.

D. Track Houston toad habitat enhancement projects.

Track installation and maintenance of Houston toad habitat enhancement projects; to include owner contact information, description of enhancement; and monitoring of success.

E. Track road improvement projects in the Plan Area.

Track area disturbed by roadway improvement projects in the Plan Area, including, location of area disturbed, amount of area disturbed, and such other data as recommend by the BAT to the LPHCP.

In addition to annual reports, every fifth year the LPHCP Administrator will prepare and submit to the Service a cumulative report regarding private sector participation in and the performance of the conservation strategies of the LPHCP.

7.2 Biological Monitoring

Regular monitoring of the distribution and abundance of Houston toads within the Plan Area is essential to the adaptive management component of the LPHCP. Bastrop County is responsible for funding or obtaining sufficient funding to accomplish biological monitoring on an annual basis. The goal of the biological monitoring program is to provide feedback on the impact of activities conducted under the LPHCP on the Houston toad, and the effectiveness of management or mitigation activities designed to offset unavoidable adverse impacts. Objectives for these monitoring studies include conducting surveys over as much of the Plan Area as feasible, and implementing surveys under a consistent design to facilitate the collection and analysis of long-term data. Bastrop County will also make data collected on the distribution and abundance of the Houston toad in Bastrop County available to the public.

The LPHCP biological monitoring program is based on pilot studies conducted by Dr. Michael Forstner of Texas State University in 2002 and 2003 (Forstner 2002, 2003).

7.2.1 Monitoring Protocol

Nocturnal audio surveys for choruses of male Houston toads in the Plan Area will be performed annually during the peak breeding season of the species, defined for this purpose as January 1 through April 30. Surveys must be conducted by qualified biologists after dark and under weather conditions that are conducive for chorusing (air temperature must be at least 50°F (10° Celsius) and wind speed must be no greater than 10 miles per hour (16 kilometers per hour). Qualified biologists must be permitted by the Service to conduct such surveys, have previous experience conducting anuran audio surveys, be familiar with the call of the Houston toad, and exceed the minimum requirements for detection as determined by Jackson et al. (2006). This requires 16 audio chorus surveys during each annual season and minimally 4 additional visits or evaluations during the year to assess breeding site condition, including the presence of water within audio range of the listening post, evidence of breeding in the form of tadpoles or juveniles, and other such supplementary data collection opportunities.

The survey route will include a total of 25 listening posts, including ten permanent index sites, ten randomly drawn positive sites, and five additional survey locations within the Plan Area. Index sites are locations that consistently exhibited chorusing during previous years and should act as relatively stable indicators for the population in the Plan Area. The ten index sites will be included in the survey route each year and are repeated each year. Ten randomly drawn listening posts will be added to each year's survey route from the pool of survey locations that have exhibited Houston toad chorusing in prior years

(exclusive of the permanent index sites) or are adjacent to such sites. These randomly drawn sites are designed to provide a broader, and potentially less biased survey effort, for the Plan Area and may also provide evidence of the species' expansion or contraction across Bastrop County. The location of the final five listening posts will be determined based on implemented, planned, or proposed habitat manipulations or changes within the Plan Area. These five posts will be used to monitor specific LPHCP-related projects including areas where various land-use guidance will be implemented, monitor the impacts of certain types of land uses, search for new Houston toad choruses, or expand the geographic range of the year's survey route. Areas of connection between Houston toad populations in Bastrop County and Lee County to its north are particularly relevant in the near term.

All listening posts on the survey route must be at least 0.5 mile apart. Physical access to chorusing ponds along the survey route should be sought, wherever possible. The geographic coordinates of each listening post and any accessible ponds must be recorded with a GPS unit. A brief description of the site characteristics at each listening post must also be recorded as these will vary over the permit period.

The timing or order of visits to each listening post on the survey route should also be varied among survey nights. Each listening post will be surveyed for five minutes at each post. Climatic data will be collected at each listening post for every survey night. Collected climatic data will include the air temperature, wind speed, wind direction, cloud cover, moon phase, moon position, and notes of any precipitation or other weather variations. Survey data to be collected at each listening post includes the number of Houston toads calling, the number of other anurans calling (by species), the general direction and distance of chorusing from the listening post or explicit pond location, observations of any hybrid Houston toads, observations of other wildlife detected, and any other pertinent data. The survey protocol must meet or exceed the minimum standards for such surveys as determined by Jackson et al. (2006).

In addition to the nocturnal audio surveys, daylight surveys will be conducted at accessible ponds along the survey route to estimate reproductive success. Ponds with observed choruses will subsequently be examined for evidence of reproduction or the emergence of juvenile toads. Survey biologists conducting daylight surveys must be familiar with the identification of Houston toad egg strands and juveniles.

The index sites will be chosen from among known chorusing sites for the Houston toad that have shown a consistency of chorusing over time, and form the basis for the evaluation of trend data for chorusing in the Houston toad in Bastrop County over time. Baseline data exists in Forstner (2003b) and Price (2003) from which index sites may be selected. Ideally these sites are locations within Bastrop County unlikely to be affected by significant onsite anthropogenic changes over the permit period. Random sites will provide information on the geographic range of chorusing and are explicitly included to evaluate chorusing outside of areas with projected long-term habitat stability, but within areas likely to have Houston toad occupancy. The surveyor, in consultation with the LPHCP Coordinator, will include an additional five listening posts to address specific monitoring needs as part of the adaptive management of land use changes or habitat modifications related to the LPHCP. The surveyor(s) will provide a detailed plan for the following season's planned listening posts and their justification to the Service for review and approval alongside the annual report each year. Confirmation of the planned listening posts will be provided to the surveyor(s) and the LPHCP Coordinator by December 1 of each year.

7.2.2 Reporting Requirements

An annual report summarizing the results of the biological monitoring will be prepared and submitted to the LPHCP staff by October 1 of each year. The report must include a summary of all data collected during the monitoring surveys. This required information includes: (1) the location of listening posts (if disclosure of listening post is authorized by the landowner); (2) a description of any deviations from the

required survey protocol; (3) personnel used; (4) a summary of the total number of Houston toads observed; (5) surveyed locations with positive Houston toad observations; (6) surveyed locations where Houston toads were not observed; (7) a summary of climatic conditions; (8) and a summary of other wildlife observed (see Forstner 2002, 2003 for a sample report).

7.3 Adaptive Management Strategy

Adaptive management is an iterative process that helps reduce uncertainty in natural resource management by incorporating new information into flexible management plans, as it becomes available. This process is appropriate when significant questions about the basic science or management of a natural resource are present. The Service developed a framework for addressing adaptive management in HCPs as part of its five-point policy that includes: (1) identifying areas of uncertainty and questions that need to be addressed to resolve this uncertainty; (2) developing alternative management strategies and determining which experimental strategies to implement; (3) integrating a monitoring program that is able to acquire the necessary information for effective strategy evaluation; and (4) incorporating feedback loops that link implementation and monitoring to the decision-making process that result in appropriate changes in management (65 FR 35242).

The conservation program in Section 6.0 (specifically, the guidelines developed for conservation subdivision development and land management activities) was developed based on the current state of knowledge on the biology, life history, and ecology of the Houston toad. However, many questions about the Houston toad and its habitat remain unanswered. This section identifies important gaps in the scientific understanding of the Houston toad and outlines a process to incorporate new information into LPHCP management strategies, as it becomes available.

7.3.1 Uncertainty and Needed Research

Current scientific understandings about the Houston toad are presented in Section 3.0. However, many questions remain unanswered regarding the life history, biology, and ecology of the Houston toad, and the short- and long-term effects of management practices on the species and its habitat. Information that could improve the effectiveness of the LPHCP and Houston toad conservation in the Plan Area includes:

- Definition of the characteristics that constitute quality Houston toad habitat, both breeding and non-breeding habitat, including vegetation composition and structure, soil moisture, pond depth and slope, proximity and distribution of breeding and non-breeding habitats, and others;
- Age estimates for Houston toads at first breeding, both males and females from field data;
- Description of the habits and movements, particularly dispersal, of adult and juvenile Houston toads during the non-breeding season;
- Conditions necessary for successful breeding by adults and emergence and survival by juveniles;
- Determination of the relative impact and interaction of individual stressors on Houston toad populations, such as predation, habitat loss, habitat fragmentation, pesticides, hybridization, weather patterns, roads and development barriers, and others;
- Determination of the density of residential development that may cause the extirpation of Houston toads from an area;

- Research regarding effective management practices, such as toad tunnels, pond construction, prescribed burning regimes, and reforestation practices; and
- Similar unresolved aspects of Houston toad biology and management.

7.3.2 Biological Monitoring and Research

The biological monitoring program described in Section 7.2 collects data on Houston toad relative abundance and distribution in the Plan Area. Higher-level analysis of multi-year data can provide further information on trends in Houston toad abundance, correlations to habitat characteristics, or responses to changing habitat conditions. Specific opportunities for adaptive management using biological monitoring data include:

- Using long-term data from index posts to assess trends in Houston toad abundance overall and in relation to specific habitat characteristics at each site;
- Data collected in different sections of the Plan Area can help answer questions regarding the distribution of Houston toads along the Bastrop and Lee county line, the impacts of residential development in areas with the soils and vegetation characteristics currently thought to represent high-quality Houston toad habitat, the impact of agricultural activities, and the effectiveness of LPHCP guidelines on improving conditions for Houston toads; and,
- Determining the effectiveness of Houston toad management activities and habitat enhancement projects by using the flexibility of the LPHCP biological monitoring program to incorporate these sites or projects into the surveys.

While the LPHCP conservation program does not include conducting or sponsoring research on the Houston toad (unless funded by grants or other contributions), all biological monitoring data collected by the LPHCP will be available to the public for review and further analysis. The LPHCP Administrator will be responsible for applying for grants that will fund the research described above. The LPHCP will facilitate the distribution of this information by incorporating results into the Houston toad survey database (see Section 6.2.6).

7.3.3 Evaluation and Incorporation of New Information

The LPHCP BAT, composed of biologists, land management specialists, and other species experts (see Section 9.1.2), will have the primary responsibility for evaluating relevant research on the Houston toad and its management. The BAT will alert the LPHCP staff, Stakeholder Advisory Committee, Service, and other LPHCP partners, of any relevant new information. The BAT will also make recommendations to the LPHCP staff regarding changes to the conservation program to incorporate new information, including recommendations based on the results of the LPHCP biological monitoring program. Changes to the LPHCP conservation program will be implemented following the procedures described in Section 9.2.

7.4 Reporting

The LPHCP will submit annual monitoring reports to the local and regional offices of the Service by December 1 of each year. The report will cover the period of October 1 through September 31, which coincides with Bastrop County's fiscal year. The due date will provide ample time to analyze and review data from biological monitoring surveys and other sources. The report will be prepared by LPHCP staff

and will contain information from compliance monitoring and biological monitoring programs. Specifically, annual monitoring reports will include:

- An accounting of current participation in the LPHCP, such as the number of participants, acres enrolled per activity, the amount of mitigation and administrative fees collected, the number and type of management plans/agreements filed, and other information derived from the participation database;
- An accounting of LPHCP revenues and expenses, including a status report on actions to procure additional grant funding for the LPHCP and the distribution of any funds from the HTCF held by the National Fish and Wildlife Foundation, as applicable;
- A summary of the status of mitigation obligations for LPHCP participants (e.g., management of green spaces in conservation subdivisions, management of conservation easements developed as an alternative to paying mitigation fees, and compliance with LPHCP guidelines) to include information acquired from participation monitoring by LPHCP staff;
- A status report for grants applied for and projects completed with grant funds provided by the LPHCP;
- The results of annual biological monitoring (with the complete monitoring report attached);
- A summary of the status of the community education and outreach program, land or conservation easement acquisitions, and other conservation program strategies;
- The results of any research conducted with the assistance of the LPHCP;
- Recommended modifications to the conservation program via the adaptive management process;
- Any compliance-related issues and actions involving individual participants of the LPHCP; and,
- Other pertinent information or recommendations (e.g., assets list), as appropriate.

The Service will have the responsibility for reviewing annual reports and ensuring that Bastrop County and LPHCP Participants are in compliance with the terms of the LPHCP, the incidental take permit, and other applicable agreements. The Service also has the responsibility of verifying the information contained in the annual reports, particularly regarding the biological monitoring data.

8.0 FUNDING

To receive approval from the Service, an HCP must identify the funding that will be available to implement the measures that are proposed to minimize and mitigate the impacts expected from incidental take authorized by an ESA section 10(a)(1)(B) permit. Further, the *Habitat Conservation Planning Handbook* states that "failure to demonstrate the requisite level of funding prior to permit approval or to meet funding obligations after the permit is issued are grounds for denying a permit application or revoking or suspending an existing permit, respectively" (Service and NMFS 1996). The LPHCP is a relatively complex HCP involving a variety of participants, partners, conservation measures, and mitigation options. Some of the conservation measures identified in Section 6.2 will be implemented with the in-kind contribution of land management actions by private landowners, while the collected mitigation and administrative fees from Plan participants will fund others. Through annual authorizations by Bastrop County's Commissioners Court, it is anticipated that Bastrop County will also provide administrative support by funding LPHCP staff positions and related overhead administrative costs. In addition, Bastrop County will be responsible for securing funding for the Administrator and the biological

monitoring through a variety of sources, including taxes, grants, fees, and strategic partnerships with governmental entities and non-governmental organizations. Together, these sources will provide adequate funds to ensure that incidental take authorized under the LPHCP will be minimized and mitigated to the maximum extent practicable for Bastrop County.

All estimates of revenues and costs given in the following sections are calculated in 2003 dollars. Revenue estimates and budgets will be reviewed annually to monitor the accuracy of revenue estimates and costs of operating the LPHCP. Bastrop County will make budget adjustments, as appropriate, throughout the term of the HCP and incidental take permit based on available funding and operational cost experience.

8.1 Revenues

Funding for the LPHCP conservation program and administration will come from the issuance of Construction Certificates, administrative and application processing fees, and, through annual authorizations by Bastrop County's Commissioners Court from general tax revenue from Bastrop County. State and federal grant awards, voluntary contributions from individuals and non-profit organizations may also be available to fund the LPHCP, but are not guaranteed sources of revenue for the HCP. Bastrop County will be responsible for securing additional funding through a variety of sources, including fees, and strategic partnerships with governmental entities and non-governmental organizations. The expected amount of revenue generated from each of these sources is listed in Table 8-1 and is described below.

Table 8-1. Estimated Annual Revenue for the LPHCP.

Source	Estimated Annual Revenue
Certificate Mitigation Fees	$38,200
Certificate Application Fees	$2,728
County General Revenue	$56,600
Total	**$97,528**

8.1.1 Certificate of Participation Mitigation Fees

Revenue generated from the purchase of Construction Certificates will depend on: (1) the amount of incidental take expected in the Plan Area over the next 30 years from single-family residential, commercial, and multi-family residential activities; (2) the level of participation in the LPHCP; and (3) the cost of Construction Certificates. Several assumptions were used to estimate the amount of funds generated from the issuance of Construction Certificates, as follows:

1. The projected amount of habitat taken is based on the estimates given in Section 5.1;
2. Most participation will be by individuals wishing to build a single-family residence on an unplatted lot. The level of participation will be low (estimated at 10 percent based on an analysis of participation in the 46-Subdivision EA/HCP and the availability of the on-site mitigation option). Participation by commercial and multi-family participants will be relatively high (estimated 80 percent), since they will be less likely to choose to mitigate on-site and will have a greater preference for seeking the ESA compliance assurances of the LPHCP; and
3. Each home or commercial/multi-family site will be allowed to choose between a maximum direct impact area of either 0.5 acre or 1.0 acre. For purposes of calculating revenue

generated, Table 8-2 shows the Maximum Expected Acreage Covered based on calculations at the 1.0-acre level for each site.

