FINAL

ENVIRONMENTAL IMPACT STATEMENT

FOR THE

SOUTHERN EDWARDS PLATEAU HABITAT CONSERVATION PLAN

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Type of Action:	Environmental Impact Statement
Lead Agency:	U.S. Department of Interior, Fish and Wildlife Service
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This Final Environmental Impact Statement evaluates the proposed issuance by the U.S. Fish Wildlife Service of a requested permit pursuant to section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.). The applicants are jointly the City of San Antonio and Bexar County, Texas. The applicants are seeking an incidental take permit to cover take of nine threatened or endangered species and to implement a conservation plan to protect and preserve these species and the habitats on which they depend.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

EXECUTIVE SUMMARY

This Environmental Impact Statement (EIS) describes potential impacts of the issuance of an incidental take permit (ITP or Permit) under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq., ESA), by the U.S. Fish and Wildlife Service (Service) to Bexar County and the City of San Antonio, Texas (the Applicants) to authorize incidental take of nine federally endangered species. Referred to as the Covered Species, they include two birds - the golden-cheeked warbler (*Setophega* [=*Dendroica*] *chrysoparia*; GCWA) and black-capped vireo (*Vireo atricapilla*, BCVI), and seven karst invertebrates (collectively the Covered Karst Invertebrates) - Government Canyon bat cave spider (*Neoleptoneta microps*), Madla Cave meshweaver (*Cicurina madla*), Braken Cave meshweaver (*Cicurina venii*), Government Canyon Bat Cave meshweaver (*Cicurina vespera*), two beetles with no common name (*Rhadine exilis* and *Rhadine infernalis*), and Helotes mold beetle (*Batrisodes venyivi*).

The Service is the lead federal agency with responsibility for issuing the ITP as described in the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP or the Plan). The issuance of the Permit is the Proposed Action. The Permit would authorize a limited amount of incidental take of the Covered Species within the jurisdictions of Bexar County and/or the City of San Antonio (excluding Comal County, since they have their own ITP TE-223267) (the Enrollment Area). In return, the SEP-HCP implements conservation measures for the Covered Species in Bexar, Comal, Blanco, Kendall, Kerr, Bandera, and Medina counties (the Plan Area). A detailed description of the Plan Area can be found in Section 2.3 of the SEP-HCP.

This EIS evaluates the potential impacts of the incidental take of the Covered Species as well as the impacts of the conservation measures in the Plan Area on the natural and social resources within the Plan Area. Four Action Alternatives were developed that proposed incidental take and conservation measures. The effects of these Action Alternatives, and a No Action Alternative, were evaluated and compared. Based on the analysis in this EIS, the Proposed SEP-HCP Alternative is recommended as the Preferred Alternative. The development of the alternatives and a description of each are described in more detail in **Chapter 3** of this EIS.

PURPOSE AND NEED

The greater San Antonio area is positioned at the southeastern edge of the Edwards Plateau ecoregion in Texas. This ecoregion supports several federally threatened or endangered species that occupy a variety of habitats, including mature woodlands, early-growth shrublands, and subterranean caves. The natural resources of the Edwards Plateau have also been a significant attraction for human communities. Over the past 30 years, the human population in and around San Antonio increased by more than 75 percent (U.S. Census Bureau [USCB] 1995, 2000, 2010a). The economy of the San Antonio metropolitan area is expected to continue drawing people to the region, with a projected population increase of more than 60 percent over the next 30 years (ESRI Business Solutions [ESRI BIS] 2009, Wendell Davis and Associates [WDA] 2010a). It is anticipated that approximately 51,000 acres of new residential, 12,000 acres of new commercial and industrial, and 30,000 acres of new transportation and utilities would be built in the Enrollment Area over the next 30 years to accommodate the anticipated growth (WDA 2010a). Habitats for federally threatened or endangered species are being and will continue to be impacted as a result of these land development activities. The Service identifies habitat loss and degradation as the primary factors threatening the survival and recovery of many of these species.

The Applicants need a long-term, comprehensive solution to allow otherwise lawful activities that could result in take of Covered Species while assuring compliance with the ESA. Therefore, the Applicants have requested an ITP from the Service, which would permit the incidental take of the Covered Species resulting from otherwise lawful activities (see Chapter 3 of the SEP-HCP for a detailed description of Covered Activities). The proposed federal action is the issuance of a section 10(a)(1)(B) permit by the Service for a term of 30 years to allow incidental take of Covered Species. The Service must consider the request and determine if the SEP-HCP meets the issuance criteria in the ESA before issuing an ITP.

SCOPING AND PUBLIC PARTICIPATION

Public scoping for this EIS began with the publication of a Notice of Intent to prepare an EIS (NOI) in the *Federal Register* on Wednesday, April 27, 2011 (**Appendix A**). The Service published the NOI to advise the public that an EIS will be prepared for the SEP-HCP and that scoping meetings will be held in June 2011. Letters were sent to 24 federal, state and, local agencies with the NOI attached requesting comments on the potential resources that could be affected or issues that could arise by the issuance of the Permit.

Public scoping meeting announcements were published in the *Blanco County News*, *The Helotes Echo*, *Kerrville Daily Times*, *The Bandera Bulletin*, *San Antonio Express News*, *La Prensa* (Spanish), *Hondo Anvil Herald*, and *The Boerne Star* (**Appendix B**). Meeting details were also posted to several websites including the SEP-HCP project website and websites managed by the Service, the Hill Country Alliance, and the Texas Water Development Board. Members of the SEP-HCP Citizens' Advisory Committee (CAC), Biological Advisory Team (BAT), and the Agency Oversight Group (AOG) were also sent invitations to the public scoping meetings. Five public scoping meetings were held throughout the Plan Area in Bandera, Boerne, Blanco, Kerrville, and Helotes, Texas, between June 6, 2011, and June 14, 2011, to engage the community, share information, and ask the community for their input. All five meetings followed the same format which began with an open house from 5:30 p.m. to 6:00 p.m., a formal presentation at 6:00 p.m. followed by a continuation of the open house, and concluded with a moderated question and answer session at 7:00 p.m. The meetings provided opportunities for the public to learn about and comment on the proposed Permit and SEP-HCP as it was being developed.

A total of 211 people attended the 5 public scoping meetings, including 194 members of the public, 3 media outlets, and 14 elected officials. The public comment period extended from April 27, 2011 through July 26, 2011. During this time, 66 public comments were received. See **Appendix B** for more details.

A Notice of Availability and announcement of public meetings (NOA) was published in the *Federal Register* on Friday, December 19, 2014 (**Appendix C**). The NOA announced the availability of the draft SEP-HCP and the draft EIS for public review and comment and that public meetings would be held. The NOA and a news release were posted to the Service's Austin Ecological Services website (www.fws.gov/southwest/es/AustinTexas) and the SEP-HCP project website (www.sephcp.com). The draft EIS was made available for public review at several libraries in the Plan Area, and a link to access an electronic version of the draft EIS was distributed via the NOA and news release to county judges in the Plan Area and members of the CAC, BAT and AOG; federal, state and local agencies; and elected officials, Native American tribes with affiliations to the Plan Area, conservation organizations, and stakeholders that signed up for the SEP-HCP mailing list.

Two public meetings were held, one in Helotes, Texas (February 3, 2015) and one in Kerrville, Texas (February 4, 2015). Public meeting announcements were published in *San Antonio Express News* and *Kerrville Daily Times* on January 18, 2015, and meeting information was published on the Service's Austin Ecological Services website and the SEP-HCP project website. The public meetings provided the public an opportunity to view the draft EIS, draft SEP-HCP, and a series of exhibits, and project staff were available to answer questions. A presentation was given from approximately 5:30 p.m. to 6:30 p.m. and was followed by an informal open house. Official comments were received at the meeting orally via a court reporter and in writing via comment cards at the meetings. After the meetings, official comments were received via the project website, email, U.S. mail, and www.regulations.gov. The comment period closed on March 19, 2015.

A total of 57 people attended the meeting in Helotes and 76 people attended the meeting in Kerrville. A total of 111 comments were received during the comment period; 44 comments provided feedback on the draft SEP-HCP, 22 comments provided feedback on the draft EIS and 45 comments provided feedback on both documents. A transcript of all comments received as well as responses can be found in **Appendix D**.

ALTERNATIVES CONSIDERED

Bexar County and the City of San Antonio instituted the CAC and the BAT during the development of the draft SEP-HCP to provide guidance to the Applicants on the range of potential alternatives that should be evaluated and compared in the EIS. All meetings of these committees were subject to the Texas Open Meetings Act and agendas, materials, and minutes were posted on the SEP-HCP website. The input received from these committees and feedback received during the scoping process helped refine the preliminary range of alternatives (described in Chapter 3.2) into four Action Alternatives and the No Action Alternative.

The four Action Alternatives share several common characteristics:

Covered Species: All four Action Alternatives propose the incidental take of nine federally listed endangered species.

Voluntarily Conserved Species: All four Action Alternatives will result in habitat that will be impacted and habitat that will be protected for species that are not federally listed as threatened or endangered but that may share similar habitats as the Covered Species. Voluntarily Conserved Species will not be covered under the Proposed Action but may be affected.

Enrollment Area: All four Action Alternatives propose an Enrollment Area that includes the jurisdictions of Bexar County and the City of San Antonio including its extraterritorial jurisdiction (ETJ) (the area where the City of San Antonio has the ability to exercise its legal authority beyond its city limits), and the area where the City of San Antonio's ETJ is projected to expand over the 30 year timeframe of the SEP-HCP. The Enrollment Area excludes any portion of Comal County. Enrolled properties are those landowners that apply for inclusion under the HCP and are extended incidental take coverage for Covered Activities for the Covered Species that occur on the property submitted for coverage.

Covered Activities: Covered Activities are all otherwise lawful, non-federal land development projects within the Enrollment Area; they may include, but are not limited to, construction and

maintenance for land development, utilities, and transportation infrastructure. The ITP associated with the SEP-HCP will authorize a certain amount of incidental take of the Covered Species. Landowners, developers, and others conducting non-federal Covered Activities within the Enrollment Area may be eligible to achieve ESA compliance through the Plan. Those that complete the enrollment process become SEP-HCP Participants. SEP-HCP Participants voluntarily elect to utilize the SEP-HCP to comply with the ESA.

Direct and Indirect Impacts to GCWA and BCVI: All acres of suitable GCWA and BCVI habitat within the boundaries of a property to be enrolled are assumed to be directly impacted by Covered Activities, unless such habitat occurs within an area where habitat will be preserved and such habitat meets a minimum set of preserve criteria. All acres of suitable GCWA and BCVI habitat located up to 300 feet outside the boundaries of a property to be enrolled are assumed to be indirectly impacted by Covered Activities.

Mitigation Measures for BCVI and GCWA: Preservation Credits will be created by the SEP-HCP for each acre of GCWA and BCVI habitat protected, such that each acre of protected habitat yields one Preservation Credit. Credit can be acquired by conserving previously unprotected habitat in the Plan Area or by purchasing credits from an existing Service-approved conservation bank. All Action Alternatives assume that the GCWA and BCVI preserve systems will be composed of consolidated tracts of 500 acres or larger and will generate at least 500 GCWA Preservation Credits or 100 BCVI Preservation Credits. Preserve land will include some areas of non-habitat; as such the SEP-HCP will purchase more land than needed to generate the appropriate number of Preservation Credits.