Table 8-2 shows estimates of revenue from mitigation fees using the assumptions stated above and the data presented in Section 5.1. Mitigation fees are currently set at $1,500 per 0.5 acre of requested incidental take. This table only includes projections for Construction Certificates issued for single-family residential construction and use and commercial or multi-family construction and use. The Total Projected Incidental Take column in Table 8-2 also includes incidental take estimated from the expansion of existing home sites and commercial developments.

Table 8-2. Estimated Participation and Revenue from Construction Certificates.

Activity	Total Projected Incidental Take (acres)	Estimated Percent Participation	Maximum Expected Acreage Covered	Revenue Generated	Average Annual Revenue
Single-family Residential	3,172	10	317	$951,000	$31,700
Commercial and Multi-family	81	80	65	$195,000	$6,500
Total	**3,253**		**382**	**$1,146,000**	**$38,200**

8.1.2 Certificate Application and Processing Fees

Certificate application processing fees are necessary to help offset some of the fixed costs of implementing the LPHCP. Application fees for Construction Certificates will be $120 per application (regardless if the application is for incidental take coverage on 0.5 acre or one acre). The application fee for a Subdivision Certificate is $1,500. The estimated revenue generated by Certificate application fees is shown in Table 8-3.

Table 8-3. Estimated Revenue from Application Fees for Certificates of Participation.

Certificate Type	Expected Number of Applicants	Fee Per Application	Revenue Generated	Average Annual Revenue
Construction Certificate	382	$120	$45,840	$1,528
Subdivision Certificate	24	$1,500	$36,000	$1,200
Total	406		$81,840	$2,728

8.1.3 County of Bastrop Financial Support

All revenues generated by mitigation will be applied to activities required to implement the LPHCP. Through annual authorizations by Bastrop County's Commissioners Court, it is anticipated that Bastrop County will budget an amount equal to the expenses required to cover the costs identified in Section 8.2 for LPHCP personnel and biological monitoring (approximately $71,600). In addition, Bastrop County

will be responsible for securing funding from a variety of sources, including grants, fees, and strategic partnerships with governmental entities and non-governmental organizations.

8.1.4 Grants and Voluntary Contributions

Grants and voluntary contributions of funds or preserve land could contribute significantly to the assets available to the LPHCP. The Houston Toad Community-based Conservation Project, the effort that led to the development of the LPHCP, has already been successful in soliciting grants from the Service, Environmental Protection Agency (EPA), and the National Wildlife Federation to help develop the LPHCP, permanently protect Houston toad habitat, and promote private landowner participation in Houston toad conservation. Since July 2000, the effort has been awarded over $2.45 million in grant funds. Voluntary contributions to aid the development of the LPHCP and Houston toad conservation in Bastrop County have also been made by several local interests. However, these sources of funding are not stable or guaranteed, and cannot be relied upon to fund the essential components of the LPHCP conservation program beyond those funded by fees collected from Construction Certificates and Subdivision Certificates.

Grants and voluntary contributions will be essential to completing any permanent habitat protection in the Plan Area other than those areas protected through the Methods of Participation (see 6.2.1 of this HCP). Permanent habitat protection under the LPHCP will be limited by the availability of these contributions and the ability of LPHCP staff to gather sufficient matching funds. To help accomplish permanent habitat protection objectives, LPHCP staff will solicit grants and other contributions to the Plan each year. The staff will regularly review grant opportunity internet sites and notices, register with supporting agencies, foundations, and organizations to receive grant notifications, and submit proposals for applicable awards. LPHCP staff will also organize fundraisers and other community activities, as appropriate, to solicit additional contributions from the local community to help protect the Houston toad and the Lost Pines ecosystem.

8.1.5 Houston Toad Conservation Fund

Money from the HTCF may be available to support or enhance non-essential portions of the LPHCP conservation program, such as funding land acquisition or expanding the LPHCP private landowner grant program. The LPHCP Administrator, with the assistance of the LPHCP Advisory Committees, will identify potential uses of HTCF monies to further the goals and objectives of the LPHCP. The LPHCP Administrator will then work with the Service to obtain access to HTCF monies. However, the availability of HTCF monies to fund LPHCP conservation strategies is not assured, and is at the discretion of the Service.

8.2 Program Costs

It is anticipated that large portions of the conservation program for the LPHCP will be implemented by private landowners, either as a requirement of participation in the LPHCP or as voluntary contributions to the conservation of the Houston toad. The emphasis on private landowner involvement will help reduce the costs of the LPHCP conservation program, consistent with the needs of the local community (see Section 1.7.4). The LPHCP will aid private landowner efforts, both required and voluntary, by providing technical guidance, staff support, and funding to help landowners implement appropriate conservation measures. Bastrop County will fund a monitoring program to help answer questions about Houston toad biology and habitat, which will be used to refine conservation and management actions. Grants and other voluntary contributions to the LPHCP conservation programs, as they become available, will allow

Bastrop County to expand regular LPHCP programs and fund additional conservation activities, such as permanent habitat protection.

Table 8-4. Cost Summary for the LPHCP.

Program Strategy / Implementation Need	Estimated Annual Cost	Method of Finance
Personnel and Overhead	$56,600	County of Bastrop general revenue
Certificate Processing and Technical Assistance	minimal	Covered by existing County resources and newly funded LPHCP Administrator
Partnerships with Existing Subdivisions	minimal	Covered by existing County resources and newly funded LPHCP Administrator
Private Landowner Grant Program	$2,500	Certificate fees (supplemented by grant funds, as available)
Land Protection	not budgeted	Grant funds and surplus revenues (as available)
Distribute LPHCP Guidelines and Other Information	minimal	Covered by existing County resources and newly funded LPHCP Administrator
Community Workshops	$3,240	Certificate fees (supplemented by grant funds, as available), or covered by the newly funded LPHCP Administrator
Maintenance and Distribution of Toad Survey and GIS Database	minimal	Covered by existing County resources and newly funded LPHCP Administrator
Biological Monitoring	$15,000	Certificate fees (supplemented by grant funds, as available) and County of Bastrop general revenue
Total	**$77,340**	

The following paragraphs describe the costs associated with the implementation of the conservation program and administration of the LPHCP.

Personnel and Overhead. Bastrop County will initially create and fund one new staff position to administer the LPHCP and provide grant writing services for other County programs (as described in Section 9.0). This initial staff person will perform most of the work associated with the administration of the LPHCP, including compliance monitoring, reporting, and distributing information regarding the HCP. Although the Bastrop County Commissioners' Court will determine the final compensation after the position is created, a preliminary estimate of the annual cost is $56,600. This estimate is based on an annual salary of approximately $35,000, plus benefits ($10,000) and overhead expenses ($11,600) (Robert Peña, Bastrop County Human Resources Director, pers. comm.).

Certificate Processing and Technical Assistance. The LPHCP Administrator will absorb much of the cost of reviewing Certificate applications, enrolling LPHCP participants, and assisting potential participants with the LPHCP guidelines and other provisions as part of his/her regular duties. The costs associated with review of Certificate applications and other administrative costs will be borne by participants of the Plan.

Bastrop County staff currently responsible for review of subdivision applications predict the increase in workload, if any, can be managed with existing resources and the assistance of the LPHCP Administrator, as described above (Dee Czora, Bastrop County Administrator of Subdivisions and Permits, pers. comm.). Bastrop County currently assesses subdivision review fees, which are set at a level considered sufficient to cover the expense to Bastrop County for reviewing the application.

Partnerships with Existing Subdivisions. The LPHCP Administrator will assist willing communities in existing subdivisions with the organization of voluntary Houston toad management programs. The

LPHCP Administrator may assist these efforts by contacting and encouraging landowners to participate, as well as help find sources of grant funding or technical assistance.

Private Landowner Grant Program. Bastrop County will continue to help fund small habitat enhancement projects on privately owned lands (see Section 6.2). The grant program for private landowner habitat enhancement projects will be budgeted at a minimum of $2,500 per year. Additional funds may be applied to the Private Landowner Grant program, depending on the availability of fees and grants.

Land Protection. Conservation of land through various programs (e.g., purchase of development rights, conservation easements, or fee-simple purchases from willing sellers) will be funded, as resources allow. Potential sources of funding include grants, donations, mitigation fees from the issuance of Certificates, and the Houston Toad Conservation Fund. Bastrop County does not support the use of local tax revenue as a funding source for this program activity.

Distribute LPHCP Guidelines and Other Information. Bastrop County will develop and distribute LPHCP guidelines and a fact sheet on the ESA, Houston toad, and LPHCP to individuals seeking information regarding Bastrop County's permitting and subdivision development processes. The cost of distributing this information is expected to be minimal.

Community Workshops. Bastrop County may partner with PPLT, or similar organization, to conduct at least one community workshop per year highlighting the Houston toad and its management. Alternately, Bastrop County may opt to conduct workshops using LPHCP staff. At least $3,240 will be budgeted annually for community workshops.

Maintenance of Houston Toad Survey and GIS Databases. The Houston toad survey and GIS databases were developed with the assistance of grant funding from the EPA (EPA Grant No. X 97626101-0 awarded to Bastrop County). The LPHCP Administrator will be responsible for distributing copies of these databases to interested parties (e.g., copying the data onto CD or other electronic media), upon request, and updating the databases with new or revised information, as available. Most of the cost associated with the distribution and maintenance of the databases will be absorbed by Bastrop County as part of the regular duties of the LPHCP Administrator. Other costs (e.g., the cost of CDs, maps, or product reproduction costs) are expected to be minimal, but may be covered by assessing an administrative fee (see below).

Biological Monitoring. Bastrop County will annually conduct biological monitoring, as described in Section 7.2. Based on the monitoring performed in 2002 and 2003, this effort is projected to cost approximately $15,000 per year.

Other Administrative Costs. Certain costs of administering the LPHCP will be passed through to participants and other individuals or businesses requesting various services related to the LPHCP (e.g., records filing fees, document copying fees, map reproduction expenses, etc.). Pursuant to Chapter 118 of the Local Government Code, such expenses are generally nominal and intended only to cover the actual expense by Bastrop County to provide the service. The revenue received for the services should be sufficient to match the costs, as state law allows. Although a precise estimate of the costs of such services is not possible at this time, it should be less than $1,000 per year.

9.0 PLAN IMPLEMENTATION AND ADMINISTRATION

Much of the implementation of the LPHCP conservation program will be implemented by private landowners in the Plan Area through their participation in the LPHCP and compliance with the land

management guidelines or through voluntary conservation actions facilitated by the LPHCP programs. In this manner, private landowners are the cornerstone of the LPHCP and a vast resource for the conservation of the Houston toad in Bastrop County. Bastrop County, as the incidental take permit holder, is the coordinating body behind the LPHCP and provides administrative, technical, and financial assistance to private landowners for Houston toad conservation and incidental take authorization. Bastrop County also provides financial and institutional status to apply for and secure additional resources for Houston toad conservation in Bastrop County and to develop partnerships and programs with other locally active agencies and organizations, such as PPLT, property owner's associations, and TPWD.

The roles of Bastrop County and other LPHCP partners and procedures for enacting changes to the Plan are described below.

9.1 Implementing Partners

9.1.1 County of Bastrop

Bastrop County is the proposed permit holder of the requested incidental take permit supported by the LPHCP. As the proposed permittee, Bastrop County has the responsibility of implementing the terms of the LPHCP, incidental take permit, and any other Implementing Agreements (IAs). These responsibilities include monitoring compliance with LPHCP Certificates of Participation, guidelines, and other agreements (e.g., grant-funded projects or conservation easements), reporting non-compliance by individual participants to the Service for enforcement, when appropriate and revoking incidental take coverage under the LPHCP when appropriate and after consultation with the Service.

To adequately meet these responsibilities, Bastrop County will support one full-time staff position to administer and implement the LPHCP conservation program. Bastrop County will also appoint advisory committees to oversee the implementation of the LPHCP, help determine funding priorities, and assist with the modification of the conservation program, as appropriate through the adaptive management process.

LPHCP Staff

Administration of the LPHCP and implementation of portions of the conservation and monitoring programs will require one full-time staff person. LPHCP staff will conduct community outreach, act as a liaison between Bastrop County and the community, and the Service, and seek grant funding or other contributions to fund Houston toad conservation efforts. The LPHCP staff person will also serve as a technical specialist responsible for monitoring participant compliance with conservation agreements, distributing and promoting use of the LPHCP guidelines (with the assistance of other relevant agencies and organizations), evaluating applications for LPHCP grant funding, and coordinating biological monitoring and research of the Houston toad. LPHCP staff will be sponsored by Bastrop County as an employee of the County.

Specific job duties anticipated for the LPHCP staff include:

- Provide a point-of-contact for the public on issues related to the Houston toad, the LPHCP, and the ESA, including distribution of the land management guidelines;
- Process Certificate of Participation applications, including determining the appropriate land management guideline to be adhered to by a landowner seeking coverage for on-going activities on previously developed land;

- Coordinate conservation, management, and education activities with LPHCP partners, such as the PPLT, property owner's associations, and advocacy groups;
- Search and apply for grants to increase funding for the LPHCP and other Houston toad conservation actions, including research;
- Coordinate with relevant agencies and organizations to distribute and promote the use of LPHCP guidelines;
- Administer the LPHCP grant program for Houston toad habitat enhancement on private lands, including soliciting participants, reviewing applications, and distributing funds;
- Administer the LPHCP land acquisition, conservation easement, and purchase of development rights program (as resources allow), including identifying potential land targets and willing sellers, negotiating purchases, and coordinating management and maintenance agreements;
- Coordinate and/or conduct annual education workshops on the Houston toad, the LPHCP, and the ESA;
- Update the participation database and maintain other LPHCP records;
- Coordinate and direct annual biological monitoring with qualified biologists;
- Coordinate with landowners participating in the LPHCP for entry into their property for biological monitoring purposes;
- Monitor participant compliance with management/conservation agreements and LPHCP guidelines;
- Maintain and update the Houston toad survey and GIS database, and distribute the information to interested parties, as needed;
- Prepare the annual LPHCP permit report to the Service;
- Prepare a cumulative report every fifth year regarding participation in and the performance of the LPHCP and submit the report to the Service;
- Consult with the Service regarding the five year cumulative reports;
- Coordinate technical and stakeholder advisory committees for the ongoing review of the LPHCP;
- Coordinate the incorporation of amendments to the LPHCP based on the adaptive management program and/or the recommendations of the LPHCP advisory committees, as approved by Bastrop County and the Service;
- Manage the finances of the LPHCP;
- Develop a rescue and salvage plan in conjunction with the Service;
- Coordinate and consult with the Service with regard to the LPHCP; and,
- All other tasks necessary for the proper implementation of the LPHCP and its conservation programs.

9.1.2 LPHCP Advisory Committees

Bastrop County will establish two LPHCP advisory committees (the Stakeholder Advisory Committee and BAT) to monitor and guide the ongoing implementation of the Plan. The committees will meet at least once per year to review the annual permit report and other relevant information. The committees will discuss and make recommendations for changes to the implementation of the LPHCP, the conservation program, funding priorities, adaptive management provisions, and other LPHCP issues, as appropriate.

Stakeholder Advisory Committee

The Stakeholder Advisory Committee will consist of members of the Bastrop County community and represent interests affected by the LPHCP and ESA (relating to the Houston toad). Stakeholder groups represented on the committee will include private landowners, farmers/ranchers, timber growers, residential communities, builders/developers, real estate professionals, businesses, environmental interests, local governments, state natural resource agencies, and/or other local interests, as appropriate. Bastrop County will appoint members to the committee and the committee will elect a chairperson. The Stakeholder Advisory Committee chairperson will coordinate with LPHCP staff on issues relating to the implementation of the Plan and call meetings of the committee as needed, with a minimum of one meeting per year.

Specific duties of the Stakeholder Advisory Committee include:

1. Reviewing participation, compliance, and biological monitoring data;
2. Reviewing progress relating to the implementation of LPHCP conservation program provisions, such as community workshops and grants to private landowners;
3. Discussing LPHCP implementation issues and recommending changes to Bastrop County and Service, as needed;
4. Reviewing the Houston Toad Conservation Fund account and recommending to the Service projects or priorities for expending funds from this account;
5. Facilitating outreach to the community; and,
6. Other duties related to the implementation of the LPHCP, as appropriate.

Biological Advisory Team

The BAT will review progress towards the biological goals and objectives of the LPHCP and advise Bastrop County on issues relating to the biological or technical aspects of the LPHCP. The BAT will include at least five biologists or natural resource specialists knowledgeable about the Houston toad and its habitat requirements. Bastrop County will appoint committee members and the committee will elect a chairperson. The committee chairperson will coordinate with LPHCP staff on issues relating to the biological aspects of the LPHCP and call a meeting of the full committee at least once per year.

Specific duties of the BAT include:

1. Reviewing biological monitoring data and available, relevant research on the Houston toad and its habitat;
2. Reviewing progress towards the biological goals and objectives of the LPHCP, particularly Goals 1, 3 through 6, and 8, and Objectives 2, 4, 5, 6, 9, and 10. See Section 6.1;

3. Discussing the status of the Houston toad in Bastrop County in relation to the LPHCP and recommending changes to the Plan based on biological or technical issues, as appropriate to accomplish the goals and objectives of the Plan;
4. Consult with LPHCP staff regarding changes to the LPHCP through the adaptive management process; and
5. Other duties related to the achievement of the LPHCP biological goals and objectives, as appropriate.

9.1.3 U.S. Fish and Wildlife Service

The Service has the primary responsibility for ensuring that Bastrop County is complying with the terms of the incidental take permit and HCP. This includes monitoring compliance by the permittee and verifying the effects and effectiveness of the HCP. The Service must also determine if a changed or unforeseen circumstance has occurred and whether the conservation program must be modified to conserve the species (within the bounds of the No Surprises policy).

9.2 HCP and Permit Amendments

Amendments to the LPHCP and/or the associated incidental take permit may be necessary during the term of the permit. These amendments may include relatively minor changes to the HCP and/or incidental take permit, or major changes that substantially alter the covered activities, conservation program, or implementation of the LPHCP. Amendments to the LPHCP and associated incidental take permit may be made through an expedited administrative process or through a formal amendment procedure that would require additional notification through the Federal Register and NEPA analysis (Service and NMFS 1996), depending on the scope of the proposed changes. All amendments to the HCP or incidental take permit will require the consent of both Bastrop County and the Service.

9.2.1 Minor Amendments

Minor amendments are defined as those that have little or no impact on the amount of incidental take authorized by the permit, the degree of negative impacts to the Houston toad from covered activities, or the effectiveness of the conservation program. Minor amendments include, but are not limited to:

- Administrative changes addressing the implementation of the LPHCP, such as staff duties, participation procedures, reporting requirements, and oversight;
- Changes to the guidelines for conservation subdivision development, forest management, agricultural management, and wildlife management activities;
- Minor modifications to biological monitoring protocols; and,
- Similarly minor alterations to the LPHCP and/or incidental take permit that could arise from changed or unforeseen circumstances, adaptive management provisions, or other circumstances.

Minor amendments may be incorporated into the LPHCP and/or incidental take permit administratively provided that both Bastrop County and the Service agree on the proposed changes, the proposed amendments are documented in written form, and the proposed amendments do not significantly change the net effect of the covered activities on the species or the amount of incidental take requested by the original HCP and incidental take permit.

The following procedure will be used to process an administrative amendment to the LPHCP and/or incidental take permit:

1. Bastrop County will submit a draft of the proposed minor amendment to Service, after consultation with the LPHCP advisory committees and relevant implementing partners;
2. The Service will review the draft amendment and provide comment on the proposal. The Service will consult with Bastrop County, as needed, to reach consensus on the requested changes;
3. Upon reaching an agreement with the Service, Bastrop County will prepare the final amendment language, including any applicable changes to other implementing documents (e.g., Certificates of Participation, partnering agreements, or IAs), and forward the proposed changes to the Service;
4. The Service will administratively process the agreed-upon changes, and append the amendment to the LPHCP and other related documents, as appropriate, and make any necessary changes to the incidental take permit.

9.2.2 Major Amendments

Major amendments are those that would substantially alter the activities or area covered by the LPHCP, the conservation program, or implementation of the LPHCP. Major amendments are likely to change the amount of take or impacts authorized by the incidental take permit, and/or have a significant impact on the structure, implementation, or effectiveness of the LPHCP conservation program. Major amendments may include, but are not limited to:

- Significantly changing the boundaries of the Plan Area or increasing the amount of take anticipated;
- Adding to the list of activities for which incidental take is covered by the LPHCP and associated incidental take permit;
- Changing the conservation program as to reduce the amount of mitigation provided by the LPHCP;
- Reducing the amount of funds or staff used to implement the LPHCP; and,
- Similar modifications to the LPHCP and/or incidental take permit that could arise from changed or unforeseen circumstances, adaptive management provisions, or other circumstances.

Incorporating major amendments will require completion of a formal amendment procedure similar to the original permit application process. This procedure may include public review through the Federal Register, additional analysis to comply with NEPA requirements, and an internal Service ESA section 7 consultation (Service and NMFS 1996).

10.0 CHANGED AND UNFORESEEN CIRCUMSTANCES

The Service provides economic and regulatory assurances under the No Surprises policy (63 FR 8859, see Section 1.7.1) to incidental take permittees who incorporate provisions for changed or unforeseen circumstances into their HCP and fully and completely implement the terms of the HCP and incidental take permit. These assurances give permittees certainty regarding the costs of mitigation and conservation of protected species on their property.

The current "No Surprises" policy of the Service provides that additional mitigation requirements for land, water, or financial obligations shall not be required of the Permittee or their successors or assigns beyond the level of mitigation provided for in this HCP and its associated permit, if fully and completely complied with and implemented. The Applicant believes the Houston toad is adequately addressed under this HCP and is, therefore, covered by No Surprises rule assurances. In the event that it is demonstrated by the Service that Unforeseen Circumstances exist during the life of the Permit, and additional conservation and mitigation measures are deemed necessary to respond to Unforeseen Circumstances, the Service may require additional measures of the Permittee where the HCP is being properly implemented, but only if such measures are limited to modifications within the HCP and maintain the original terms of the HCP to the maximum extent possible.

Additionally, notwithstanding anything to the contrary in the IA and the HCP, the Service retains statutory authority, under both sections 7 and 10 of the ESA, to revoke incidental take permits that are found likely to jeopardize the continued existence of a listed species.

10.1 Changed Circumstances

Changed circumstances are defined as "circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and the Service and that can be planned for..." (50 CFR 17.3). An HCP must identify provisions to help compensate for any negative impacts to covered species from changed circumstances to qualify for No Surprises assurances. If the Service determines that a changed circumstance has occurred, the permittee must implement any provisions included in the HCP and/or incidental take permit that address such circumstances. If a changed circumstance has not been addressed by the HCP and/or incidental take permit, the Service will not require additional conservation or mitigation measures of the permittee, provided that the terms of the HCP and incidental take permit are being properly implemented. Under these conditions, any additional conservation measures deemed necessary by the Service to compensate for a changed circumstance must be implemented at the expense of the Service. It is important to note that Bastrop County has limited authority to enter private property and take corrective actions.

Fires, droughts, floods, and infestations of pine bark beetles are reasonably foreseeable events in central Texas and the Lost Pines ecosystem. These events occur in the Plan Area under normal conditions to the extent described in the sections below, and may result in changed circumstances with respect to the Houston toad. One of the goals of the LPHCP is to protect primary toad habitat and water management zones throughout the Plan Area. It is anticipated that dispersal of toads and toad habitat across the Plan Area will reduce the potential adverse impacts of localized changed circumstances, such as fire, flood, and pine bark infestations. Extraordinary instances of these events may also occur in the Plan Area, but not as a normal condition of the landscape and are thus treated as unforeseen circumstances (see Section 10.2).

Upon notification from the Service that a changed circumstance has occurred, the following measures will be implemented:

1. LPHCP staff will meet with the LPHCP advisory committees to review LPHCP guidelines to determine if the guidelines may be amended to address any negative impacts of a changed circumstance. For example, conservation subdivision guidelines may be amended to include provisions for wildfire prevention and control. Changes to the guidelines will be made by LPHCP staff upon concurrence of Bastrop County and the Service;

2. LPHCP staff will amend procedures for implementing the private landowner grant program, community workshops, and community partnerships to focus resources on measures to help address any negative impacts of a changed circumstance. For example, community workshops may be directed towards distributing information on preventing damage or loss of pine trees from pine bark beetles in times of drought, or private landowner grants may be directed towards projects that reforest habitat lost during a wildfire. LPHCP staff will make such changes to the implementation of the conservation program after consultation with the LPHCP advisory committees and the Service.
3. Bastrop County may also petition the Service or future NFWF fund administrators for access to funds in the HTCF to help offset any negative impacts changed circumstances that are not addressed in the LPHCP. For example, Bastrop County may request funds from NFWF to help purchase preserve land for the Houston toad or expand the LPHCP grant program.
4. Implement rescue and salvage activities, as appropriate.

10.1.1 Wildfires

Wildfires are a natural part of the Lost Pines system, and their intensity is a function of the fuel load, season, and daily weather conditions. Most wildfires occur in herbaceous vegetation or forest understory, and consume the top layer of leaf litter and other light, easily burnable fuels. A wildfire of any size occurring in a grassland, pasture, or cropland setting, or a crown fire consuming less than 100 acres of forest may be considered foreseeable and a changed circumstance.

However, given appropriate conditions, a fire of great intensity and duration could occur in the Plan Area and have adverse effects on the Houston toad. The effects of a large-scale crown fire on the Houston toad have not been determined, nor can they be precisely predicted. A crown fire consuming over 100 acres of forest would cause extreme damage to the small range of the Lost Pines ecosystem (Daniel Lewis, Texas Forest Service, pers. comm.). Therefore, the LPHCP assumes that a crown fire consuming over 100 acres of forest would be an extraordinary circumstance and unforeseen.

10.1.2 Flooding

Large flood events may negatively impact Houston toad habitat due to sedimentation, deposits of debris, or widespread damage to forest cover. However, flash flooding is common in central Texas and this type of short-term, periodic flooding in the Plan Area is not likely to have a long-term, adverse impact on the Houston toad. Further, a relatively major storm capable of producing a 100-year or 200-year flood could reasonably be expected to occur within a 30-year period.

The LPHCP assumes that a 200-year or less flood event will not likely jeopardize the continued existence of the Houston toad and may be considered a changed circumstance. A flooding event with a magnitude greater than a 200-year flood event is highly unlikely and shall therefore be considered an unforeseen circumstance.

10.1.3 Drought

Like flooding and wildfires, drought is a natural occurrence in this region and the Houston toad should be adapted to handle the stresses associated with periodic droughts (see Section 3.0). However, a long-term drought that results in the temporary disappearance or early evaporation of breeding ponds, desiccation of

soils in upland habitats, decrease in insect populations, and other potential impacts, could have devastating effects on the species.

The Palmer Drought Severity Index (PDSI) is a measure of meteorological drought, which takes into account hydrologic factors such as precipitation, evaporation, and soil moisture. Severe to extreme droughts (events with a Palmer Drought Severity Index of –3.0 or less) have occurred in the Texas Gulf Coast basin, which includes Bastrop County, at least once every 10 years between 1895 and 1995 (National Drought Mitigation Center 1996). Periods of severe to extreme drought lasting up to two years are not uncommon in central Texas or the Plan Area, and may be considered a changed circumstance. Severe to extreme droughts lasting for more than two years, such as the drought of record that occurred in the 1950's, are less likely and would constitute an unforeseen circumstance.

10.1.4 Infestation of Pine Bark Beetles

Pine engraver beetles (*Ips* sp.) are known to occur in Bastrop County and attack and kill pine trees. These beetles seldom attack healthy trees, but readily infest and kill pine trees weakened by drought, fire, disease, or other damage. Unlike the southern pine beetle (*Dendroctonus frontalis*), which can cause widespread deforestation, pine engraver beetles more commonly affect scattered, individual trees, or small groups of trees. However, damage from pine engraver beetles can become more extensive during droughts (Pase 2002).

Scattered damage from pine engraver beetles is relatively common, and does not present a likely threat to the continued existence of the Houston toad in the Plan Area. Pine engraver beetle damage to large patches of forest under drought conditions could have locally negative impacts to the Houston toad and could constitute a changed circumstance. The introduction of the southern pine beetle to Bastrop County could severely impact the amount of forest cover in the Plan Area, and deforestation from this species would constitute an unforeseen circumstance.

10.2 Unforeseen Circumstances

Unforeseen circumstances are "changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers or the Service at the time of the conservation plan's negotiation and development, and that result in a substantial and adverse change in the status of the covered species" (50 CFR 17.3). The No Surprises policy assures incidental take permittees that the Service will not require additional mitigation or resources (other than those available under the original terms of the conservation plan) without the consent of the permittee (63 FR 8859).

The No Surprises policy states that the Service may require additional conservation measures of an incidental take permittee as a result of unforeseen circumstances "only if such measures are limited to modifications within conserved habitat areas, if any, or to the conservation plan's operating conservation program for the affected species, and maintain the original terms of the conservation plan to the maximum extent possible." The Service shall not require the commitment of additional land, water, or financial resources by the permittee without the consent of the permittee, or impose additional restrictions on the use of land, water, or other natural resource otherwise available for use by the permittee under the original terms of the incidental take permit. No Surprises assurances apply only to the species adequately covered by the HCP, and only to those permittees who are in full compliance with the terms of their HCP, incidental take permit, and other supporting documents. The Houston toad is adequately covered by the LPHCP, and the LPHCP conservation program for the Houston toad is, therefore, eligible for the assurances of the No Surprises policy.

The Service determines whether unforeseen circumstances have occurred based on, but not limited to, the following considerations (63 FR 8871):

- Size of the current range of the affected species;
- Percentage of the covered species' range adversely affected by the HCP;
- Percentage of the covered species' range conserved by the HCP;
- Ecological significance of that portion of the range affected by the HCP;
- Level of knowledge about the affected species and the degree of specificity of the species' conservation program under the HCP; and
- Whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.

A determination by the Service that unforeseen circumstances exist must be documented and based upon reliable technical information regarding the status and habitat requirements of the affected species. In the case of an unforeseen circumstance, the Service, any federal, state, or local government agency, non-government organization, or private entity may take any actions necessary in order to conserve a species, as long as the actions are at the expense of that organization.

In the event of an unforeseen circumstance, the Service shall provide at least 30 days notice of a proposed finding of unforeseen circumstances to Bastrop County and will work with the County to develop an appropriate response to the new conditions. Bastrop County shall have the opportunity to submit information to rebut the proposed finding, if it deems necessary. The Service may request that Bastrop County alter the LPHCP conservation program to address the unforeseen circumstance, provided that the requested alterations are limited to the LPHCP conservation program and maintain the original terms of the HCP to the maximum extent practicable. Pursuant to the No Surprises policy, the Service also may not require the dedication of additional resources, including land, water, funding, or restrictions on the use of resources otherwise available for development or use by Plan participants.

11.0 ALTERNATIVES CONSIDERED

Section 10(a)(2)(A) of the ESA requires that HCPs include a description of the "alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized." The *Habitat Conservation Planning Handbook* (Service and NMFS 1996) states that economic reasons for rejecting an alternative are permissible, if the applicant provides data to justify the decision (to the extent that such data is reasonably available and non-proprietary). Further, the decision regarding which alternative is chosen rests with the applicant. However, the Service retains the authority to reject an application for an incidental take permit, if it does not satisfy the requirements of the ESA.