Direct and Indirect Impacts to Covered Karst Invertebrates: Direct impacts to known locations of Covered Karst Invertebrates will only occur once certain conservation baselines are met. The conservation baselines are derived from the Service's recovery standards for downlisting each of the Covered Karst Invertebrates; these baselines include preservation of high and medium quality karst preserves (as described in the Service's *Karst Preserve Design Recommendations*) within each karst faunal region where each Covered Karst Invertebrate is currently known to occur (Service 2012). Without those conservation baselines, the landowner would have to maintain a minimum distance of 750 feet around the feature, including those features on adjacent properties that are within 750 feet. Additionally, each landowner would have to conduct extensive karst feature surveys on their property prior to applying to be covered under the SEP-HCP to identify any previously unknown features. Parcels in Karst Zones 1 through 4 could contain occupied features with no surface expression. Therefore, there is an expectation that direct and indirect impacts to previously unknown and undetectable subsurface features will occur upon clearing and construction. There is no way to know exactly what the extent of these impacts would be.

Mitigation Measures for Covered Karst Invertebrates: For all Action Alternatives, the SEP-HCP will establish new preserves with Covered Karst Invertebrates, which will be distributed across the karst fauna regions (KFRs) in Bexar County (except Alamo Heights KFR). These preserves would be established in accordance with the Service's (2012) *Karst Preserve Design Recommendations* and would contribute to meeting recovery criteria for the Covered Karst Invertebrates.

Preserve Management and Monitoring: To ensure the permanent protection and management of Covered Species' habitat, the Applicants will establish a preserve management and monitoring process.

Cost Estimates: The cost estimates for all Action Alternatives assume that the entire allocation of incidental take authorization will be used by the SEP-HCP Participants within the 30-year timeframe of the SEP-HCP.

Financing: All of the Action Alternatives will implement a conservation program which will include the purchase and management of preserve land for the Covered Species. The funding for these actions will come from fees collected from SEP-HCP Participants and public funding sources. However, each Action Alternative contemplates a different distribution of these two sources of revenue, as described below.

- **Proposed SEP-HCP Alternative:** 74% from participation fees, 26% from public sources
- **10% Participation Alternative:** 47% from participation fees, 53% from public sources
- **Single-County Alternative:** 46% from participation fees, 54% from public sources
- **Increased Mitigation Alternative:** 37% from participation fees, 63% from public sources

No Action Alternative

The No Action Alternative represents the status quo, whereby individuals seeking authorization for incidental take of an endangered species must apply directly to the Service; they will be responsible for completing the permitting process and complying with other state and federal requirements associated with the issuance of a federal permit. Bexar County and the City of San Antonio will not seek a broad-scale and long-term ITP from the Service. Bexar County will not implement the SEP-HCP and will not sponsor a locally-administered program to streamline ESA compliance. If the SEP-HCP is not implemented the cost of ESA compliance will remain the responsibility of the individual seeking authorization for incidental take of an endangered species.

Action Alternatives

Proposed SEP-HCP Alternative

The Proposed SEP-HCP Alternative assumes 50 percent of the development activities requiring an ITP for the Covered Species over the next 30 years will participate in the SEP-HCP. The incidental take represents 50 percent of the projected habitat loss for GCWA (9,371 acres) and BCVI (2,640 acres) and 20 percent of the loss of Karst Zones 1-4 (21,086 acres/49 occupied features) resulting from land development projects within the Enrollment Area over the next 30 years. The Proposed SEP-HCP Alternative requires a mitigation ratio of 2 to 1 for direct impacts to GCWA or BCVI and 0.5 to 1 for indirect impacts. It would preserve 23,430 acres of habitat for the GCWA and 6,600 acres of habitat for the BCVI.

For the Covered Karst Invertebrates, all development activities must be outside a 750-foot radius around all occupied features until the conservation baseline is met for the species within each cave within each KFR. After the conservation baseline is met, Covered Activities would be permitted for a fee ranging between $40,000 and $400,000, depending on the distance of the activity to an occupied cave. Approximately 1,000 acres of new karst preserves will be protected for the Covered Karst Invertebrates.

10% Participation Alternative

The 10% Participation Alternative represents the alternative with a reduced amount of take in the same Enrollment Area as the Proposed SEP-HCP Alternative. It assumes 10 percent of the development activities requiring an ITP for the Covered Species over the next 30 years will participate in the SEP-HCP. The incidental take request represents 10 percent of the projected habitat loss for GCWA (2,100 acres) and BCVI (556 acres) and 10 percent of the loss of Karst Zones 1-4 (10,543 acres/25 occupied features) resulting from development within the Enrollment Area over the next 30 years. The 10% Participation Alternative proposes the same mitigation ratio for direct and indirect impacts to the GCWA and BCVI; and the same conservation baseline requirements for Covered Karst Species as the Proposed SEP-HCP Alternative. The result is 5,250 acres of habitat for GCWA, 1,390 acres of habitat for BCVI, and approximately 750 acres of new karst preserve that would be preserved as a result of the 10% Participation Alternative.

Single County Alternative

The Single-County Alternative was modeled from other single-county HCPs in Central Texas, whereby all incidental take and all mitigation occur within the same county. The Single County Alternative will authorize the same amount of incidental take within the Enrollment Area as the Proposed SEP-HCP Alternative; however, it will require that all mitigation measures be limited to the jurisdictions of San Antonio and Bexar County.

The Single County Alternative proposes the same karst conservation program as the Proposed SEP-HCP Alternative. However, the Single County Alternative will only require 1 to 1 mitigation ratio for direct impacts to GCWA and BCVI. As such, the Single County Alternative would provide fewer acres of preserve for GCWA (11,714 acres) and BCVI (3,330 acres) when compared to the Proposed SEP-HCP Alternative. The Single County Alternative assumes that 75 percent of the GCWA and BCVI preserve land will be located in relatively suburban areas and 25 percent will be located in relatively rural areas. A largely suburban preserve system will require more intensive management to address threats from adjacent land uses than a rural preserve system. In addition, land values in suburban areas are higher than in rural areas. In order to account for the higher costs associated with preserve acquisition and management, the Single County Alternative will require higher Preservation Credit fees and will require three times the amount of public funding when compared to the Proposed SEP-HCP Alternative.

Increased Mitigation Alternative

The Increased Mitigation Alternative incorporates input received from the BAT and some CAC members whereby greater protection measures are proposed for the Covered Species than the other Action Alternatives. Like the Proposed SEP-HCP Alternative, the Increased Mitigation Alternative would authorize the incidental take of 9,371 acres of GCWA habitat, 2,640 acres of BCVI habitat and 21,086 acres/49 occupied features of Covered Karst Invertebrate habitat and BCVI mitigation is the same as Proposed SEP-HCP Alternative. However, unlike the Proposed SEP-HCP Alternative, the proposed habitat conservation for the GCWA would require a mitigation ratio of 3 to 1 for direct impacts resulting in 35,141 acres of preserve and 2,000 acres of new karst preserves for the Covered Karst Invertebrates. As recommended, the Increased Mitigation Alternative would also require 60 percent of the GCWA preserve to be within Bexar County or within 5 miles of the county border. Of the action alternatives, the Increased Mitigation Alternative would have the highest Preservation Credit fees and would require the most public funding.

AFFECTED ENVIRONMENT AND CONSEQUENCES

Affected Environment

The description of the affected environment describes the current environmental conditions considered by the Service to be potentially affected by the alternatives. In order to provide a succinct description of those resources that may be affected by the alternatives and a level of analysis that is commensurate with the importance of the impact, some resources and topics are analyzed in detail and others are considered but dismissed from further analysis.

The resources described and analyzed in detail in this EIS are: Water Resources (see **Section 4.3**); Vegetation (see **Section 4.4**); General Wildlife (see **Section 4.5**); Threatened and Endangered Species (see **Section 4.6**); Socioeconomic Resources (see **Section 4.7**) and Climate Change (see **Section 4.8**). Other topics analyzed in this EIS include: Cumulative Impacts (see **Section 4.9**); Unavoidable Impacts (see **Section 4.10**); Irreversible and Irretrievable Commitment of Resources (see **Section 4.11**) and Short-term Use of the Environment vs. Long-term Productivity (see **Section 4.12**).

Resources or topics that were considered but dismissed from detailed analysis include energy and depleteable resources; prime and unique farmlands; public health and safety; wetlands and floodplains; cultural resources; geology; air quality; noise; environmental justice; wild and scenic rivers; and national forests and grasslands. These resources are not likely to be affected by the authorized take, proposed mitigation, or funding and administration of the Action Alternatives (see **Section 4.1.1 Issues and Resources Considered but Dismissed from Detailed Analysis** for more details).

Environmental Consequences

National Environmental Policy Act (NEPA) regulations require the analysis of a No Action Alternative as a benchmark that enables decision makers to assess the magnitude of the environmental impacts of the Action Alternatives (40 CFR 1502.14). Under the No Action Alternative, the current trends projected for human population growth and associated land development in Bexar County and the City of San Antonio, Texas, will continue and impacts to listed species will be authorized under existing federal programs. If no difference is anticipated between the future condition under the No Action Alternative and the Action Alternatives, then there is no impact from the proposed federal action. However, the SEP-HCP will influence where development occurs around caves and also may influence the amount of habitat a developer chooses to destroy versus paying mitigation fees.

The timing and location of development projects are influenced most by market conditions. Therefore, it is reasonable to assume that the Action Alternatives, compared to the No Action Alternative, will have only minor impacts on the extent, timing and placement of development and any associated impacts to habitat for the Covered Species over the next 30 years. Since there will likely be no significant difference in land development patterns across the Enrollment Area under the No Action or the Action Alternatives, consideration of environmental consequences in this EIS are limited to the potential impacts of the take that will be authorized by the permit, the proposed mitigation activities, and the funding and administration of the Action Alternatives.

The EIS contains a resource-by-resource analysis of direct, indirect, and cumulative impacts for each of the affected resources. A summary of the anticipated impacts of the No Action and the four Action Alternatives is provided in **Table ES-1** below.

Controversy

Public perception of the SEP-HCP as a governmental attempt to control private property drove considerable controversy. The public scoping meetings held prior to releasing the draft EIS, as well as the public meetings held after the draft EIS was published were generally contentious, and most of the written and verbal comments were opposed to the Plan. During the meetings, many people expressed distrust of the role of the federal government. Others expressed concern that the SEP-HCP was an attempt by the City of San Antonio to secure rural portions of the Edwards Aquafer Recharge Zone for San Antonio's future water supply. The controversy was exacerbated by a misconception that the "Incidental Take Permit" gave the Applicants permission to "take" private property rather than the authority to regulate "take" of endangered species, as provided by the ESA. In part, as a result of this controversy Bandera, Blanco, Medina, Kendall, and Kerr counties passed resolutions voicing concern about the SEP-HCP and requesting to be removed from the Plan Area. These resolutions were submitted despite being told by the Applicants that removing them from the plan meant that they could not utilize the SEP-HCP to mitigate land development activities and conservation activities could still occur anywhere in the Plan Area with suitable habitat where a willing land owner wanted to maintain habitat in exchange for financial compensation. Many commenters expressed preference for the No Action Alternative, under an apparent misconception that "no action" meant no development would occur and there would be no government involvement in the Plan Area. The public involvement program, described in Chapter 2, was intended to inform the public and receive substantive input from the biological experts, local land developers, resource agencies, and local citizenry. Although there were several comments from plan advocates, the majority of the comments were from those concerned that the government was trying to control private land ownership.

An additional controversy arose among SEP-HCP advocates over the amount of mitigation and whether or not BAT and CAC recommendations were incorporated into the plan. The BAT was charged with: 1) advising the Applicant on technical matters relating to the biology and conservation of the species and habitats addressed in the SEP-HCP; 2) recommending the form and level of mitigation and methods for determining mitigation needs; and 3) recommending a plan for consideration by Bexar County and the City of San Antonio prior to its submittal to the Service as the basis for a permit application. Likewise, the CAC was charged with overall goals and objectives for the plan and alternatives for each of five framing issues: 1) plan boundaries; 2) species to be included; 3) activities covered by the ITP; 4) conservation strategies; and 5) funding strategies. While the BAT submitted their final recommendations to the CAC, the CAC could not reach consensus on a single set of recommendations. While no single Action Alternative includes all aspects of the BAT recommendations, their recommendations are captured, in some form, in each of the Action Alternatives. Moreover, the BAT recommendations and CAC deliberations were used to construct the Proposed SEP-HCP Alternative as a compromise among various interests. Therefore, BAT recommendations and CAC deliberations were integral to the development of the Proposed SEP-HCP Alternative.

Table ES-1: Summary of Environmental Impacts for each Alternative

Resource/ Topic	No Action	Proposed SEP-HCP	10% Participation	Single-County	Increased Mitigation
Land Development Trends	Land development trends will continue as projected in the SEP-HCP Plan Area. 241,152 acres in the Plan Area are projected to be converted to a developed land use between 2010 and 2040, of which 51,150 acres will result in habitat loss for the GCWA, 10,084 acres will result in habitat loss for the BCVI, and 247 occupied karst features will be impacted. Compliance with the ESA will occur on a project-by-project basis via incidental take authorizations from the Service. Land development activities will have a **minor to moderate adverse impact** on the Covered Species in the Plan Area.	Land development trends will continue as projected in the SEP-HCP Plan Area resulting in the loss of habitat for the Covered Species. The SEP-HCP will not substantially affect the amount, timing, or location of land development over the next 30 years, with the exception of preventing future development from occurring in areas that are designated as preserve. These activities will have a similar impact as the No Action Alternative and result in **minor to moderate adverse impacts** on the Covered Species. Unlike the No Action Alternative, incidental take authorization will be administered by the SEP-HCP for Covered Species including:			
		9,371 acres for the GCWA, 2,640 acres for the BCVI, and 21,086 acres of Karst Zones 1-4. This alternative assumes a 50 percent participation rate which will provide for 50 percent of the projected habitat loss for the GCWA and the BCVI and 20 percent of the projected habitat loss for Covered Karst Invertebrates in the Enrollment Area over 30 years.	2,100 acres for the GCWA, 566 acres for the BCVI, and 10,543 acres of Karst Zones 1-4. This alternative assumes a 10 percent participation rate which will provide for 10 percent of the projected habitat loss for the GCWA, BCVI and Covered Karst Invertebrates in the Enrollment Area over 30 years.	9,371 acres for the GCWA, 2,640 acres for the BCVI, and 21,086 acres of Karst Zones 1-4. This alternative assumes a 50 percent participation rate which will provide for 50 percent of the projected habitat loss for the GCWA and the BCVI and 20 percent of the projected loss for Covered Karst Invertebrates in the Enrollment Area over 30 years.	9,371 acres for the GCWA, 2,640 acres for the BCVI, and 21,086 acres of Karst Zones 1-4. This alternative assumes a 50 percent participation rate which will provide for 50 percent of the projected habitat loss for the GCWA and the BCVI and 20 percent of the projected loss for Covered Karst Invertebrates in the Enrollment Area over 30 years.

Resource/ Topic	No Action	Proposed SEP-HCP	10% Participation	Single-County	Increased Mitigation
Water Resources	Potential adverse impacts to water resources associated with land development activities are moderated by existing regulatory programs and mitigation from incidental take authorization (the Edwards Aquifer HCP). **Minor to moderate adverse impacts** overall will occur.	Potential adverse impacts to water resources associated with land development activities are similar to the No Action Alternative but are moderated by existing regulations. The conservation of approximately:			
		31,030 acres from land development activities within the SEP-HCP Plan Area could result in **negligible to minor beneficial impacts** to water resources compared to No Action.	7,390 acres from land development activities within the SEP-HCP Plan Area could result in **negligible beneficial impacts** to water resources compared to No Action.	16,014 acres from land development activities within and adjacent to Bexar County could result in **negligible to minor beneficial impacts** to water resources compared to No Action.	16,014 acres from land development activities within and adjacent to Bexar County could result in **negligible to minor beneficial impacts** to water resources compared to No Action.
Vegetation	Anticipated land development will generally reduce the extent and sustainability of native vegetation communities. Some adverse impacts may be moderated by existing regulations and through other park and open space initiatives, as well as incidental take authorizations. **Moderate adverse impacts** to vegetation are expected.	Potential adverse impacts to vegetation associated with land development activities are similar to the No Action Alternative; some may be moderated by existing regulations and through other park and open space initiatives. The conservation of approximately:			
		31,030 acres from land development activities within the SEP-HCP Plan Area could result in **moderate beneficial impacts** to vegetation compared to No Action.	7,390 acres from land development activities within the SEP-HCP Plan Area could result in **minor beneficial impacts** to vegetation compared to No Action.	16,014 acres from land development activities within and adjacent to Bexar County could result in **minor to moderate beneficial impacts** to vegetation compared to No Action.	43,741 acres from land development activities within the SEP-HCP Plan Area could result in **moderate beneficial impacts** to vegetation compared to No Action.

Resource/ Topic	No Action	Proposed SEP-HCP	10% Participation	Single-County	Increased Mitigation
General Wildlife	Anticipated land development will generally reduce wildlife habitat, may introduce non-native species, and disrupt the balance of natural wildlife communities; however, some urban-adapted species could benefit. Adverse impacts may be moderated by existing regulations through other parks and open space programs and incidental take authorizations. **Moderate adverse impacts** to native wildlife communities are expected.	Potential adverse impacts to wildlife associated with land development activities are similar to the No Action Alternative; some urban-adapted species could benefit. The conservation of approximately:			
		31,030 acres from land development activities within the SEP-HCP Plan Area could result in **moderate beneficial impacts** to wildlife compared to No Action.	7,390 acres from land development activities within the SEP-HCP Plan Area could result in **minor beneficial impacts** to wildlife compared to No Action.	16,014 acres from land development activities within and adjacent to Bexar County could result in **moderate beneficial impacts** to wildlife compared to No Action.	43,741 acres from land development activities within the SEP-HCP Plan Area could result in **moderate beneficial impacts** to wildlife compared to No Action.

Resource/ Topic	No Action	Proposed SEP-HCP	10% Participation	Single-County	Increased Mitigation
Golden-cheeked Warbler	Anticipated land development will result in the loss of approximately 51,150 acres of GCWA habitat within the SEP-HCP Plan Area. These adverse impacts may be mitigated through project-by-project incidental take authorization by the Service and would contribute to species' recovery. However, many projects may continue, as they do now, with no take coverage for impacts to listed species resulting in **moderate adverse impacts**.	The take of 9,371 acres of habitat in the Enrollment Area and the conservation of 23,430 acres of GCWA habitat from land development activities within the SEP-HCP Plan Area could result in **moderate beneficial impacts** to the GCWA compared to No Action.	The take of 2,100 acres of habitat in the Enrollment Area and the conservation of approximately 5,250 acres of GCWA habitat from land development activities within the SEP-HCP Plan Area could result in **minor beneficial impacts** to GCWA compared to No Action.	The take of 9,371 acres of habitat in the Enrollment Area and the conservation of approximately 11,714 acres of GCWA habitat from land development activities in or within 10 miles of Bexar County could result in **minor to moderate beneficial impacts** to GCWA compared to No Action.	The take of 9,371 acres of habitat in the Enrollment Area and the conservation of approximately 35,141 acres of GCWA habitat from land development activities within the SEP-HCP Plan Area, of which 60 percent would be in Bexar County and/or within 5 miles, could result in **moderate beneficial impacts** to GCWA compared to No Action.
Black-capped Vireo	Anticipated land development will result in the loss of approximately 10,084 acres of BCVI habitat within the SEP-HCP Plan Area. However, historic land cover change suggests that BCVI habitat will also be created. Adverse impacts will be mitigated through project-by-project incidental take authorization by the Service. No Action could result in **negligible adverse and beneficial impacts**.	The take of 2,640 acres of habitat in the Enrollment Area and the conservation of 6,600 acres of BCVI habitat within the SEP-HCP Plan Area could result in **minor to moderate beneficial impacts** to the BCVI compared to No Action.	The take of 556 acres of habitat in the Enrollment Area and the conservation of 1,390 acres of BCVI habitat within the SEP-HCP Plan Area could result in **minor beneficial impacts** to the BCVI compared to No Action.	The take of 2,640 acres of habitat in the Enrollment Area and the conservation of 3,300 acres of BCVI habitat within or adjacent to Bexar County could result in **minor beneficial impacts** to the BCVI compared to No Action.	The take of 2,640 acres of habitat in the Enrollment Area and the conservation of 6,600 acres of BCVI habitat within the SEP-HCP Plan Area could result in **minor to moderate beneficial impacts** to the BCVI compared to No Action.

Resource/ Topic	No Action	Proposed SEP-HCP	10% Participation	Single-County	Increased Mitigation
Covered Karst Invertebrates	Anticipated land development could result in the loss of approximately 105,431 acres in Karst Zone 1 through Zone 4 or 247 occupied karst features within the SEP-HCP Plan Area, which will result in adverse impacts. These adverse impacts may be mitigated through project-by-project incidental take authorization by the Service and would contribute to species' recovery. However, many projects may continue, as they do now, with no take coverage for impacts to listed species resulting in **moderate adverse impacts**.	The take of 21,086 acres of potential habitat and 49 occupied features in the Enrollment Area and the conservation of 1,000 acres within the SEP-HCP Plan Area could result in **minor to moderate beneficial impacts** to the Covered Karst Invertebrates compared to No Action.	The take of 10,543 acres of potential habitat and 25 occupied features in the Enrollment Area and the conservation of 750 acres within the SEP-HCP Plan Area could result in **minor beneficial impacts** to the Covered Karst Invertebrates compared to No Action.	The take of 21,086 acres of potential habitat and 49 occupied features in the Enrollment Area and the conservation of 1,000 acres within the SEP-HCP Plan Area could result in **minor beneficial impacts** to the Covered Karst Invertebrates compared to No Action.	The take of 21,086 acres of potential habitat and 49 occupied features in the Enrollment Area and the conservation of 2,000 acres within the SEP-HCP Plan Area could result in **moderate beneficial impacts** to the Covered Karst Invertebrates compared to No Action.
Other Threatened, Endangered and Candidate Species	Anticipated land development will generally reduce habitat, may introduce non-native species, and disrupt the balance of natural wildlife communities. Adverse impacts may be moderated by existing regulations through other parks and open space programs and incidental take authorizations. **Moderate adverse impacts** to other threatened, endangered and candidate species are expected.	Potential adverse impacts to other threatened, endangered and candidate species associated with land development activities are similar to the No Action Alternative. The conservation of approximately:			
		31,030 acres from land development activities within the SEP-HCP Plan Area could result in **moderate beneficial impacts** to other threatened, endangered and candidate species compared to No Action.	7,390 acres from land development activities within the SEP-HCP Plan Area could result in **minor beneficial impacts** to threatened, endangered and candidate species compared to No Action.	16,014 acres from land development activities within and adjacent to Bexar County could result in **moderate beneficial impacts** to threatened, endangered and candidate species compared to No Action.	43,741 acres from land development activities within the SEP-HCP Plan Area could result in **moderate beneficial impacts** to threatened, endangered and candidate species compared to No Action.