The LPHCP and the associated EA consider three principal alternatives. Each of the three alternatives, including the proposed action, is described below, and a discussion of the reasons for accepting or rejecting each alternative is provided.

11.1 Alternative 1: No Action

Under the No Action alternative, Bastrop County would not seek an incidental take permit for the Houston toad, nor would it develop an HCP for the species, including the conservation subdivision guidelines. Under the No Action alternative, Bastrop County would not create an efficient mechanism for people to comply with the ESA (outside the areas covered by the 46-Subdivision umbrella HCP or the

template HCP the Service provides to requesting applicants). It is unknown whether the Service would continue to renew the 46-Subdivision EA/HCP. Instead, Bastrop County citizens and business interests seeking authorization for incidental take of the Houston toad would have the responsibility of obtaining individual permits from the Service and developing a separate HCP for each proposed project. Several disadvantages to Bastrop County citizens and the Houston toad make this alternative undesirable.

Drawbacks of the No Action alternative include continued regulatory uncertainty for landowners in Bastrop County. Although the Service will provide information regarding the biology, habitat, distribution, and management of Houston toad habitat upon request, the public may not know where to easily access such information. Without going to the Service for information, there is no clear definition of the types of land uses and activities that are likely to result in take. Additionally, there would not be a centralized source of information regarding the Houston toad and its habitat located within Bastrop County.

Conservation on private lands is vital to the survival and recovery of the Houston toad in Bastrop County. It is likely that clear recommendations based on sound biological research would not be developed and distributed to the public, if current conditions persist. As a result, many landowners would have difficulty accessing currently available incentive and assistance programs that would help them keep land in uses that are compatible with Houston toad conservation. Additionally, existing incentive and assistance programs are currently uncoordinated and often poorly advertised, leaving many landowners unaware of potential resources. Currently, there are no plans outside of the proposed LPHCP to increase landowner access to these programs. The No Action alternative would not encourage the voluntary management or conservation of the Houston toad on private lands.

The status of the Houston toad is likely to decline under the No Action alternative. For example, forest management is essential to maintaining the long-term viability of toad habitat. See Section 3.5.3. Under the No Action alternative, no lawful forest management could occur on private lands except under an individual incidental take permit. Given the cost, time and uncertainty associated with obtaining an individual incidental take permit, landowners might be unwilling or unable to seek a permit and thereby contribute to the incremental loss and degradation of habitat through unauthorized incidental take.

Available projections suggest that between 12,000 and 14,903 acres of treed land cover is expected to be lost in the Plan Area over the next 30 years (see Table 2-17). The No Action alternative would not help promote the otherwise lawful and desired economic development in Bastrop County, and the burden of the often lengthy and expensive planning and permit application process would fall on individuals. Prior to the issuance of the 46-Subdivision umbrella HCP, many individual landowners did not come forward to apply for individual incidental take permits and thus, were not being educated about or committing to conservation measures and mitigations for impacts to Houston toads. This would likely lead to a further decline in the population of the Houston toad in Bastrop County.

Even where incidental take would be authorized, uncoordinated conservation efforts from individual HCPs are also less likely to conserve the species than a coordinated effort. Small, isolated habitat preserves, such as would be expected from the mitigation requirements of smaller projects, are less likely to support viable and self-sustaining toad populations (Semlitsch 2002, Guerry and Hunter 2002, Marsh and Trenham 2001). The status quo also does not provide for organized research on the status and life history of the species to aid conservation efforts, nor does it encourage private landowners to become partners in this research (see 7.3.2). Given the current scarcity of research on the Houston toad, management and conservation efforts conducted under the No Action alternative might proceed under unsubstantiated or incorrect assumptions regarding the biology and habitat of the Houston toad and unknowingly decrease the recovery potential of the species.

One benefit to Bastrop County in using this alternative would include the elimination of potential legal liability and financial responsibility associated with holding an incidental take permit. On the other hand, Bastrop County would not receive the protection of an incidental take permit for its own activities, such as maintenance of County roads and parks.

The No Action alternative is not preferred by Bastrop County for several reasons. It does not alleviate uncertainty regarding landowner responsibilities under the ESA, it would result in the protection of the toad primarily through enforcement actions under Section 9 of the ESA, it would not assist landowners in the conservation process, it would not provide a mechanism for planning and coordinating conservation efforts, it would not provide public education regarding the toad, nor would it provide a means to coordinate research on the biology and management of the Houston toad.

11.2 Alternative 2: Lost Pines HCP and Incidental Take Permit (the Proposed Action)

The approval of the LPHCP and issuance of an incidental take permit for the Plan Area is the proposed action and preferred alternative for Bastrop County. The proposed permit would streamline the authorization of incidental take in areas of potential Houston toad habitat resulting from activities described in Section 4.0. The LPHCP would help reduce the amount of incidental take associated with these activities by providing participants and the general public with information regarding the ESA and the Houston toad, as well as providing them with assistance to avoid and minimize impacts to the maximum extent practicable.

As described further in Section 6.0, the proposed LPHCP would coordinate mitigation efforts for incidental take by standardizing minimization measures and strategically using mitigation fees to provide financial incentives for voluntary conservation measures, protect and enhance key habitat, and fund research and education. The support for voluntary conservation actions by private landowners would help link lands protected as part of the mitigation requirements for other HCPs in the Plan Area and adjacent counties. These efforts would also help offset the impacts of fragmentation by increasing the overall quality of remaining Houston toad habitat in the Plan Area.

The proposed LPHCP would benefit Bastrop County citizens by creating a simple and certain process for obtaining incidental take authorization. The proposed action would reduce the burden on individual landowners of obtaining a permit and would facilitate desired economic development in the Plan Area. It is likely that this simplified process and the regulatory certainty it provides would encourage more landowners to seek authorization for incidental take than would be the case under the No Action alternative.

The conservation program described in Section 6.0 would provide a benefit to the Houston toad and its habitat. The conservation program would use mitigation fees from participants seeking authorization for take to help fund conservation and management activities for the Houston toad using a variety of conservation tools that have broad community support. By providing incentives to keep land in uses that are compatible with the conservation of the Houston toad, and to improve conditions for the toad where possible, this alternative seeks to place much of the Plan Area under active management for the species by the voluntary efforts of private landowners. It is anticipated that enlisting the participation of private landowners will result in a significantly larger amount of Houston toad habitat being managed for the benefit of the toad than would occur through public sector purchase and management of toad habitat.

Although one objective of the LPHCP is to increase the amount of land permanently protected for the Houston toad, the LPHCP does commit local tax revenue funds to the purchase and management of a

publicly owned, interconnected, habitat preserve system. Large areas of publicly owned preserve lands (e.g., Bastrop and Buescher SPs) already exist in Bastrop County. Instead, this alternative focuses limited available resources on facilitating conservation efforts by private landowners, encouraging land uses that are compatible with Houston toad conservation (e.g., conservation subdivisions and low-impact agricultural land uses). This approach is intended to preserve the overall ability of the Plan Area to function as Houston toad habitat, while allowing the responsible economic and recreational use of the land. Preserving the overall functionality of the Plan Area as Houston toad habitat allows for connectivity between Houston toad preserves and subpopulations in adjacent counties without specifically dedicating some areas for protection and others for development.

The LPHCP is the proposed alternative because it provides the necessary assurances to landowners and other local interests and protects the Houston toad in a manner consistent with local community values and resources.

11.3 Alternative 3: HCP to Cover All Future Development

This alternative would be similar to Alternative 2, but would include all foreseeable development and land uses in the Plan Area over a 30-year period, including high-density subdivisions and large-scale commercial developments. Under this alternative, the existing 46-Subdivision EA/HCP would be discontinued, and all new development in existing subdivisions would be permitted through Bastrop County HCP. This alternative would result in more covered habitat loss than Alternative 2, facilitate the construction of large land development projects in the Lost Pines area, and would likely necessitate the development of a well-funded land protection program.

Small-scale land development projects, such as single-family residential construction and low-impact land management activities conducted under this alternative would be treated in a similar manner to the proposed LPHCP. The HCP would focus on avoidance and minimization to reduce negative impacts, where practicable, and would provide the option of paying a mitigation fee, protecting habitat on-site, or implementing conservation measures to offset unavoidable negative impacts, as appropriate. The HCP would also provide community education and incentive programs to the public, similar to the LPHCP, to support voluntary Houston toad conservation measures throughout the Plan Area.

Incidental take authorization would be available for large-scale land development projects under this alternative, which would remove much of the burden of ESA compliance for these types of projects. It is likely that easing compliance with the ESA could provide a powerful incentive for large-scale developments to take advantage of the aesthetic natural environment of the Plan Area. Encouraging large developments to locate in the Plan Area could also increase other types of land development, such as single-family residential construction, as more people are drawn to the area.

It is likely that this alternative would result in significantly more habitat loss than would occur under the No Action alternative or the LPHCP. Mitigation for this increased habitat loss would likely require a land acquisition program funded primarily by mitigation fees and administered by Bastrop County. Per acre mitigation fees would likely be similar to those proposed for the LPHCP (e.g., approximately $3,000 per acre). Collected funds would be used for land acquisition in accordance with the criteria developed by the Workgroup for the LPHCP (Section 6.2.4 and Appendix H). This approach could trigger the provisions of Subchapter B of Chapter 83, Texas Parks and Wildlife Code relating to Regional HCPs (Section 1.7.2) that require the acquisition of all designated preserve land within four years of the issuance of the incidental take permit for this plan. Such an acquisition schedule is beyond the means of Bastrop County.

Under this alternative, there would be no guarantee that the resulting preserve system would adequately mitigate for wide-spread habitat loss, since there would be little control over the availability, quality, or

configuration of potential acquisition targets in the Plan Area. Further, the continued operations and management of any acquired preserve land would likely require the use of County tax revenue, which would be beyond the financial resources of Bastrop County, contrary to the policies recommended by the Workgroup for a successful local HCP effort (Section 1.7.3), and not sufficient to meet the funding criteria required for incidental take permit approval by the Service (Section 8.0).

In addition, many members of the local community do not desire the intensive development that this alternative would facilitate, preferring instead to preserve the more rural nature of the Plan Area. This alternative was also rejected partly for that reason. Maintaining the current semi-rural lifestyle in the Plan Area is important to many citizens in Bastrop County, and there is little interest in creating a plan that would accelerate undesirable land use change.

11.4 Alternatives Not Considered for Detailed Analysis

Additionally, five secondary alternatives were considered at various times throughout the planning and development of the proposed LPHCP, but were rejected for detailed analysis. These rejected alternatives include:

- Securing and managing a large, interconnected Houston toad preserve system to mitigate for the impacts of all future incidental take of the Houston toad in Bastrop County;
- Using the management of Camp Swift as the primary mitigation strategy for offsetting the impacts of incidental take in the Plan Area;
- Developing a regional HCP encompassing Bastrop and Lee counties;
- Enhancing existing Houston toad preserve lands as the primary mitigation strategy for offsetting the impacts of incidental take in the Plan Area; and
- Developing a template HCP for landowners and developers in Bastrop County without pursuing an incidental take permit for Bastrop County (this option is currently available through the Service).

11.4.1 Preserve System Acquisition and Management

Bastrop County considered the acquisition and management of part of a 15,000-acre, permanently protected and interconnected preserve system for the Houston toad as an alternative to the proposed LPHCP. This alternative would allow the remainder of the Plan Area to be fully and intensely developed. The preserve system in this alternative would follow the initial recommendations of local Service staff (Service 2001b), and would authorize all incidental take expected to occur from covered activities in the Plan Area over the life of the permit. This alternative would be similar to the approach used by the Balcones Canyonlands Conservation Plan (BCCP) in western Travis County (RECON and Service 1996). The preserve system required by the BCCP was designed to ensure that Travis County could support a viable and self-sustaining population of endangered golden-cheeked warblers, black-capped vireos, and karst invertebrates, regardless of the actual amount of participation in the BCCP by area landowners and developers.

The principal mitigation component of this alternative is a land acquisition program by Bastrop County to bring the total acreage permanently protected for the species to 15,000 acres. This would require Bastrop County to purchase in fee simple or by the purchase of development rights at least 8,000 to 9,000 additional acres (3,237 to 3,642 hectares) near existing state parks or other conservation land (e.g., Bastrop SP). The amount of money required to secure this amount of acreage could be between $16

million and $24 million. Bastrop County would also need to ensure that permanently protected areas were connected by dispersal habitat. Further, Bastrop County would be required to fund the continued operation and management of these additional acres in perpetuity, as well as any other proposed conservation, incentive, or education programs. Management efforts would be focused on the 15,000-acre preserve system, and minimal effort would be given to privately owned lands in the remainder of the Plan Area.

As with Alternatives 2 and 3, this alternative would provide a streamlined process for landowners to obtain authorization for incidental take through the issuance of Certificates of Participation. Potential benefits might also include the possibility of making more land available for outdoor recreation by Bastrop County residents and others in the region, which would support some of the recommendations of the recently developed Bastrop County Parks, Recreation, and Open Space Master Plan (Community Development Management Co., Inc. 2001). Since this option would give Bastrop County and/or other managing partners the most control over use of preserve land and access to it, a properly implemented preserve system might also afford a higher degree of protection to the Houston toad, but over a smaller area.

While this alternative may provide several benefits to the Bastrop County community and the Houston toad, it would not be a feasible option to implement. As with the proposed LPHCP, mitigation fees collected from HCP participants would be the primary source of available funding for the conservation program under this alternative. However, mitigation fees would not be likely to generate sufficient funds to purchase and manage the required acreage.

Using all available funds collected under this alternative for land acquisition might also preclude the implementation of many other types of desirable conservation actions, such as supporting voluntary land management by private landowners or funding research on the management needs of the Houston toad. These types of conservation efforts are highly favored by the Bastrop County community. However, it is unlikely that sufficient funds would be available under this alternative to fund these and other conservation measures.

Since mitigation fees alone would be insufficient to fund the conservation program under this alternative, Bastrop County would need to seek another form of guaranteed funding before the Service could issue a permit. Options for Bastrop County include passing a bond proposition or dedicating a portion of County tax revenues to support the HCP. The Bastrop County Commissioners' Court has stated that Bastrop County can not support a HCP that required spending tax dollars on land acquisition (see Section 1.7.4). Without County tax revenue, the HCP for this alternative would not be able to meet the funding standards required for the Service to be able to issue an incidental take permit.

This feasibility of this alternative is also limited by the provisions of Chapter 83 of the Parks and Wildlife Code, which state that any preserve land required for such an effort must be previously owned or under contract by Bastrop County at the time of the incidental take permit application or:

1. Voters must have authorized the issuance of bonds or other debt financing in an amount equal to the estimated cost of acquiring all the preserve land within two years after permit issuance or three years after the date of first permit application (whichever is earlier); or
2. The political subdivision must demonstrate that such funding exists within the above-mentioned time frame.

Bastrop County could not fund the acquisition of the additional acres within the timeframe specified by the Parks and Wildlife Code, since Bastrop County's tax base is insufficient for such a proposal and support for other public financing options is minimal. A strict acquisition-based approach to Houston

toad conservation in Bastrop County would also overlook the role that private landowners could play in protecting the species.

11.4.2 Camp Swift as a Potential Preserve

Camp Swift contains areas of deep sandy soil that are associated with other known Houston toad populations in Bastrop County (SCS 1979). However, its suitability as a habitat preserve is questionable because Houston toads have not been observed on the property to date. Additionally, inclusions of deep sandy soils on Camp Swift are at least three miles from other large areas of deep sands and the property overlays a different geologic formation than all other known toad localities (SCS 1979). Since Camp Swift is outside of the Plan Area and may not be suitable toad habitat, it was not considered as a viable option for mitigation.