Resource/ Topic	No Action	Proposed SEP-HCP	10% Participation	Single-County	Increased Mitigation
Socio-economic Resources	The No Action Alternative is not likely to substantially affect the projected population, employment, or general economic trends and the tax base will continue to grow within the SEP-HCP Plan Area. Growth under the No Action Alternative would result in **negligible adverse impacts**.	Potential adverse impacts to the Socioeconomic Environment associated with land development activities are similar to the No Action Alternative. The conservation of approximately:			
		31,030 acres from land development activities within the SEP-HCP Plan Area could result in both beneficial and adverse impacts. The intensity of these impacts is anticipated be minimal. Compared to No Action, this alternative is likely to have **negligible adverse impacts**.	7,390 acres from land development activities within the SEP-HCP Plan Area could result in both beneficial and adverse impacts. The intensity of these impacts is anticipated to be minimal. Compared to No Action, this alternative is likely to have **negligible adverse impacts.**	16,014 acres from land development activities within the SEP-HCP Plan Area could result in both beneficial and adverse impacts. The intensity of these impacts is anticipated to be minimal. Compared to No Action, this alternative is likely to have **negligible adverse impacts.**	43,741 acres from land development activities within the SEP-HCP Plan Area could result in both beneficial and adverse impacts. The intensity of these impacts is anticipated to be minimal. Compared to No Action, this alternative is likely to have **minor adverse impacts.**
Climate Change	Anticipated land development will generally reduce open space, native vegetation communities, and increase heat island effects. Some adverse impacts may be moderated by existing regulations and through other park and open space initiatives as well as incidental take authorizations. Overall **minor adverse impacts** to the climate relative to the action alternatives.	Potential adverse impacts to the Climate Change associated with land development activities are similar to the No Action Alternative. The conservation of approximately:			
		31,030 acres from land development activities within the SEP-HCP Plan Area could result in **minor beneficial impacts** to climate compared to No Action.	7,390 acres from land development activities within the SEP-HCP Plan Area could result in **negligible beneficial impacts** to climate compared to No Action.	16,014 acres from land development activities within and adjacent to Bexar County could result in **minor beneficial impacts** to climate compared to No Action.	43,741 acres from land development activities within the SEP-HCP Plan Area could result in **moderate beneficial impacts** to climate compared to No Action.

CHAPTER 1

INTRODUCTION, PURPOSE AND NEED

1.1 INTRODUCTION

Bexar County and the City of San Antonio (Applicants) are applying to the U. S. Fish and Wildlife Service (Service) for an incidental take permit (ITP) under section 10(a)(1)(B) of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq., ESA), to authorize the incidental take of nine federally endangered species, two birds and seven karst invertebrates (collectively the Covered Species). The ESA protects threatened and endangered species and their habitats by prohibiting "take" of these species without a permit. As defined by the ESA, take means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct." The Service can permit the incidental take of endangered species for certain activities if certain permit issuance criteria are met, as described in Section 10(a)(2)(B) of the ESA, including prescribed measures to mitigate or minimize harm.

The issuance of an ITP by the Service is a federal action subject to the provisions of the National Environmental Policy Act of 1969 (42 USC 4321 et seq., NEPA). As part of the NEPA process, the Service prepared this Environmental Impact Statement (EIS) to analyze the impacts of issuing an ITP to the Applicants including, among others, impacts to social, cultural and economic resources as well as natural resources.

In support of the permit application the Applicants have prepared a habitat conservation plan called the Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP). If approved by the Service, the permit would be for a period of 30 years and would authorize a limited amount of incidental take of the Covered Species within the jurisdictions of Bexar County and the City of San Antonio. The SEP-HCP creates a voluntary, locally managed, and simplified process for complying with the ESA. In this chapter we briefly describe the SEP-HCP and baseline conditions within the Plan Area (see below).

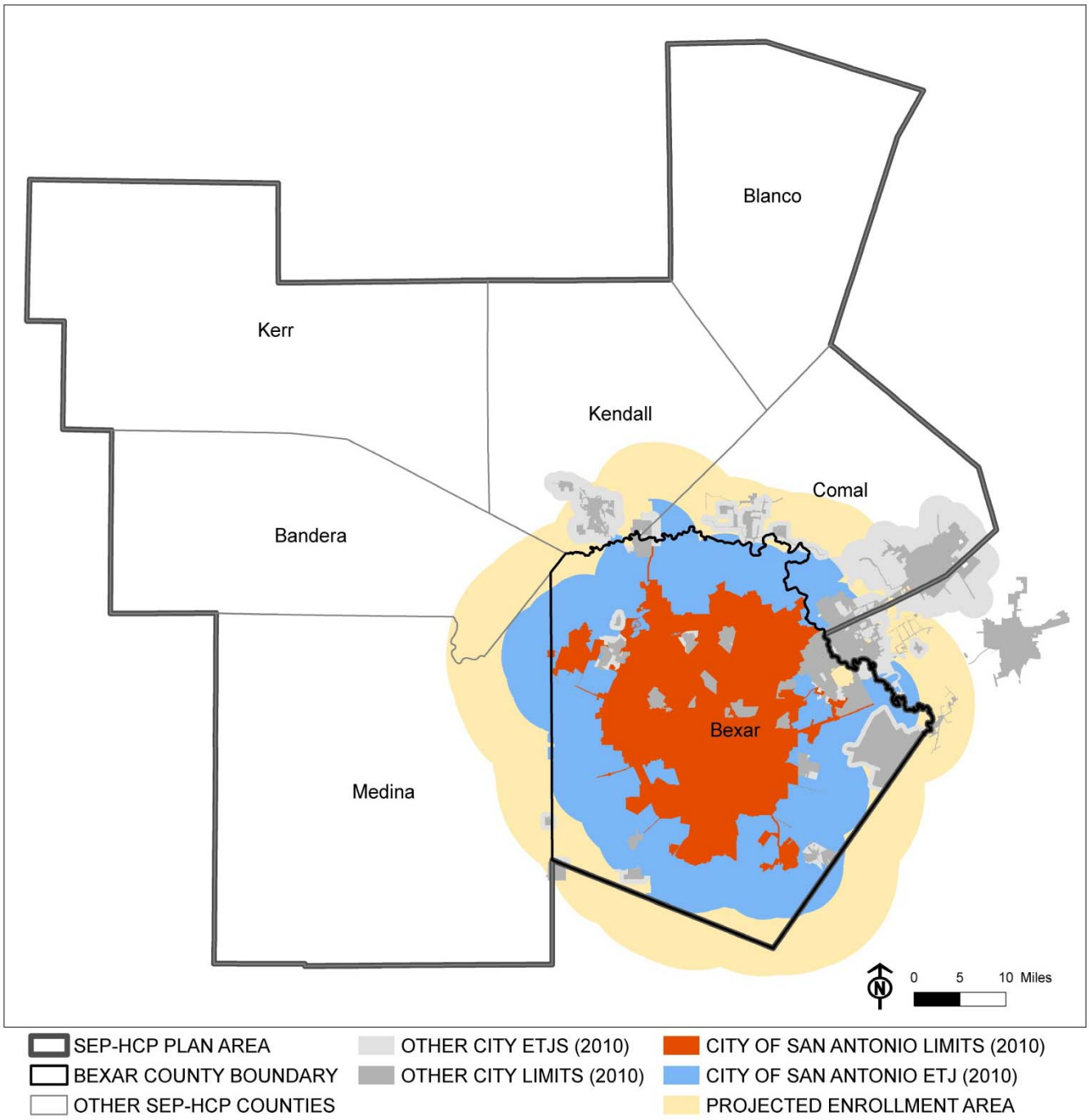
1.1.1 SEP-HCP Plan Area and Enrollment Area

The SEP-HCP Plan Area (Plan Area) includes Bexar, Medina, Bandera, Kerr, Kendall, Blanco and Comal counties (**Figure 1-1**). An activity that will incidentally take a Covered Species (Covered Activities) must occur within the Enrollment Area. The Enrollment Area is defined as the jurisdictions of Bexar County and the City of San Antonio, including both the current and future extra-territorial jurisdiction (ETJ), excluding Comal County which is covered by ITP TE-223267. Conservation actions may occur throughout all seven counties of the Plan Area.

The Natural Environment

The Plan Area is approximately 4,126,000 acres and crosses parts of six different ecological subregions, as described by the U.S. Environmental Protection Agency (EPA) including: Balcones Canyonlands, Edwards Plateau Woodlands, Northern Blackland Prairie, Northern Nueces Alluvial Plains, Southern Post Oak Savanna, and Llano Uplift (Griffith *et al.* 2004). As such, the Plan Area has highly variable terrain ranging from gently undulating to rolling hills in the southeast to high topographic relief associated with incised valleys in the northwest. The dominant vegetation cover in the Plan Area ranges

Figure 1-1: SEP-HCP Plan Area and Enrollment Area



Source: SEP-HCP 2015.

from a combination of oak and juniper woodlands (McMahan *et al.* 1984) in the west to tall grass and short grass prairies in the eastern portion of the Plan Area. Starting in the 1990s the forested land cover in the Plan Area began shrinking due to conversion to grassland/shrub vegetation and urban land uses (U.S. Geological Survey [USGS] 2003). It is anticipated that almost 7,800 acres of natural vegetation will be converted to urban uses each year between 2010 and 2040.

The water resources within the Plan Area support a variety of wildlife and riparian habitat, and provide for recreational uses and scenic vistas. These resources include the Edwards and Trinity aquifers; several rivers including the Blanco, Guadalupe, Medina, San Antonio, and Pedernales; two major impoundments at Medina and Canyon lakes; and numerous streams, creeks, and springs, some of which have been designated as ecologically significant. The Plan Area provides habitat for approximately 520 wildlife species as well as 48 federally and/or state-listed threatened and endangered species. Approximately 128,000 acres of the Plan Area are currently under some degree of conservation, including lands owned by public entities or conservation organizations and private lands under conservation easements.

The Human Environment

The Plan Area is a growing region in Central Texas with a 2010 population of almost 2 million people; more than 86 percent live in the City of San Antonio and Bexar County (USCB 2010a). The Plan Area is expected to continue to grow to more than 3.2 million people by 2040 with notable changes expected in Medina County (207 percent increase), Comal County (173 percent increase), and Kendall County (98 percent increase) (ESRI BIS 2009; WDA 2010a). The dominant economic drivers within the Plan Area include education, health care, the leisure industries, and the financial and real estate industries. Joint Base San Antonio- Camp Bullis (Camp Bullis) is a 28,000-acre military base located in northern Bexar County. It is the largest military facility in the Plan Area. According to 2006 employment statistics, Camp Bullis was the largest generator of employment in the San Antonio metropolitan area, supporting the employment of 195,075 people including direct, indirect and induced jobs (City of San Antonio and United States Department of Defense 2009). Because of these economic strengths, the region has fared generally well through the recent economic downturn. The education and health care sectors, in particular, have been forecasted to continue to lead the economic growth of the region; combined, these industries are forecasted to add over 67,000 new jobs to the region by 2018 (Texas Workforce Commission [TWC] 2008). The rapidly growing human population and the vibrant and growing economy suggest a potential for losses or degradation of habitat for the region's endangered species as land is developed to support this growth. Of the total acres within the Plan Area, excluding Camp Bullis and the areas within Bexar County that do contain potential habitat for the Covered Species, approximately 12 percent of the land was developed by 2009, with Bexar and Comal counties accounting for the largest percentage of development. By 2040 the amount of developed acreage is expected to increase in the Plan Area to 19 percent for a total of more than 240,000 acres (WDA 2010b).

1.1.2 Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP)

The SEP-HCP seeks to balance the needs for future growth in the region and the conservation needs of endangered species and their habitat. It will provide an option that non-federal entities may voluntarily use to achieve compliance with the ESA in an expedited and efficient manner for otherwise lawful, development activities. In support of the ITP application, the Applicants prepared the SEP-HCP to establish a conservation program that will minimize and mitigate, to the maximum extent practicable, the impacts of incidental take of the Covered Species in the Plan Area that will be authorized by the proposed permit. In addition to the Covered Species, the SEP-HCP voluntarily addresses some of the

conservation needs of several other species found in the Plan Area (Voluntarily Conserved Species, **Table 1-1**). The Voluntarily Conserved Species are expected to benefit from the conservation actions implemented for the Covered Species through the SEP-HCP. Voluntarily Conserved Species would not be covered by the ITP. If any are listed in the future, the ITP and its associated SEP-HCP may need to be amended to cover incidental take for those species.

Table 1-1: Covered and Voluntarily Conserved Species in the Plan Area

Common Name	Scientific Name	Taxa	Habitat
Covered Species			
Golden-cheeked warbler	*Setophaga* [=*Dendroica*] *chrysoparia*	Bird	Closed canopy juniper-oak woodlands
Black-capped vireo	*Vireo atricapilla*	Bird	Deciduous shrub habitats
Government Canyon Bat Cave spider	*Neoleptoneta microps*	Arachnid	Karst caves – known in Government Canyon State Natural Area
Madla Cave meshweaver	*Cicurina madla*	Arachnid	Karst – known in 20 caves in Bexar County
Bracken Cave meshweaver	*Cicurina venii*	Arachnid	Karst – known in 1 cave in Bexar County
Government Canyon Bat Cave meshweaver	*Cicurina vespera*	Arachnid	Karst – known in 1 cave in Bexar County
A beetle with no common name	*Rhadine exilis*	Insect	Karst – known in 45 to 50 caves in Bexar County
A beetle with no common name	*Rhadine infernalis*	Insect	Karst – known in 36 to 39 caves in Bexar County
Helotes mold beetle	*Batrisodes venyivi*	Insect	Karst – known in 8 caves in Bexar County
Voluntary Conserved Species			
Cave myotis bat	*Myotis velifer*	Mammal	Natural and manmade structures and limestone caves
Cagle's map turtle	*Graptemys caglei*	Reptile	Riffles and pools of rivers and major streams
Texas tortoise	*Gopherus berlandieri*	Reptile	Open scrub woods, arid brush, lomas, and grass-cactus associations
Indigo snake	*Drymarchon corais*	Reptile	Mesquite-grassland-savannah near water source
Spot-tailed earless lizard	*Holbrookia lacerate*	Reptile	Prairies, grasslands, savannas, and open woodlands
Texas horned lizard	*Phrynosoma cornutum*	Reptile	Flat open terrain with sparse plant cover with sandy, rocky or loamy soils
Texas garter snake	*Thamnophis sirtalis annectens*	Reptile	Adjacent to streams, rivers, ponds, lakes, and marshes
Eurycea salamanders	Various	Amphibian	Aquatic karst, aquifers, and springs
Golden orb	*Quadrula aurea*	Mollusk	Moderate-sized streams and small rivers
Texas pimpleback	*Quadrula petrina*	Mollusk	Moderate-sized streams and small rivers
Texas fatmucket	*Lampsilis bracteata*	Mollusk	Moderate-sized streams and small rivers
Tobusch fishhook cactus	*Sclerocactus brevihamatus*	Plant	Juniper-oak woodland

Common Name	Scientific Name	Taxa	Habitat
	ssp. Tobuschii		
Big red sage	*Salvia pentstemonoides*	Plant	Seeps and creeks within limestone canyons
Bracted twistflower	*Strentanthus bracteatus*	Plant	Oak-juniper woodland
Longstalk heimia	*Nesaea longipes*	Plant	Desert spring-runs, seepage slopes and near perennial streams
Correll's false dragon-head	*Physostegia correlli*	Plant	Stream sides, creek beds, irrigation channels, and roadside ditches
Canyon rattlesnake-root	*Prenanthes carrii*	Plant	Upper woodland canyon drainages and creek side seepage shelves

Source: SEP-HCP 2015.

1.2 PURPOSE AND NEED FOR ACTION

The Proposed Action under NEPA is the issuance of an ITP by the Service that will authorize incidental take of the Covered Species, as provided for under section 10(a)(1)(B) of the ESA, associated with lawful activities. Issuance of this permit will also allow the Applicants to extend this incidental take authorization to other non-federal entities within the Enrollment Area in accordance with the SEP-HCP. The purpose of issuing an ITP is to authorize the Applicants to "take" the Covered Species in the Enrollment Area while conserving their habitat. The need for issuing the permit is to conserve the Covered Species and the ecosystems upon which they depend and to ensure ESA compliance.

Several key goals and objectives have been identified through input from public and agency stakeholders in support of the purpose and need for the Proposed Action. The goals and objectives described below reflect the benefits that the Applicants and the stakeholder community expect to achieve as a result of a permit being issued.

1.2.1 Protect and Manage Habitat of Threatened and Endangered Species at a Regional Scale

Land development activities have accompanied and supported the population and economic growth in Bexar County and have resulted in the loss of habitat for federally threatened or endangered species within the Plan Area. Between 2010 and 2040, 341,551 new residential buildings (multi-family and single family) are projected to be built in the Plan Area. More than half of this development (55 percent) will occur in Bexar County (WDA 2010b). **Table 1-2** gives an estimate of Covered Species habitat that is projected to be lost between 2010 and 2040 within the Plan Area. While occupied Covered Karst Invertebrate caves are not known to occur outside of Bexar County, Veni (2002) delineated karst zones into Medina and Bandera counties. Because these counties are within the current and future expanded Enrollment Area, they are included in the analysis.

Table 1-2: Estimated Habitat Loss within the Plan Area (2010 to 2040)

County	Acres of Available Habitat	Estimated Acres of Habitat Loss without SEP-HCP	Estimated Percent Habitat Loss without SEP-HCP	Estimated Percent Habitat Loss Relative to Overall Estimated Habitat Loss without the SEP-HCP	Proportion of Habitat Loss to be mitigated by the SEP-HCP
Golden-cheeked Warbler Habitat					
Bandera	165,752	2,428	1.5%	4.7%	
Bexar	59,018	14,883	25.2%	29.1%	
Blanco	46,530	166	0.4%	0.3%	
Comal	115,808	23,163	20.0%	45.3%	
Kendall	65,269	3,413	5.2%	6.7%	
Kerr	113,985	1,565	1.4%	3.1%	
Medina	92,308	5,532	6.0%	10.8%	
SEP-HCP Plan Area	658,670	51,150	7.8%		18.3%*
Black-capped Vireo Habitat					
Bandera	7,599	133	1.8%	1.3%	
Bexar	17,856	5,073	28.4%	50.3%	
Blanco	2,275	7	0.3%	0.1%	
Comal	3,591	715	19.9%	7.1%	
Kendall	4,945	217	4.4%	2.2%	
Kerr	53,074	905	1.7%	9.0%	
Medina	62,292	3,034	4.9%	30.1%	
SEP-HCP Plan Area	151,632	10,084	6.7%		26.2%*
Karst Species Habitat – Karst Zones 1 & 2					
Bandera	0	0	0.0%	0.0%	0%**
Bexar	109,793	46,276	42.1%	90.4%	20%
Blanco	0	0	0.0%	0.0%	
Comal	0	0	0.0%	0.0%	
Kendall	0	0	0.0%	0.0%	
Kerr	0	0	0.0%	0.0%	
Medina	20,161	4,895	24.3%	9.6%	0%**
SEP-HCP Plan Area	129,954	51,171	39.4%		20%*
Karst Species Habitat – Karst Zones 3 & 4					
Bandera	444	40	9.0%	0.07%	0%**
Bexar	131,209	48,296	36.8%	89.0%	20%
Blanco	0	0	0.0%	0.0%	
Comal	0	0	0.0%	0.0%	
Kendall	0	0	0.0%	0.0%	
Kerr	0	0	0.0%	0.0%	
Medina	24,358	5,923	24.3%	10.9%	0%**
SEP-HCP Plan Area	156,011	54,259	34.8%		20%*

*Requested incidental take for the Covered Species is 9,371 ac of potential GCW habitat, 2,640 acres of potential BCV habitat and 21,086 acres of potential karst habitat (10,234 acres Karst Zones 1 & 2 and 10,852 acres Karst Zones 3 &4 as delineated by Veni (2002)).
**Currently the Covered Karst Invertebrates are not known to occur outside of Bexar County, however, it is possible that over the life of the permit, given the little known information on the distribution and occurrence of these species, that they could occur in the areas of the Bexar County Karst Zones (Veni 2002) which extend into the surrounding counties. Source: SEP-HCP 2015.

The Service has identified habitat loss and degradation as one of the primary factors threatening the survival and recovery of these species. While recent conservation initiatives sponsored by the City of San Antonio, such as the Edwards Aquifer Protection Program, have protected tens of thousands of acres in the Plan Area from future development, most of these actions do not specifically provide for the protection or management of the Covered Species. Without specific habitat protection and on-going management, the conservation value of these lands for the Covered Species may be limited. The region's few conservation actions that have specifically targeted the protection and management of endangered species are relatively small and scattered. Unfortunately, these isolated efforts may not provide for the self-sustaining ecosystem processes that naturally maintain endangered species habitats. One objective of the SEP-HCP is to design and implement a regional conservation program that focuses on protection and long-term management of endangered species habitat while supporting the conservation of other regionally important natural resources.