11.4.3 Bastrop and Lee County Regional HCP

Recently, significant choruses of Houston toads have been observed in Lee County (Kuhl 1997). Lee County also contains similar soils and geology as Bastrop County. However, it is not experiencing the same growth and development pressures as Bastrop County. Protecting habitat for the Houston toad in Lee County has been discussed as a more cost-efficient way to help meet recovery goals for the species, since land values are significantly less in Lee County. However, efforts to include Lee County in a regional HCP are not feasible at this time, given time and budget constraints associated with the development of the LPHCP. Also, Lee County stakeholders have not organized to join with Bastrop County in a joint HCP.

11.4.4 Enhancement of Existing Toad Preserves

Under this alternative, Bastrop County would develop an HCP and pursue an incidental take permit for the same general activities covered by the proposed LPHCP. As such, the alternative would result in a similar amount of expected incidental take. However, mitigation for incidental take under this alternative would be accomplished primarily by funding habitat enhancement and other management activities on lands already designated as Houston toad habitat preserves (e.g., Bastrop SP, Buescher SP, and Griffith League Ranch). Mitigation fees would also be used to support landowner incentive programs, education and outreach, and research. No new preserve land would be acquired under this alternative.

Benefits to Bastrop County and local citizens are similar to those provided by the proposed alternative, in terms of offering a streamlined process for complying with the ESA. Since funding requirements under this alternative would be lower than for alternatives where land or conservation easement acquisition is required, mitigation fees assessed to HCP participants could also be lower. A lower fee could stimulate higher participation in the conservation program.

Providing funds to manage and enhance already acquired preserve lands would benefit the toad by ensuring that dedicated toad preserves retain the highest quality habitat. Currently, adequate funds for ongoing management of publicly owned toad preserves are lacking. Enlisting private landowners in conservation efforts through generously funded incentive programs and other forms of assistance would also increase the amount of habitat available for the toad in Bastrop County, although individual tracts of land may not be dedicated to the conservation and management of the Houston toad in perpetuity.

Not providing sufficient mitigation for incidental take authorized under the permit is a probable limitation of this approach.

11.4.5 Bastrop County HCP Template

This alternative would involve Bastrop County developing a HCP for the area of potential habitat in the County to be used as a template or "umbrella" HCP for landowners applying for individual incidental take permits. Bastrop County would not apply for an incidental take permit under this option, leaving this responsibility to individual landowners seeking incidental take authorization. The template HCP would specify standardized minimization and mitigation activities, such as best management practices or the payment of mitigation fees, for projects conducted under the HCP. This approach is similar to the 46-Subdivision EA/HCP prepared by the Service for select subdivisions in Bastrop County (Service 2001).

This approach would help relieve some of the burden for landowners in Bastrop County, since the development of an HCP to support an application for an incidental take permit would be simplified. Some degree of coordination of mitigation efforts would be achieved under this alternative, since mitigation fees would be collected in a single account and later used to purchase and maintain preserve land or conservation easements for the Houston toad. Further, Bastrop County would not be responsible for holding or administering an incidental take permit.

However, a third party (such as a local land trust or other non-profit organization) may be needed to help administer the coordinated mitigation efforts specified by the HCP. It is unknown if an appropriate agency or organization would be available to take on responsibility for the administration of the mitigation fund. Further, this alternative does not provide staff or funds for the development of informational or educational programs, research on the biology and management of the Houston toad, or assistance to private landowners wishing to voluntarily manage land for the species.

The lack of administrative support for a full conservation program that provides tangible benefits to both landowners seeking authorization for incidental take and others who wish to voluntarily improve habitat for the Houston toad makes this alternative undesirable. This alternative does not contain provisions aimed at gaining community support for Houston toad conservation. While this alternative provides a streamlined mechanism for permitting incidental take, it does not satisfy other goals and objectives identified as important to a successful conservation program. Without solid community support, it is unlikely that this alternative could adequately protect the Houston toad in Bastrop County. Therefore, this alternative was also rejected.

12.0 GLOSSARY OF TERMS AND ABBREVIATIONS

adequately covered – With respect to species listed pursuant to section 4 of the ESA, that a proposed conservation plan has satisfied the permit issuance criteria under section 10(a)(2)(B) of the ESA for the species covered by the plan (50 C.F.R. Section 17.3 amended by the Service).

Bastrop County – The geographic area of Bastrop County, Texas.

BAT – Biological Advisory Team

BCAD – Bastrop Central Appraisal District

BCP – Balcones Canyonlands Plan – a regional habitat conservation plan and incidental take permit jointly held by the City of Austin and the County of Travis.

Biological Opinion - A document that is the product of a formal consultation with the Service and states the opinion of the Service on whether or not a federal action is likely to jeopardize the continued existence of a species (Service 2002).

BMPs – Best Management Practices

BSA –Boy Scouts of America (usually in reference to the Capitol Area Council #564)

Bufo houstonensis – The scientific name of the Houston toad.

Certificates of Participation – The mechanism for participation in the LPHCP for activities that are expected to result in habitat loss. Certificates extend incidental take authorization under the LPHCP to private landowners for land development activities addressed by the LPHCP. Certificates describe what mitigation measures the landowner will take, as well as the type and amount of take anticipated.

CFR – Code of Federal Regulations

changed circumstances – Those circumstances affecting a species or geographic area covered by a conservation plan that can reasonably be anticipated by plan developers and that can be planned for (50 C.F.R. Section 17.3 amended by the Service).

Conservation Easement – A legal agreement between a property owner and a nonprofit organization or public agency that restricts the type and amount of development that may take place on a property, while keeping the property under private ownership. The easement defines the rights retained by the landowners and any restrictions on the use of the property. The landowner and easement holder negotiate each of these rights and restrictions and tailor the easement to the resources of the particular property and the desires of the landowner (Land Trust Alliance 2003; Northern California Regional Land Trust 2002).

County of Bastrop – The Bastrop County governmental body (e.g., the Bastrop County Commissioner's Court), generally in association with its role as the proposed permit holder.

critical habitat – "Specific geographic areas, whether occupied by listed species or not, that are determined to be essential for the conservation and management of listed species, and that have been formally described in the Federal Register," (Service 2002).

Development – The construction or reconstruction of a building, road, or the placement of any other structure on land; the excavation, mining, dredging, grading, or filling of land; the clearing or removal of vegetation from land; landscaping with non-native vegetation, or the deposit of refuse, waste, or fill on land. The following activities are not development, as that term is used in the LPHCP:

1. Lawn and yard care, including mowing, gardening, tree care and maintenance of landscaped areas;
2. Any maintenance of a Conservation Area that is approved under the applicable Conservation Area Management Plan; and
3. Activities undertaken pursuant to the attached management guidelines for agriculture, wildlife, and forestry.

EA – Environmental Assessment

EA/HCP – Environmental Assessment and Habitat Conservation Plan.

ecosystem – A community of organisms and its surrounding environment functioning as an ecological unit.

endangered species – A species that is in imminent danger of extinction throughout all or a significant portion of its range having protection afforded to it by the federal Endangered Species Act.

endemic – Native to a particular geographic area.

Environmental Assessment – A document required to satisfy National Environmental Policy Act requirements for a detailed analysis of a proposed federal project or action and all reasonable alternatives.

ephemeral – An adjective describing something that lasts for a very short time. In the LPHCP, ephemeral usually refers to a pond that is dry for a portion of the year.

ESA – Endangered Species Act

extraterritorial jurisdiction – The unincorporated area contiguous to a municipality that is located within a designated distance from the corporate boundary in which the municipality has limited regulatory power over development activities.

Five-point policy – A Service policy designed to enhance the application of the habitat conservation planning process by developing biological goals and objectives, adaptive management strategies, monitoring provisions, permit duration considerations, and public participation. 65 F.R 35242, June 1, 2000.

FR – Federal Register

geographic information system – A computerized database management system used to display, query, summarize, and organize spatial data.

GIS – Geographic Information System

GLR – Griffith League Ranch owned by the Capitol Area Council #564 of the Boy Scouts of America

greenspace - An interconnected system of open land or a coherently designed place that is determined to have cultural, ecological, developmental, agricultural, or recreational value.

habitat – The place or environment where a plant or animal naturally or normally lives and grows.

HCP – Habitat Conservation Plan, as defined by Section 83.011(6) of the Parks and Wildlife Code

herpetologist – A person who studies reptiles and amphibians.

homesite – The area associated with a single-family residence that includes all improvements associated with the residential use of the property (e.g., yard, gardens, driveways, decks, pools, and outbuildings) but does not include any area subject to a conservation easement or other restriction against modification.

HTCF – Houston Toad Conservation Fund managed by the National Fish and Wildlife Foundation.

impact – An assessment, usually qualitative, of the changes in all attributes being measured for a given resource.

incidental take permit – A permit issued under section 10(a)(1)(B) of the ESA that allows for take of a threatened or endangered species on private land that is associated with otherwise lawful activities.

indirect impact – Collateral impact to a species or system attributable to an action.

interlocal agreement – An agreement between different governmental agencies.

jeopardy – The result of an action that is reasonably expected, directly or indirectly, to diminish a species' numbers, reproduction, or distribution so that the likelihood of survival and recovery in the wild is appreciably reduced.

Lost Pines ecosystem – The 124,000-acre area named for remnant stands of loblolly pine that are related to, but geographically separated from, the forests of East Texas.

lot – A tract of land described by a recorded subdivision plat approved by applicable regulatory entities or a division of land that is otherwise lawful under Texas law.

LPHCP – Lost Pines Habitat Conservation Plan

metapopulation – A population of populations of a species, each occupying a suitable patch of habitat in a landscape of otherwise unsuitable habitat and are linked by some degree of migration.

mitigation – Compensation for the change in or loss of a resource.

natural vegetation – Vegetation that is naturally occurring on a site and not planted by humans.

NEPA – National Environmental Policy Act

NFWF – National Fish and Wildlife Foundation

NMFS – National Marine and Fisheries Service

No Surprises policy – A Service policy designed to protect landowners with properly implemented HCPs from further liability under the ESA.

non-platted lot – A tract of land not defined by a subdivision plat recorded with Bastrop County but that is otherwise legally eligible to receive utility services.

NPS – National Park Service

Plan Area – The approximately 124,000-acre area of Bastrop County, Texas that is covered by the provisions of the LPHCP and related incidental take permit.

prescribed burning – The controlled application of fire under certain conditions of weather and fuel moisture that allow the fire to be confined to a predetermined area, while producing the intensity of heat and rate of spread needed to accomplish certain planned objectives, such as stand improvement, wildlife habitat management, grazing, fire hazard reduction, etc.

property tax – A tax levied by a local government on real or personal property.

qualified biologist – A person with a B.S. or B.A. degree from an accredited college or university with specialization in ecology, wildlife science, wildlife management, wildlife ecology, or directly related field of natural resource conservation and two years of experience with evaluating wildlife habitat and mapping natural resources.

Recovery plan – A document prepared by a team of biologists and stakeholders with the goal of declassifying a species, several species, or an ecosystem as being threatened or endangered under the Endangered Species Act.

RHCP – Regional Habitat Conservation Plan, as defined by Section 83.011(12) of the Parks and Wildlife Code.

Safe Harbor Agreement – An agreement between a landowner and the Service that allows landowners to implement a management program for endangered or threatened species without incurring the additional liability under the ESA of attracting these species to their property.

Section 10(a)(1)(B) – The section in the ESA allowing permits to be issued for incidental take of an endangered or threatened species.

Section 7 consultation – The formal process used by a federal agency "to insure that their actions are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat" (Service 2002).

Service – United States Fish and Wildlife Service

silviculture – "A branch of forestry dealing with the development and care of forests" (Merriam-Webster, Incorporated 2002).

site preparation - A general forestry management term for removing unwanted vegetation and other materials, if necessary, and conducting any soil preparations necessary before reforestation.

species – An interbreeding group of individuals.

water management zones – A buffer area immediately adjacent to stream channels or other water bodies, such as ponds, wetlands, springs, or seeps. The purpose is to protect important breeding and emergence habitat for the Houston toad, in addition to protecting water quality.

take – A term defined by section 3 of the ESA as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct," as related to threatened or endangered species.

threatened species – A species that is likely to become endangered throughout all or a significant portion of its range.

TPWD – Texas Parks and Wildlife Department

U.S.C. – United States Code

unforeseen circumstances – Changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the Service at the time of the conservation plan's negotiation and development, and that result in a substantial and adverse change in the status of the covered species (50 C.F.R. Section 17.3 amended by the Service).

USACE – United States Army Corps of Engineers

USGS – United States Geological Survey

viable population – A group of individuals of the same species that perpetuate the group's survival through successful breeding.

Workgroup – The citizen's stakeholder group of the Houston Toad Community-based Conservation Project appointed by the Bastrop County Commissioners' Court to develop the LPHCP.

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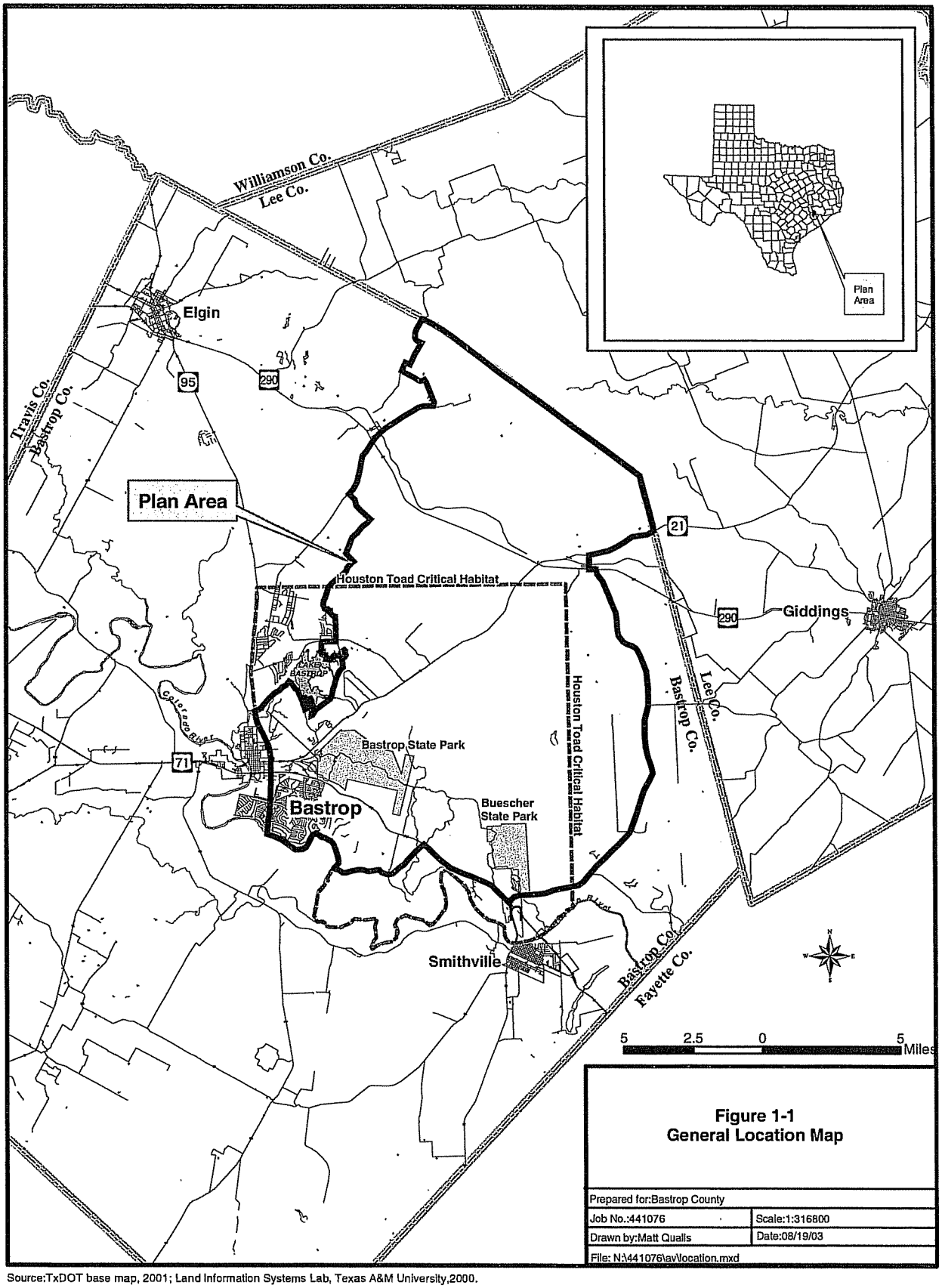

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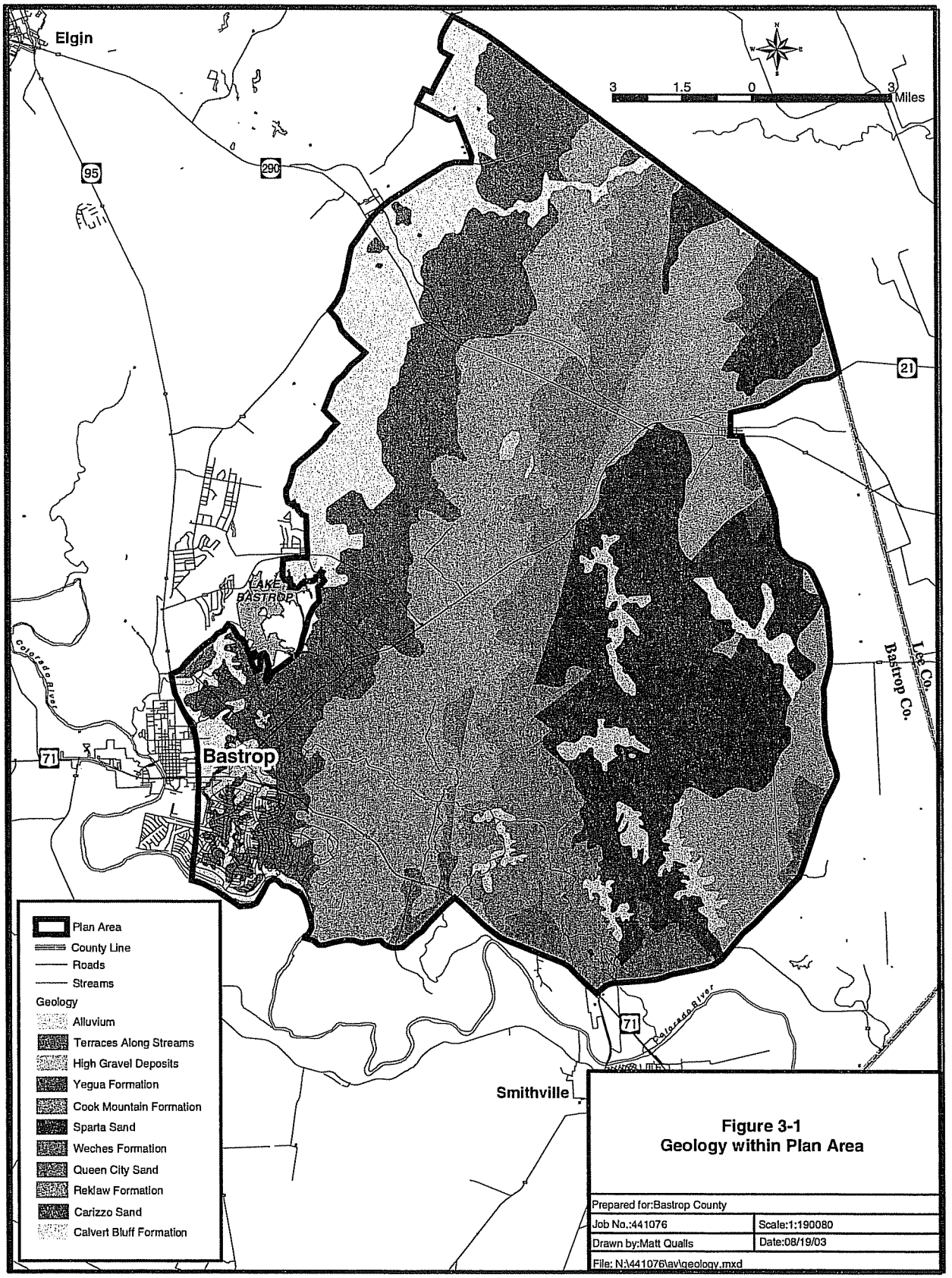

Figure 3-1
Geology within Plan Area

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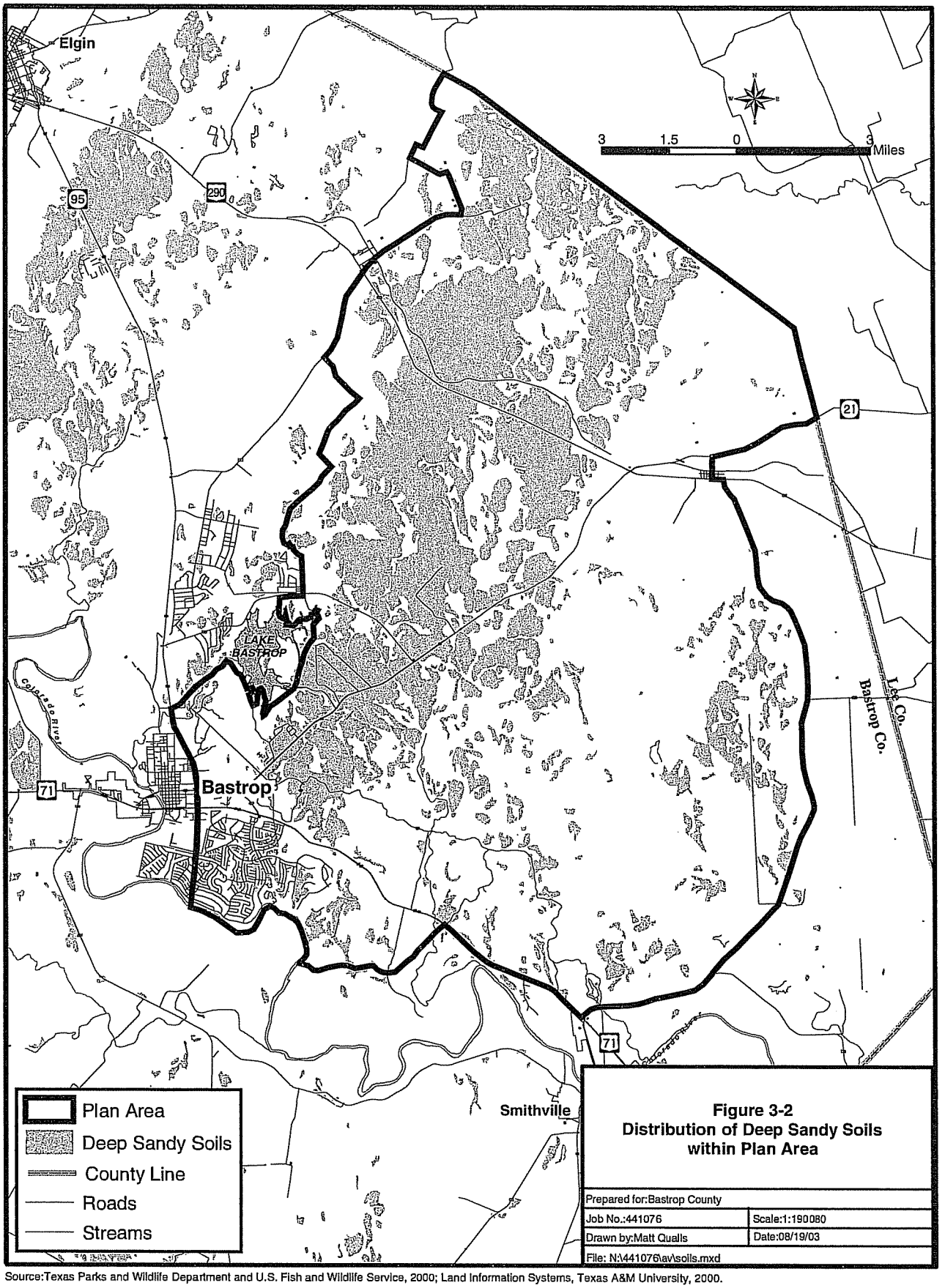

Figure 3-2
Distribution of Deep Sandy Soils within Plan Area

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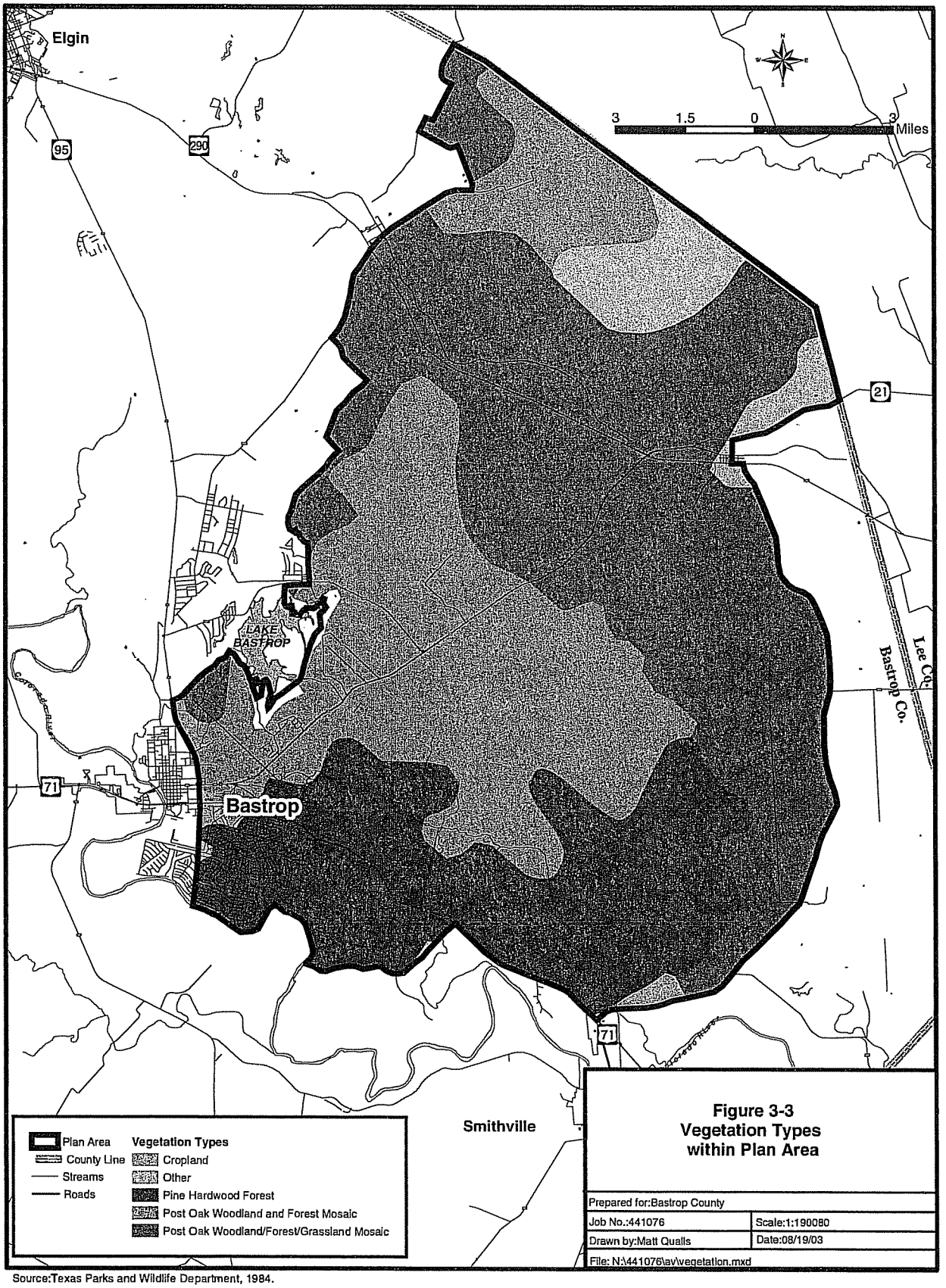

Figure 3-3
Vegetation Types within Plan Area

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Source:Texas Parks and Wildlife Department, 1984.

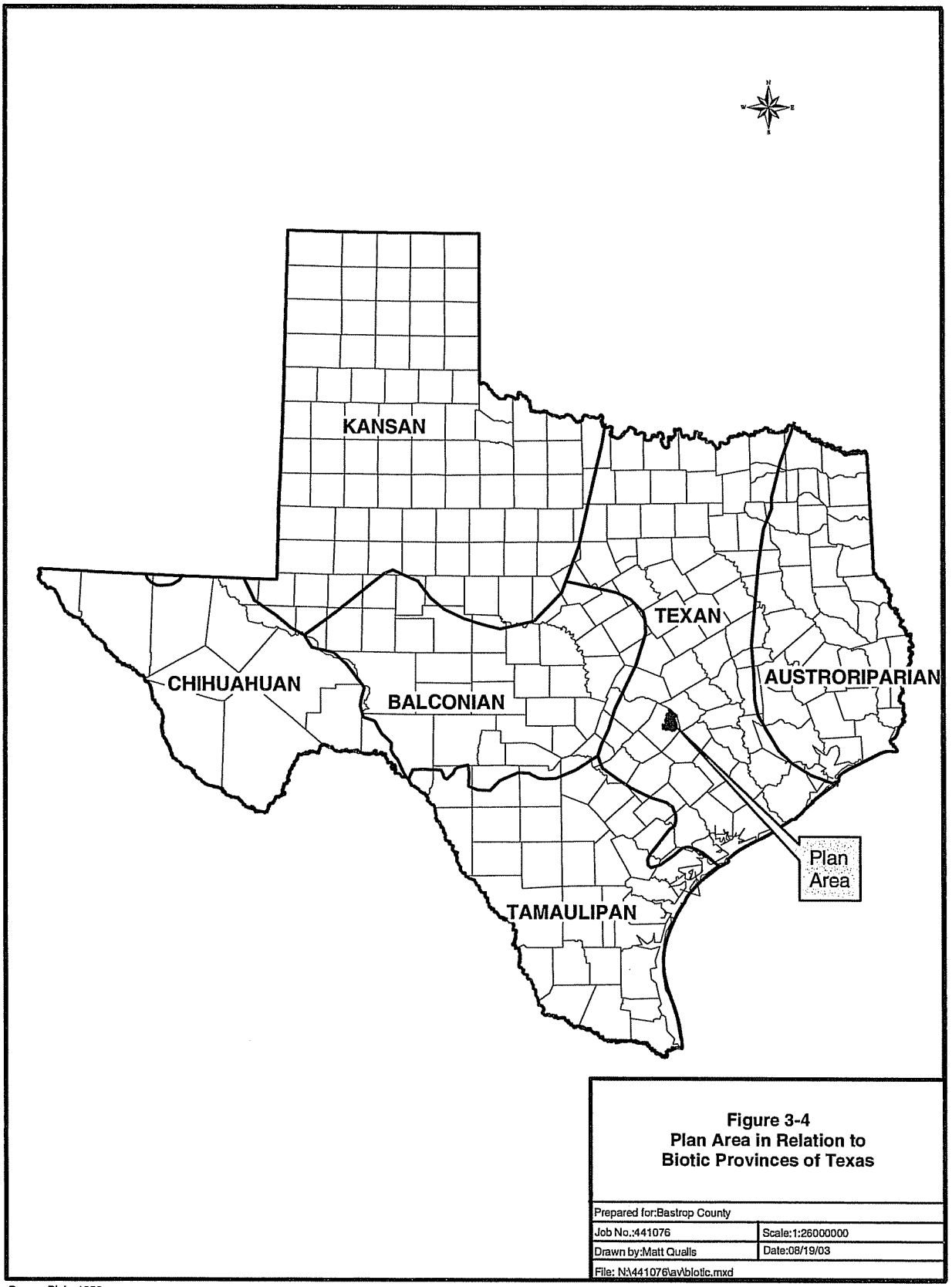

Figure 3-4
Plan Area in Relation to Biotic Provinces of Texas

Prepared for:Bastrop County	
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Source:Blair, 1950.