1.2.2 Expedite the Incidental Take Permitting Process

The process for obtaining an ITP from the Service can be expensive and could take years to complete. One of the benefits of the SEP-HCP is that it reduces the number of steps and time required to complete the individual permitting process. The SEP-HCP will provide a significant time savings for development projects in the Enrollment Area that require a permit (**Figure 1-2**).

Figure 1-2: Permitting Process – Without a HCP vs. With a HCP

Source: SEP-HCP EIS Team 2011.

1.2.3 Increase Compliance with ESA

As the population and employment in Bexar County continues to grow, land development will occur to accommodate this growth. The need for an ITP is based on the development expected to occur in the Enrollment Area that has the potential to result in take of the Covered Species. In applying for an ITP directly from the Service, the developer is responsible for all legal and consultation fees, costs for scientific studies and environmental documentation, and the cost of implementing the agreed upon mitigation measures; these expenses can range from tens of thousands to hundreds of thousands of dollars. Some developers elect to proceed with projects without proper coordination with the Service and risk law enforcement actions that could delay completion of their projects and result in fines or imprisonment. Non-compliance with the ESA creates a situation where habitat is lost or degraded

without the benefits of the corresponding conservation measures. A benefit of the expedited compliance process associated with the SEP-HCP is that it could encourage greater compliance with the ESA.

1.2.4 Address Compatibility Issues between the Mission of Camp Bullis and the Needs of Endangered Species

The DOD identified encroaching land development and conflicts with endangered species as significant compatibility issues threatening the training mission at Camp Bullis (Cannizzo 2011). To identify solutions, the City of San Antonio, Bexar County, and Camp Bullis prepared the *Camp Bullis Joint Land Use Study* (JLUS) with the input from local stakeholders to help ensure that economic growth and land development is managed in a manner that allows the installation to achieve its mission and remain a vital contributor to the region's economy. The JLUS recommended the implementation of a HCP to help alleviate endangered species-related compatibility issues (City of San Antonio and United States Department of Defense 2009).

1.2.5 Support Economic Growth

Out of concern that compliance with the ESA could adversely affect local economies, the State of Texas formed an "Interagency Task Force on Economic Growth and Endangered Species" (Task Force). The mission of this Task Force was to provide policy and technical assistance regarding compliance with endangered species laws and to provide recommendations to local and regional governments to help ensure compliance with endangered species laws and regulations in an effective and cost efficient manner. The Task Force identified HCPs as an innovative and important conservation tool for endangered species that could help alleviate potential conflicts with the economic growth of Texas communities (Task Force 2010).

1.2.6 Involve a Diversity of Stakeholders and Seek Partnerships

The Applicants emphasized the need to seek input and achieve support from a wide spectrum of stakeholders during development and implementation of the SEP-HCP. Some of the guiding principles used to involve a diversity of stakeholders and foster partnerships were:

1. Include a broad spectrum of stakeholder interests on advisory committees and teams.
2. Convene advisory groups after permit issuance to provide feedback on SEP-HCP implementation.
3. Enable and encourage formal, but flexible, partnerships with other jurisdictions to cooperate on SEP-HCP administration and implementation in regionally-appropriate ways.
4. Share research results, monitoring data and other planning information with the public to the extent practicable without compromising sensitive biological, personal, or property information.

1.2.7 Implement a Locally-appropriate and Cost-effective Habitat Conservation Plan

According to stakeholder input, the regional conservation of threatened or endangered species should be achieved by using locally-appropriate and cost-effective tools and approaches. This includes understanding local community and landowner concerns regarding endangered species habitat protection and prioritizing the use of compatible land protection tools. There are several means to achieve this goal, including:

1. Seek voluntary, willing conservation partners for endangered species habitat protection and management.
2. Provide opportunities to review the progress of the conservation project and adapt it to changing needs and circumstances over time.

3. Minimize administrative costs associated with SEP-HCP implementation through the use of efficient and effective practices.

1.2.8 Leverage Existing Conservation Resources

Within the Plan Area there are several natural preserves, such as Texas Parks and Wildlife Department's (TPWD) Government Canyon State Natural Area, which provide habitat for endangered species, as well as established programs designed to conserve open space. One way to maximize the benefits of past, present, and future conservation efforts or opportunities is to coordinate the conservation efforts of the SEP-HCP within existing programs.

1. Coordinate conservation planning for endangered species on a regional scale to take advantage of available conservation opportunities.
2. Pool conservation resources from multiple sources, as available, to achieve biologically significant, regional conservation of endangered species.
3. Compliment other conservation efforts in the region (such as aquifer protection initiatives, scenic and cultural preservation, and parkland acquisition programs) and avoid competition with complementary programs for conservation resources.

1.3 REGULATORY FRAMEWORK

1.3.1 Endangered Species Act

The ESA is intended to protect and conserve species listed as threatened or endangered and the habitats upon which they depend. The implementing regulations for the ESA are presented in Title 50, section 17 of the Code of Federal Regulations (50 CFR § 17). Section 9 of the ESA prohibits "take" of any federally listed wildlife species (16 USC 1538(a)). Take, as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC 1532(19)). Section 10(a)(1)(B) of the ESA authorizes the Service to issue an ITP for non-federal projects or activities not requiring federal authorization or funding. The permit allows for impacts to listed species, provided certain conditions are satisfied. These conditions include the preparation of a HCP outlining the measures that the recipient of the permit will undertake to minimize and mitigate "to the maximum extent practicable" the impacts of the taking of the species (ESA (10)(a)(2)(A)).

Section 7(a)(2) of the ESA requires all federal agencies, in consultation with the Service, to ensure that any action "authorized, funded, or carried out" by that agency is "not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification" of designated critical habitat. The Service's issuance of an ITP is an action subject to the provisions of section 7 of the ESA and, therefore, the Service must consult to determine whether issuance of the permit will jeopardize the continued existence of the listed species or result in the adverse modification or destruction of designated critical habitats. Section 7 requires, among other things, an analysis of direct, indirect and, cumulative effects on the listed species and effects on designated critical habitat. The results of the section 7 consultation are documented in a Biological Opinion prepared by the Service. The intra-service section 7 consultation must be concluded prior to the issuance of the ITP.

1.3.2 National Environmental Policy Act (NEPA)

The issuance of an ITP is a federal action and is, therefore, subject to NEPA. NEPA requires that federal agencies consider all reasonably foreseeable environmental impacts of their proposed actions on the human environment. NEPA also requires that the federal action agency involve and inform the public in

the decision-making process; although NEPA does not mandate a specific outcome. NEPA also established the Council on Environmental Quality (CEQ) in the Executive Office of the President to formulate and recommend national policies that ensure that the programs of the federal government promote improvement of the quality of the environment. The CEQ set forth regulations (40 CFR 1500-1508) to assist federal agencies in implementing NEPA during the planning phases of any federal action. These regulations, together with specific federal agency NEPA implementation procedures, help ensure that the environmental impacts of any proposed decisions are fully considered.

While the ESA lays out substantive requirement for compliance, NEPA sets out procedures for agencies to consider the impacts of their actions, so the scope of NEPA goes beyond that of the ESA. NEPA analyses must consider the impacts of a federal action on the human environment, such as cultural (archeological and historical), social, and economic resources, as well as the natural environment. With respect to HCPs in general, compliance with NEPA is not a direct obligation or requirement of the Applicant for the ITP. However, the Service must comply with NEPA when making its decision on the application and implementing the federal action of issuing a permit. Consequently, the appropriate environmental analyses must be conducted and documented before an ITP can be issued.

The CEQ identifies three levels of environmental review in decision-making for agency actions. Routine actions which normally do not have adverse environmental impacts may be classified as Categorical Exclusions. Agencies may prepare an Environmental Assessment in order to determine whether or not an action may have significant impacts, and if so then prepare an EIS, or it may prepare an EIS, if significant impacts are anticipated. The severity of impacts can be subjective, and may depend on public perception and controversy. The Service has determined that an EIS is appropriate for this proposed action. The final step in the EIS process is a Record of Decision (ROD).

1.3.3 Texas State Law Relevant to Regional Habitat Conservation Plans

Texas state law, as written in Chapter 83 of the Texas Parks and Wildlife Code, restricts a local government's role in developing, adopting, approving, or participating in an HCP. Among other things, state law requires the governmental entity participating in an HCP to establish a Citizens' Advisory Committee (CAC), appoint a Biological Advisory Team (BAT), comply with open records and open meetings laws, comply with public hearing requirements, provide a grievance process to CAC members, and acquire preserves by specific deadlines.

Under Chapter 83 of the Texas Parks and Wildlife Code, governmental entities participating in a HCP are prohibited from:

- Imposing any sort of regulation related to endangered species (other than regulations involving groundwater withdrawal) unless that regulation is necessary to implement a HCP for which the governmental entity was issued a federal permit (§ 83.014(a)).
- Discriminating against a permit application, permit approval, or request for utility service to land that has been designated a habitat preserve for an HCP (§ 83.014(b)).
- Limiting water or wastewater service to land that has been designated as habitat preserve (§ 83.014(c)).
- Requiring a landowner to pay a mitigation fee or set aside, lease, or convey land as habitat preserve as a condition to the issuance of a permit, approval or service (§ 83.014(d)).

In addition to the above prohibitions, Chapter 83 stipulates that the mitigation included in an HCP, including any participation fee and the size of habitat preserves, must be based on the amount of harm to each endangered species that the HCP will protect. However, after notice and hearing, an HCP (including the mitigation fees and size of any proposed preserves) may be based partially upon recovery criteria applicable to the listed species covered by the HCP (§ 83.105).

Chapter 83 also stipulates that governmental entities participating in an HCP demonstrate that adequate sources of funding exist to acquire the land for designated habitat preserves within four years of the date of permit issuance or within six years from the date of initial application, or the voters must have authorized bonds or other financing in an amount equal to the estimated cost of acquiring all of the land needed for habitat preserves within that time frame (§83.013). The deadline is calculated from the time a particular parcel is designated as proposed habitat preserve, a provision that may allow governmental entities flexibility to acquire preserves on a phased basis as the HCP is implemented.

Finally, Chapter 83 imposes a requirement that before adopting an HCP, amendment, ordinance, budget, fee schedule, rule, regulation, or order with respect to an HCP, the Applicants must hold a public hearing and publish notice of such hearing in the newspaper of largest general circulation in the counties in which the Applicants proposes the action. Such notice must include a brief description of the proposed action and the time and place of the public hearing on the proposed action. The Applicants must publish notice in accordance with the foregoing requirements, and must do so not later than the thirtieth day prior to the public hearing (§83.019).

1.4 DECISION NEEDED

Section 10(a)(1)(B) requires that the Service determine, after public comment, that five issuance criteria are satisfied before a permit can be issued. These criteria are: 1**)** the taking will be incidental; 2**)** the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking; 3**)** the applicant will ensure that adequate funding for the plan will be provided; 4**)** the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild; and 5**)** other measures, if any, are required under will be met. If issuance criteria are met, the Service must issue an ITP (16 U.S.C. 1539(a)(2)(A).