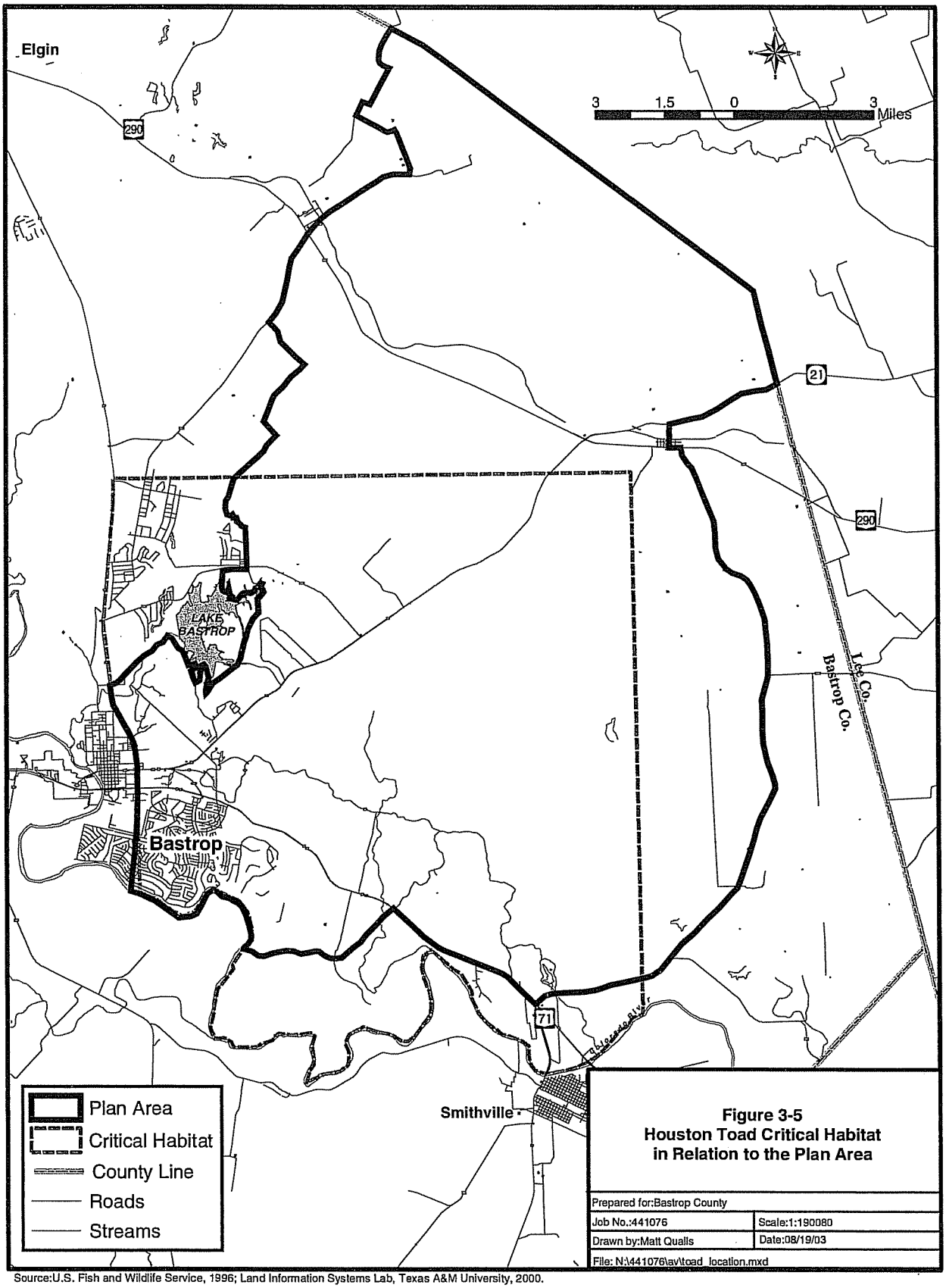
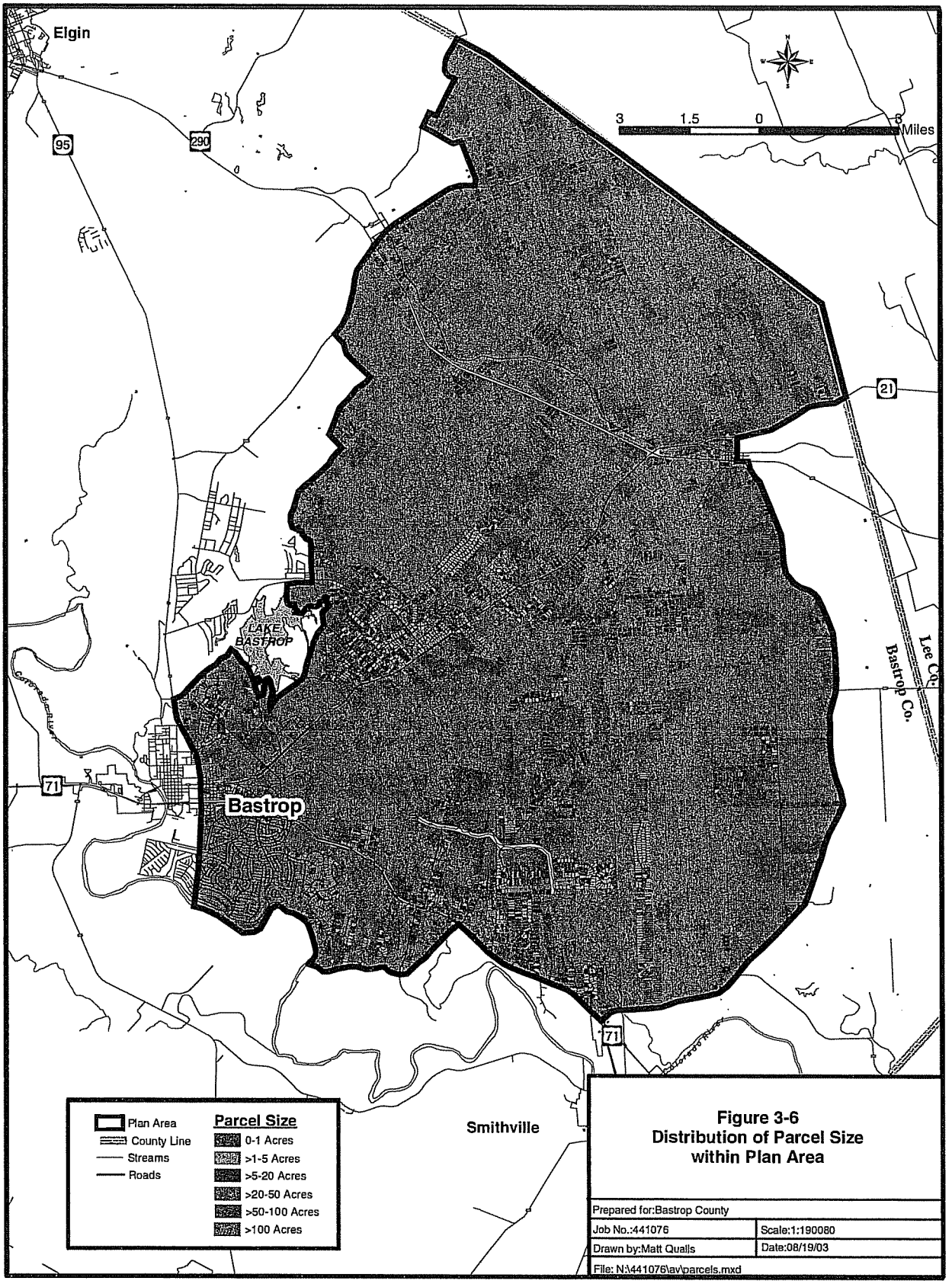


Figure 3-5
Houston Toad Critical Habitat in Relation to the Plan Area

Prepared for:Bastrop County	
Job No.:441076	Scale:1:190080
Drawn by:Matt Qualls	Date:08/19/03
File: N:\441076\gv\toad_location.mxd	

Source:U.S. Fish and Wildlife Service, 1996; Land Information Systems Lab, Texas A&M University, 2000.



Source:Bastrop Central Appraisal District, 2002.

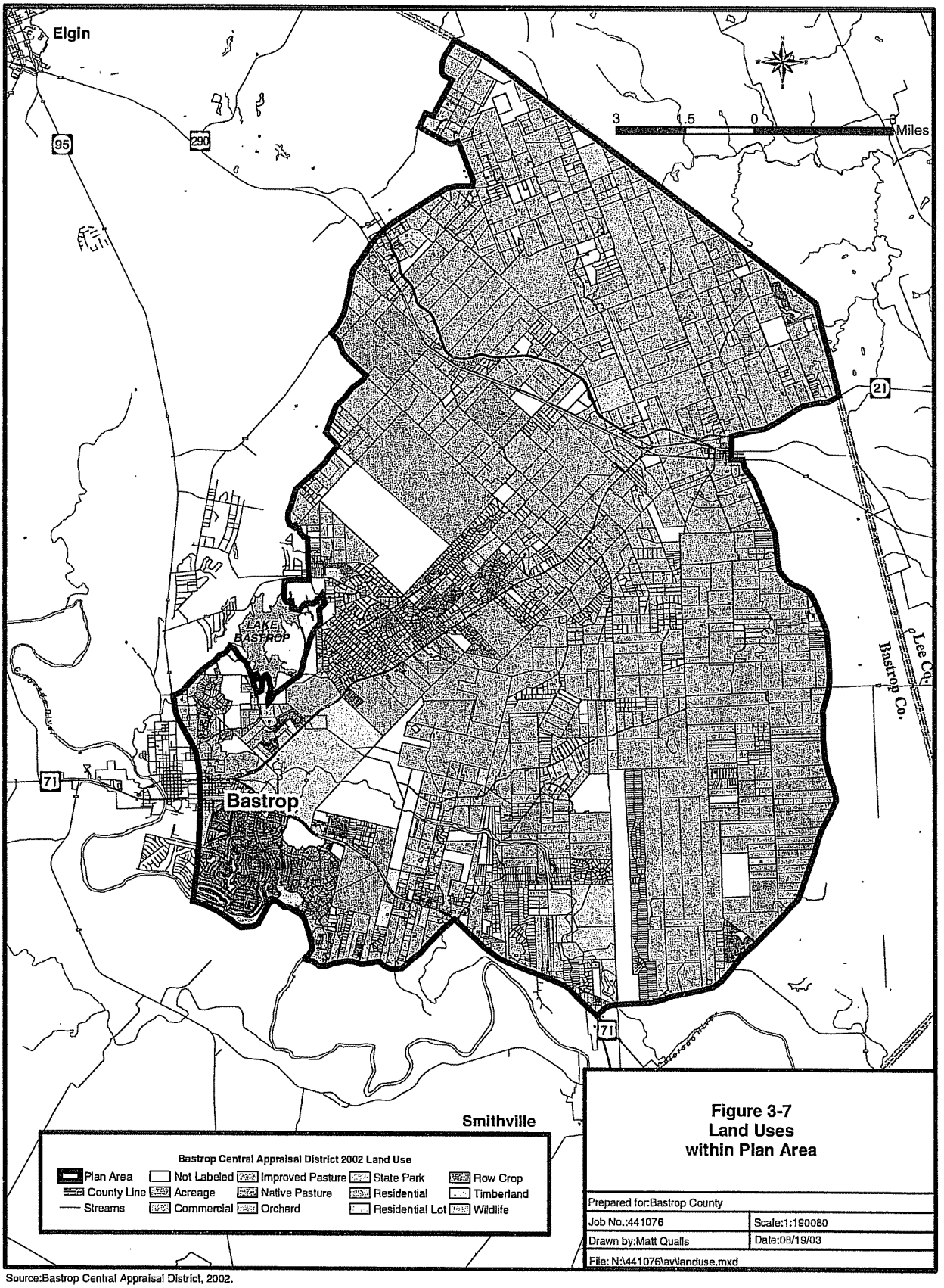
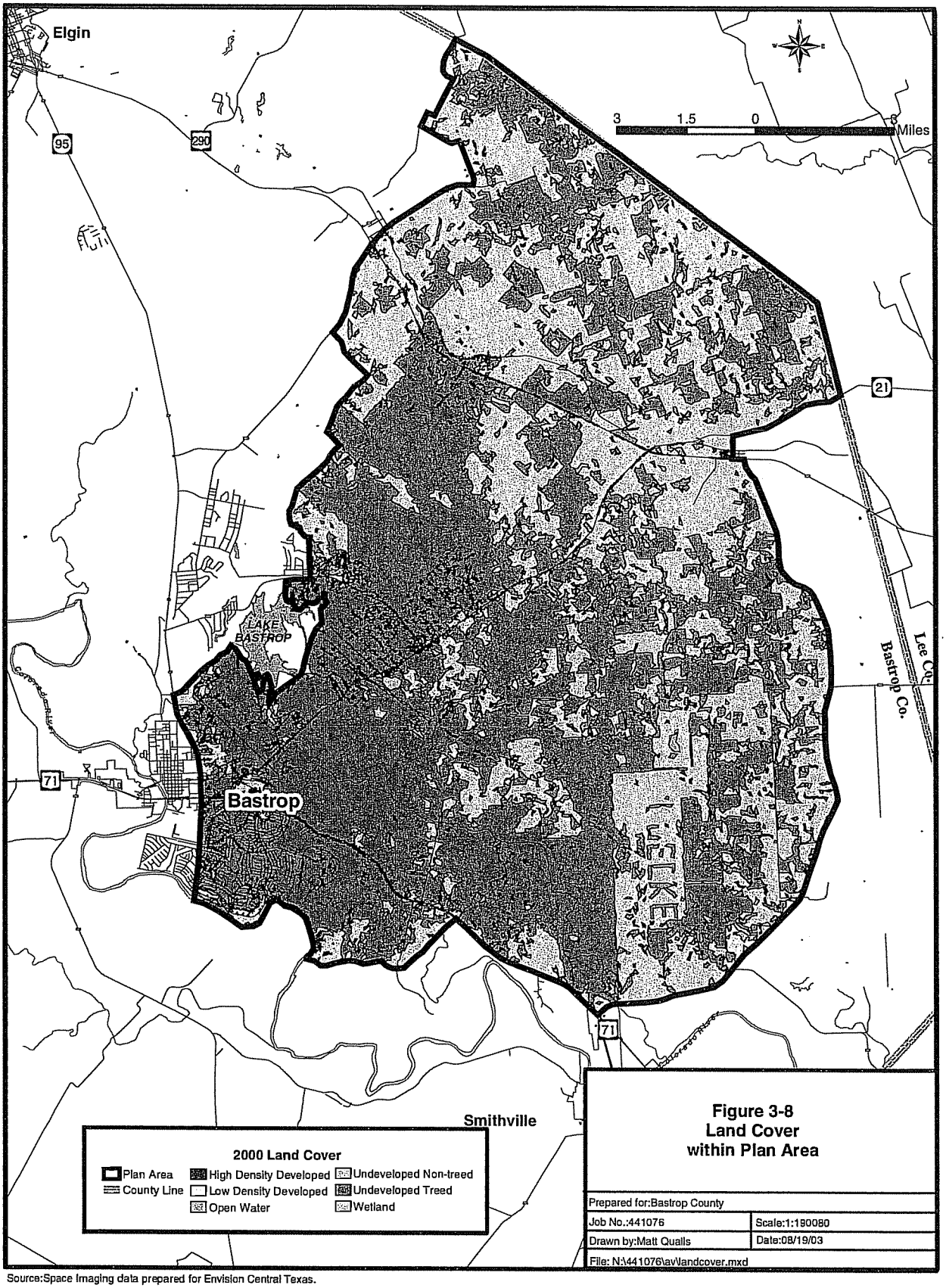


Figure 3-7
Land Uses
within Plan Area

Prepared for:Bastrop County	
Job No.:441076	Scale:1:190080
Drawn by:Matt Qualls	Date:08/19/03
File: N:\441076\av\landuse.mxd	

Source:Bastrop Central Appraisal District, 2002.