CHAPTER 2

SCOPING AND PUBLIC PARTICIPATION

2.1 SCOPING

In accordance with NEPA agencies preparing an EIS shall conduct scoping as an early and open process to determine the range of issues to be addressed and to identify the significant issues related to the proposed action. As part of the scoping process, the Service invites the participation of affected federal, state, and local agencies; any affected Indian tribe; the proponent of the action; and other interested parties including those who might not be in accord with the action. NEPA requires a specific process for scoping that includes the publication of a Notice of Intent (NOI) in the *Federal Register*, a scoping meeting, and a comment period.

2.1.1 Notice of Intent

An NOI was published in the *Federal Register* on Wednesday, April 27, 2011. The Service issued this notice to advise the public that an EIS will be prepared for the SEP-HCP. A copy was posted to the SEP-HCP website (www.sephcp.com) and is included in **Appendix A**.

2.1.2 Public Scoping Meetings

Five public scoping meetings were held throughout the Plan Area between June 6, 2011 and June 14, 2011 to engage the community, share information and ask the community for their input (**Table 2-1**). The meetings provided opportunities for the public to learn about and comment on the EIS as it was being developed.

Kerrville, TX – June 13, 2011

Photo Credit: SEP-HCP EIS Team 2011.

Table 2-1: Dates and Locations of Public Scoping Meetings

Date	City	Location
June 6, 2011	Bandera, TX	Silver Sage Corral Great Room, 803 Buck Creek Drive
June 7, 2011	Boerne, TX	Boerne Convention Center, 820 Adler Road
June 9, 2011	Blanco, TX	Old Blanco County Courthouse, 300 Main Street
June 13, 2011	Kerrville, TX	YO Ranch Conference Center, 2033 Sidney Baker
June 14, 2011	Helotes, TX	Helotes Ag Activity Center, 12132 Leslie Road

Source: SEP-HCP EIS Team 2011.

2.1.3 Outreach

Meeting announcements were published in the *Blanco County News*, *Helotes Echo*, *Kerrville Daily Times*, *Bandera Bulletin*, *San Antonio Express News*, *La Prensa* (Spanish), *Hondo Anvil Herald* and *Boerne Star*. These announcements were published the week of May 16, 2011, the week of May 30, 2011, and again the week of June 6, 2011. Meeting details were also posted to several websites

including the SEP-HCP project website and websites managed by the Service, the Hill Country Alliance, and the Texas Water Development Board.

Members of the CAC, BAT, and the AOG were also sent invitations to the public scoping meetings. These notifications served as an invitation to interested stakeholders to become involved in the scoping process for the EIS. All meeting announcements and Scoping Meeting materials can be found in **Appendix B**.

Helotes, TX – June 14, 2011

Photo Credit: SEP-HCP EIS Team 2011.

2.1.4 Attendance

A total of 211 people attended the five public scoping meetings, including 194 members of the public, 3 media outlets, and 14 elected officials (**Table 2-2**).

Table 2-2: Attendance

Location	Public	Media	Public Officials	Total
Bandera – Silver Sage Corral Great Room	10	0	3	13
Boerne – Boerne Convention Center	44	3	5	52
Blanco – Old Blanco County Courthouse	25	0	1	26
Kerrville – YO Ranch Conference Center	95	0	4	99
Helotes – Helotes AG Activity Center	20	0	1	21
TOTAL	194	3	14	211

Source: SEP-HCP EIS Team 2011.

2.1.5 Agency Scoping Process

In June 2011, letters were sent to federal, state and local agencies with the NOI attached requesting comments by August 22, 2011, on the potential resources that could be affected or issues that could arise by the issuance of the permit. The letter is included in **Appendix E**. The following agencies received a copy of this letter.

- Bexar Metropolitan Water District
- Edwards Aquifer Authority
- Federal Emergency Management
- Federal Highway Administration
- General Services Administration
- Guadalupe-Blanco River Authority
- Railroad Commission of Texas
- San Antonio Water Systems
- Texas Attorney General's Office
- Texas Commission on Environmental. Quality
- Texas Department of Agriculture
- Texas Department of Transportation
- Texas Division of Emergency Management

- Texas General Land Office
- Texas Parks and Wildlife Department
- Texas State Soil and Water Conservation Board
- Texas Water Development Board
- U.S. Army Corps of Engineers
- U.S. Department of Agriculture – Natural Resources Conservation Service
- U.S. Department of Housing & Urban Development
- U.S. Department of the Air Force – Randolph Fir Force Base
- U.S. Department of the Army - Fort Sam Houston
- U.S. Environmental Protection Agency
- U.S. Geological Survey

2.1.6 Scoping Comments

A total of 66 comments were received during the comment period, which closed July 26, 2011. Five of the Plan Area's County Commissioners' Courts (Bandera, Blanco, Medina, Kendall, and Kerr counties) passed resolutions during the EIS scoping period for the SEP-HCP. In their resolutions the Commissioners' Courts raised concerns that the SEP-HCP is an illegal extension of the Applicant's regulatory authorities over land development into other counties. As a result of this concern, they each requested to be removed from the Plan Area and from possible future inclusion in the SEP-HCP as permittees. The Service and Applicants considered the request and the concerns and modified the plan to remove the option for these counties to become co-permittees at any time in the future. Therefore, these counties will not have to do anything to comply with this permit, nor will they receive authority to extend incidental take authorization for non-federal activities in their jurisdictions under the SEP HCP. However, conservation activities could occur in Bandera, Blanco, Medina, Kendall, Comal, Kerr, and Bexar counties. The acquisition of preserve land would only occur through private land transactions for conservation easements, Preservation Credits, and possibly fee title real estate transactions with willing landowners. This will provide willing landowners with financial benefits for maintaining habitat for listed species on their private lands.

See **Appendix B** for the comments received during the scoping process and the responses.

2.2 DRAFT EIS PUBLIC MEETINGS

2.2.1 Notice of Availability

A Notice of Availability and announcement of public meetings (NOA) was published in the *Federal Register* on Friday, December 19, 2014 (**Appendix C**). The NOA announced the availability of the draft SEP-HCP and the draft EIS for public review and comment and to announce that public meetings will be held during the comment period. The NOA and a news release were posted to the Service's Austin Ecological Services website (www.fws.gov/southwest/es/AustinTexas) and the SEP-HCP project website (www.sephcp.com). The draft EIS was made available for public review at several libraries in the Plan Area, and a link to access an electronic version of the draft EIS was distributed via the NOA and news release to county judges in the Plan Area and members of the CAC, BAT and AOG; federal, state and local agencies; and elected officials, Native American tribes with affiliations to the Plan Area, conservation organizations, and stakeholders that signed up for the SEP-HCP mailing list.

Agencies and Officials

- Bexar County
- Bandera County

- Comal County
- Edwards Aquifer Authority, Environmental Studies
- Edwards Aquifer Research and Data Center, Texas State University
- Guadalupe-Blanco River Authority
- Kendall County
- Kerr County
- Medina County
- National Park Service, Santa Fe, New Mexico
- Texas Commission on Environmental Quality
- San Antonio River Authority
- Texas Department of Agriculture
- Texas Department of Transportation
- Texas General Land Office
- Texas Parks and Wildlife Department
- Texas Water Development Board
- Texas Department of Water Resources
- Texas State University, Texas Rivers Center, River Systems Institute
- U.S. Army Corps of Engineers, Fort Worth, Texas
- U.S. Bureau of Reclamation, Austin, Texas
- U.S. Department of Agriculture
- Natural Resources Conservation Service, Temple, Texas
- Rural Utilities Service (RUS), Washington, D.C.
- U.S. Environmental Protection Agency, Region 6, Dallas, Texas
- U.S. Farmers Home Administration, Temple, Texas
- U.S. Geological Survey, Austin, Texas
- The City of San Antonio, Texas

U.S. Senators

- Senator John Cornyn
- Senator Ted Cruz

U.S. Representatives

- Congressman Francisco Canseco
- Congressman Henry Cuellar
- Congressman Lloyd Doggett
- Congressman Blake Farenthold
- Congressman Charles Gonzales
- Congressman Ruben Hinojosa
- Congressman Ron Paul
- Congressman Lamar Smith

State Senators

- Senator Glenn Hegar
- Senator Leticia Van Deputte
- Senator Carlos I. Uresti
- Senator Jeff Wentworth
- Senator Judith Zaffirini

State Representatives

- Representative Jose Aliseda
- Representative Joaquin Castro
- Representative Joe Farias
- Representative Trey Martinez Fischer
- Representative Pete P. Gallego
- Representative John V. Garza
- Representative Roland Gutierrez
- Representative Harvey Hilderbran
- Representative Todd A. Hunter
- Representative Jason Isaac
- Representative Tracy O. King
- Representative John Langston Kuempel
- Representative Lyle Larson
- Representative Ruth Jones McClendon
- Representative Jose Menendez
- Representative Doug Miller
- Representative Geanie Morrison
- Representative Joe Strauss
- Representative Mike Villarreal

Native American Tribes

- Alabama-Coushatta Tribe of Texas
- Alabama-Quassarte Tribal Town
- Apache Tribe of Oklahoma
- Caddo Nation of Oklahoma
- Comanche Nation of Oklahoma
- The Delaware Nation
- Kiowa Indian Tribe of Oklahoma
- Mescalero Apache Tribe
- Seminole Nation of Oklahoma
- Tonkawa Tribe of Indians of Oklahoma
- Wichita and Affiliated Tribes

Conservation Organizations

- Gulf States National Resource Center
- San Antonio Audubon Society
- San Marcos River Foundation
- Sierra Club
- Sportsmen Conservationists of Texas
- Texas Nature Conservancy
- Texas Farm Bureau

2.2.2 Public Meetings

Two public meetings were held, one in Helotes, Texas (February 3, 2015) and one in Kerrville, Texas (February 4, 2015). Public meeting announcements were published in *San Antonio Express News* and

Kerrville Daily Times on January 18, 2015, and meeting information was published on the Service's Austin Ecological Services website and the SEP-HCP project website.

The public meetings provided the public an opportunity to view the draft EIS and SEP-HCP, a series of exhibits, and project staff was available to answer questions. A presentation was given from approximately 5:30 p.m. to 6:30 p.m. and was followed by an informal open house. A total of 57 people attended the meeting in Helotes and 76 people attended the meeting in Kerrville. See **Appendix C** for the public meeting materials.

2.2.3 Public Meeting Comments

Official comments were received at the meetings orally via a court reporter and in writing via comment cards. Official comments were also received via the project website, email, U.S. mail, and www.regulations.gov. The comment period closed on March 19, 2015. A total of 111 comments were received during the comment period; 44 comments provided feedback on the draft SEP-HCP, 22 comments provided feedback on the draft EIS, and 45 comments provided feedback on both documents. A transcript of all comments received as well as responses can be found in **Appendix D**.

2.3 SEP-HCP WEBSITE

The SEP-HCP website, www.sephcp.com, is the repository of all information concerning the development and activities involved in the SEP-HCP project and the NEPA process. Documents, such as the draft SEP-HCP, draft EIS, technical reports, maps, public notices, project management and guidance documents, press and media coverage, and other links are included, in addition to a calendar of events, details about the project committees, and a page with project contact information and a place to leave a comment. The dedicated EIS page includes all materials from the public scoping process and the public meetings.