Source:Space Imaging data prepared for Envision Central Texas.

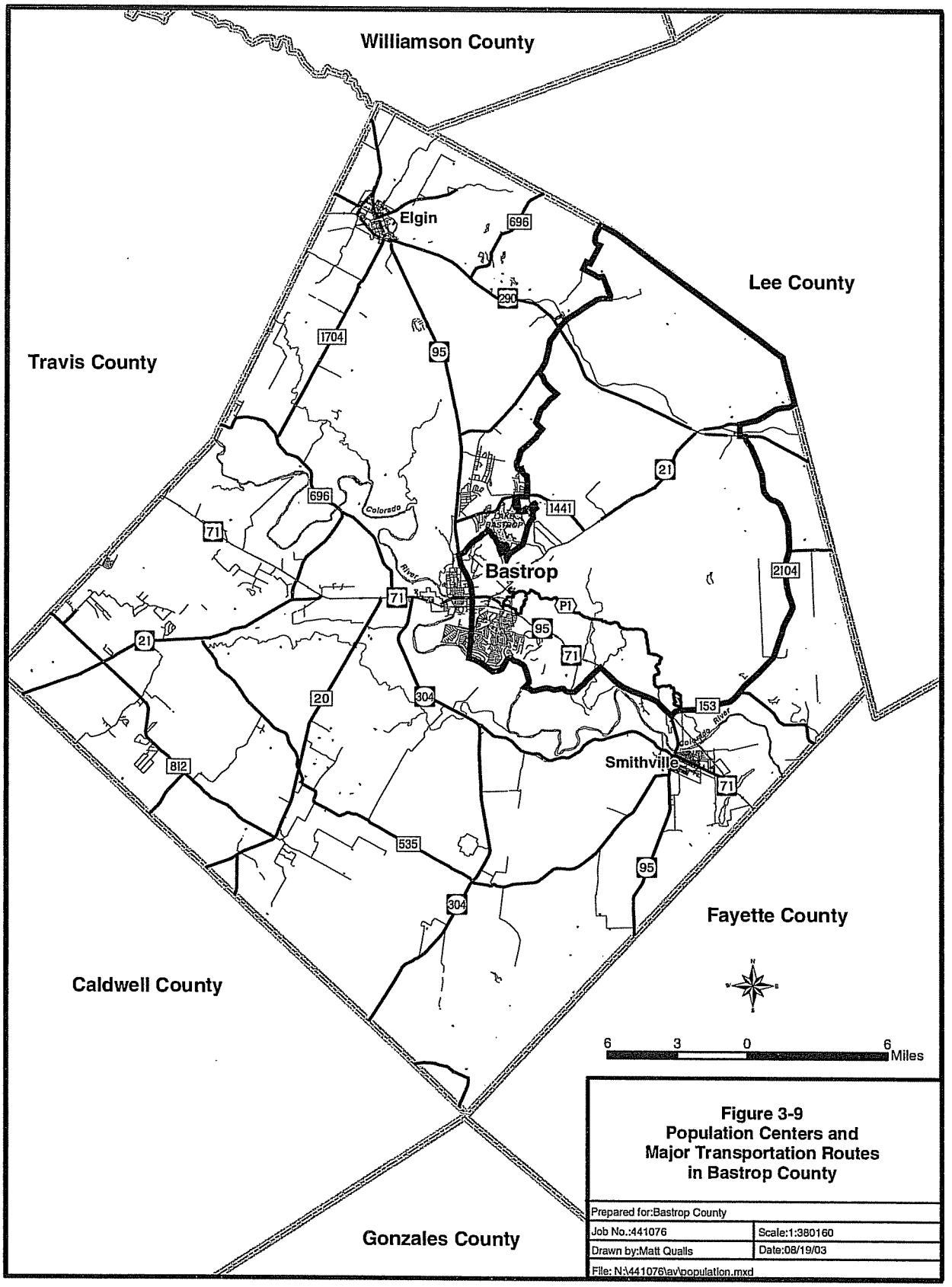
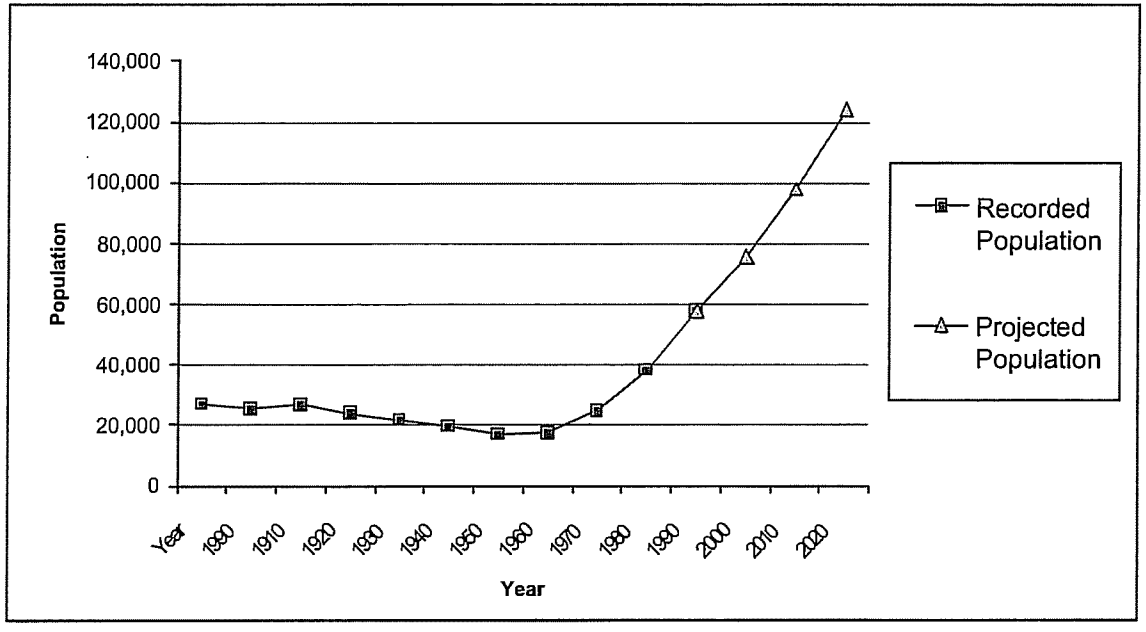


Figure 3-9
Population Centers and
Major Transportation Routes
in Bastrop County

Prepared for:Bastrop County	
Job No.:441076	Scale:1:380160
Drawn by:Matt Qualls	Date:08/19/03
File: N:\441076\gv\population.mxd	

Figure 3-10. Recorded and Projected Population in Bastrop County Between 1900 and 2030



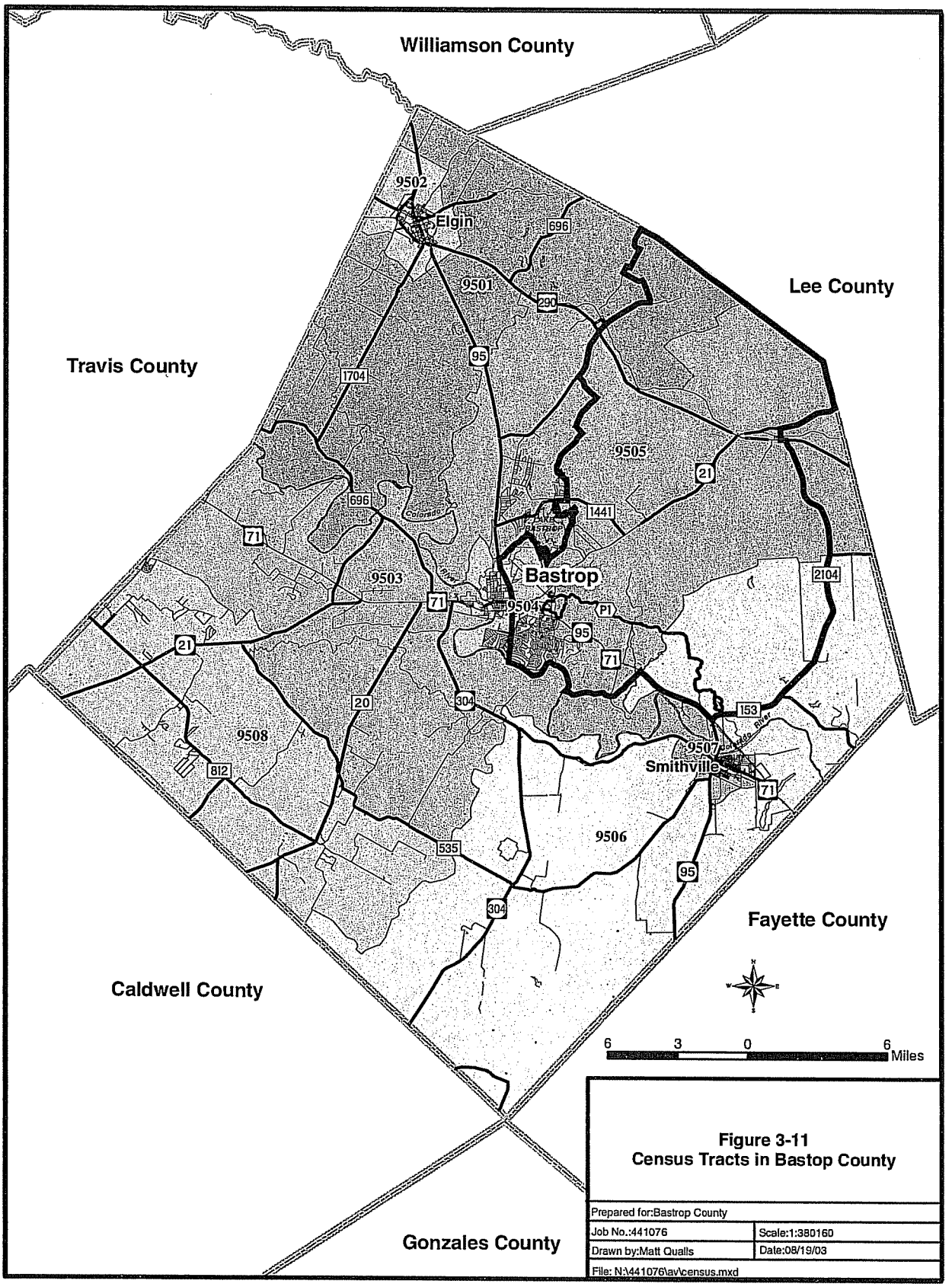
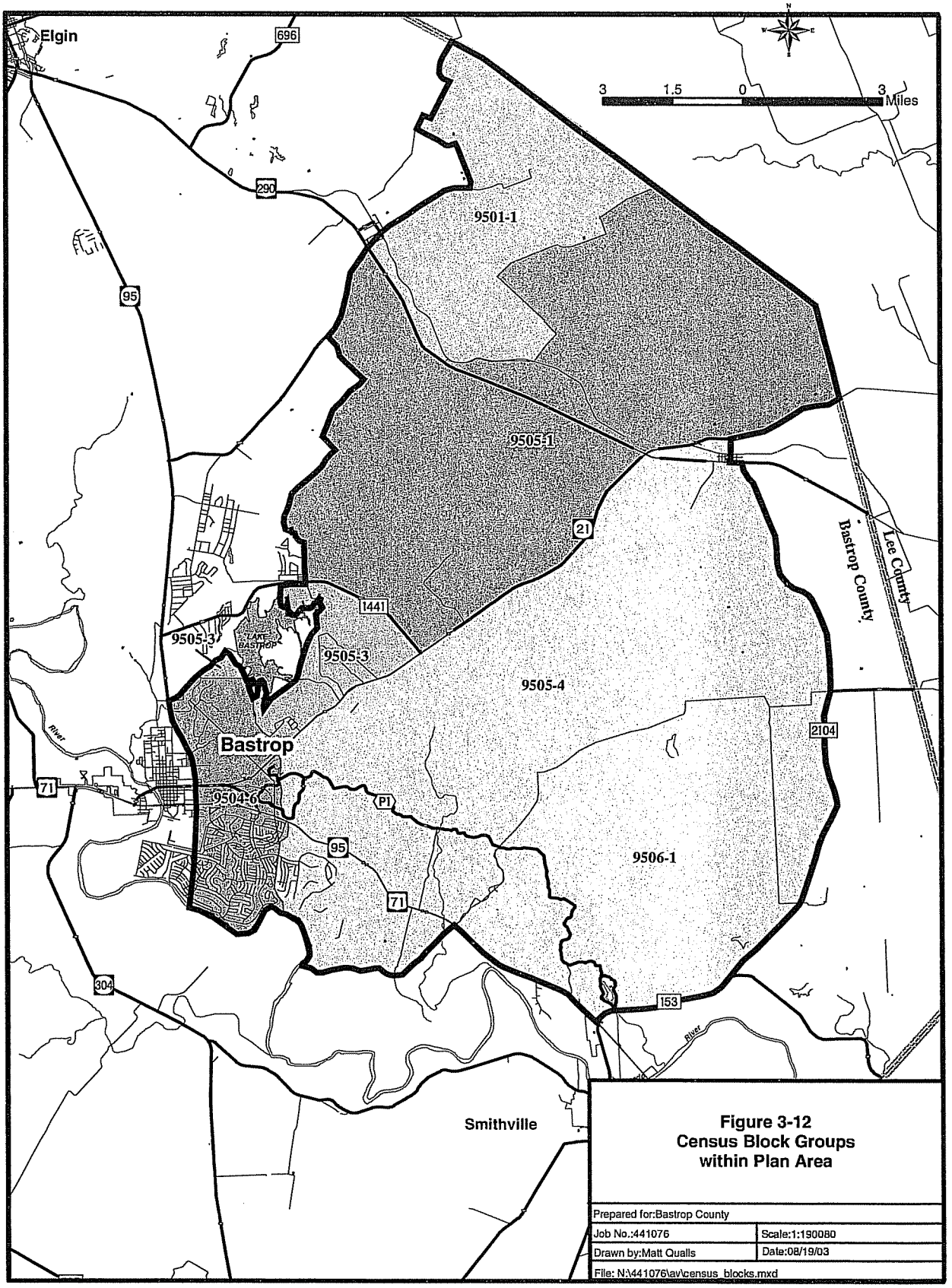


Figure 3-11
Census Tracts in Bastop County

Prepared for:Bastrop County	
Job No.:441076	Scale:1:380160
Drawn by:Matt Qualls	Date:08/19/03
File: N:\441076\av\census.mxd	


Elgin
696
290
95
9501-1
9505-1
21
Bastrop County
Lee County
1441
9505-3
9505-3
9505-4
Bastrop
River
71
9504-6
PI
95
71
9506-1
2104
304
153
River
Smithville
3 1.5 0 3 Miles
Figure 3-12
Census Block Groups
within Plan Area
Prepared for:Bastrop County
Job No.:441076
Scale:1:190080
Drawn by:Matt Qualls
Date:08/19/03
File: N:\441076\av\census_blocks.mxd