2.4 TRIBAL CONSULTATION

In order to initiate consultation with American Indian tribes that may have an interest in resources within the 7-county Plan Area, the Texas Historical Commission's web-site was consulted (THC 2015). The website includes a list of federallyrecognized Native American tribes affiliated with Texas, and eight tribes have provided maps exhibiting counties with tribal cultural affiliations. The list identifies 11 tribes with cultural affiliation to the 7-county Plan Area. A letter was sent to each of the tribes to initiate consultation. One tribe responded to the letter (the Caddo Nation of Oklahoma). According to the tribal response, the project is in the Caddo Nation area of interest; however, it does not impact sites of interest to the Caddo Nation. The letter and a list of contacted tribes are in **Appendix F**.

2.5 SEP-HCP PERMIT APPLICATION

Anyone wishing to review the SEP-HCP permit application may request a copy by writing the Regional Director, U.S. Fish and Wildlife Service, P.O. Box 1306, Room 4012, Albuquerque, NM 87103.

CHAPTER 3
ALTERNATIVES

3.1 ALTERNATIVES DEVELOPMENT PROCESS

The identification and evaluation of alternatives was informed through active community and public agency involvement. The alternative analysis process for the SEP-HCP involved input from the BAT, CAC, and AOG. The CAC adopted a charge which included:

- Recommend overall vision, goals and objectives of the SEP-HCP, including assistance with the recovery of threatened and endangered species; and reducing the associated pressures on Camp Bullis and aid in maintaining its training mission.
- Recommend a preferred alternative for each of the SEP-HCP major framing issues:
    - Boundaries of the Plan Area
    - Species to be covered for incidental take
    - Activities to be covered by incidental take
    - Conservation strategies
    - Funding strategies
- Recommend the form and level of mitigation required of plan participants, and the methods for determining such requirements.
- Recommend a plan for consideration by Bexar County and the City of San Antonio prior to its submittal to the Service as the basis for a permit application.

The CAC could not reach consensus on a single set of recommendations.

The BAT was responsible for advising the project Applicants on technical matters relating to the biology and conservation of the species and habitats addressed in the SEP-HCP. The BAT's charge included:

- Providing input to the project Applicants and the CAC on biological matters in connection with the development of the SEP-HCP, including critical review of any aspect of the SEP-HCP directly or indirectly affecting the biological integrity of the plan.
- As required by Chapter 83 of the Texas Parks & Wildlife Code, the BAT also assisted in the:
    - Calculation of harm to the endangered species
    - The sizing and configuring of the habitat preserves
- Comments and recommendations from the BAT were based on the best available science.

BAT recommendations were used to develop Action Alternatives. Moreover, the BAT recommendations and CAC deliberations were used to construct the Proposed SEP-HCP Alternative as a compromise among various interests. Therefore, BAT recommendations and CAC input were integral to the development of a preferred alternative. For example, the BAT recommended and the CAC adopted the Plan Area, Covered Activities, permit duration, and Covered Species. The BAT recommendations are contained in Section 14.4 of the SEP-HCP and other discussions among CAC members, particularly during a workshop, are described in Chapter 3.2 below.

Through the AOG, the Service provided oversight and concurrence on the development and evaluation of the alternatives in the SEP-HCP, which were carried forward into the EIS. Variables considered for each alternative include: 1) the Plan Area, the Enrollment Area, and the area where the preserve system could be located; 2) the amount of incidental take that would be requested for each of the Covered Species in the plan; 3) the conservation needs for each species, including mitigation ratio, preserve size, preserve distribution, preservation credit criteria, and participation fees; and 4) an estimated budget for implementing the alternative.

The alternatives considered during development of the SEP-HCP were initially identified from a review of other HCP models used in Texas and elsewhere across the country. These models include two general approaches for mitigating impacts to Covered Species: regulatory programs and pre-determined preserves.

3.1.1 Regulatory Programs

One approach for structuring an HCP is based on regulations designed to either require or provide an incentive for the conservation of an endangered species. This approach is not a realistic option for the SEP-HCP because Texas counties have limited authority to regulate land use, pursuant to the Texas Constitution. In addition, Chapter 83 of the Texas Parks and Wildlife Code contains a number of specific limitations on the authority of local government to regulate activities for the benefit of endangered species. For example, section 83.014 of the Texas Parks and Wildlife Code prohibits governmental entities from imposing a "regulation, rule, or ordinance related to endangered species unless the regulation, rule, ordinance is necessary to implement [an HCP] for which the governmental entity was issued a Federal Permit." The only exception to this prohibition is for regulations that involve groundwater withdrawal. A government entity also is prohibited from discriminating against a permit application, and is prohibited from denying a request for utility, water, or wastewater service to land that has been designated a habitat preserve for an HCP or as critical habitat for endangered species. Finally, governmental entities are precluded from requiring that a landowner pay a mitigation fee or take any other action as a condition for obtaining a government approval not related to the HCP. In short, a county's ability to pass regulations for the purpose of protecting endangered species is extremely limited; therefore, the regulatory approach was not considered a model for the SEP-HCP.

3.1.2 Pre-determined Preserves

Under the pre-determined preserve model, the HCP would identify and delineate a target area for preserve acquisition that may or may not be owned by an applicant. Implementing this approach would trigger several provisions of Texas state law related to development of HCPs by local governments. Within this pre-determined target area, an applicant would agree to acquire or otherwise protect a certain amount of habitat for the species covered by the plan. Development would be allowed outside the designated target area, through participation in the HCP or through individual ESA incidental take authorizations. Projects on land within the target area would not be allowed to participate in the HCP, but could seek ESA incidental take authorizations directly from the Service. This type of plan is premised on protecting an appropriate amount of high-quality habitat up-front, such that the impacts of development in the remainder of the Enrollment Area (up to the limit of authorized take) would be adequately minimized and mitigated and the continued existence of the species would not be jeopardized. The Balcones Cayonlands Conservation Plan in Travis County, Texas, and the Riverside County and San Diego Multi-species Conservation Plans, California, are examples of HCPs based on this model. Under current Texas state law an applicant would be required to acquire targeted properties within six years of permit issuance. This would mean that an applicant would need to have agreements with

willing landowners and all of the funding in place within the first few years, if not before the issuance of the permit, to accomplish this goal. This would not be a practicable option for the Applicants; therefore, the pre-determined preserve approach was not used for the SEP-HCP.

3.1.3 The Action Alternatives

Alternative development was an iterative process involving making changes to one variable, and reviewing the effects to other variables. Employing this method of changing a variable and reviewing how its resulting affects meet the purpose and need resulted in numerous alternatives that were suggested and refined. The first pre-application draft of the SEP-HCP proposed 10 Preliminary Alternatives, including the No Action Alternative. These 10 Preliminary Alternatives were presented to agencies, project stakeholders, and the public through a series of scoping meetings held throughout the Plan Area during the month of June 2011 (see **Chapter 2 – Public Scoping and Participation** for more information).

The input received during the scoping process helped to further refine the 10 Preliminary Alternatives into 4 Action Alternatives. Key factors that played a role in removing some of the alternatives include: (1) counties in the Plan Area formally requesting to be removed from the Enrollment Area of the SEP-HCP and declining the opportunity to opt-in to the SEP-HCP in the future; and (2) the City of San Antonio requested that its city limits, ETJ, and the area where its ETJ will likely expand over the 30 year timeframe of the SEP-HCP be added to the Enrollment Area. Based on this feedback and comments received during scoping several of the Preliminary Alternatives were modified and several were eliminated from further consideration. Four Action Alternatives and the No Action Alternative were advanced for consideration in this EIS.

3.2 ALTERNATIVES CONSIDERED BUT REJECTED FROM FURTHER STUDY

Of the 10 Preliminary Alternatives identified, five action alternatives were eliminated from further study based on preliminary screening. These five alternatives are: 1) Proposed SEP-HCP Full Implementation, 2) First Draft Alternative, 3) CAC Workshop Alternative, 4) Limited Karst Alternative, and 5) Complete Coverage Alternative. **Table 3-1** provides detailed information on each of the alternatives eliminated from further study using the same parameters used in the alternatives promoted for further study, includinghe Plan Area, Covered Species, Incidental Take Request in acres, Mitigation Measures by species, and the Estimated Budget. The brief description of attributes and the rationale for eliminating each of these alternatives is given below.

3.2.1 SEP-HCP Full Implementation

The SEP-HCP Full Implementation Alternative covers Bexar County and the City of San Antonio, including its future ETJ, and also allocates an amount of incidental take for impacts outside of Bexar County that may be accessed if one or more other jurisdictions outside of Bexar County opt to become formal SEP-HCP Partners. This alternative authorizes incidental take of 12,000 acres for GCWA, 4,000 acres for BCVI, and 15,800 acres of karst zones 1 though 4 for seven listed karst invertebrates across a 7-county Plan Area. The SEP-HCP Full Implementation Alternative does not authorize incidental take of two listed karst invertebrates, *C. baronia* and *T. cokendolpheri*, that only occur in the fully developed Alamo Heights Karst Fauna Region.

The amount of incidental take allocated to the SEP-HCP Full Implementation Alternative represents approximately 50 percent of the estimated GCWA and BCVI habitat losses within Bexar County over 30 years and approximately 33 percent of the estimated habitat losses for these species in other Plan

Table 3-1: SEP-HCP Alternatives Eliminated from Further Study

October 2015

	Proposed SEP-HCP Full Implementation	First Draft Alternative	CAC Workshop Alternative	Limited Karst Alternative	Complete Coverage Alternative
PLAN AREA					
Participation Area	Bexar County plus the jurisdictions of other formal SEP-HCP Partners that have "opted in" to the Plan's participation process	6 counties: Bexar, Medina, Bandera, Kerr, Kendall, and Blanco	Bexar County plus the jurisdictions of other counties (excluding Comal) that have "opted in" to the Plan's participation process	Bexar County plus the jurisdictions of other formal SEP-HCP Partners that have "opted in" to the Plan's participation process	6 counties: Bexar, Medina, Bandera, Kerr, Kendall, and Blanco
Conservation Actions	7counties: Bexar, Medina, Bandera, Kerr, Kendall, Blanco, and Comal	7counties: Bexar, Medina, Bandera, Kerr, Kendall, Blanco, and Comal	7counties: Bexar, Medina, Bandera, Kerr, Kendall, Blanco, and Comal	7counties: Bexar, Medina, Bandera, Kerr, Kendall, Blanco, and Comal	7counties: Bexar, Medina, Bandera, Kerr, Kendall, Blanco, and Comal
COVERED SPECIES					
	GCWA, BCVI, 7 Listed Karst Invertebrates	GCWA, BCVI, and 9 Listed Karst Invertebrates	GCWA, BCVI, and 9 Listed Karst Invertebrates	GCWA, BCVI, 3 Listed Karst Invertebrates	GCWA, BCVI, and 9 Listed Karst Invertebrates
INCIDENTAL TAKE REQUEST					
GCWA *(acres of habitat loss or degradation within Enrolled Properties)*	12,000 ac	12,000 ac	11,800 ac (Bexar County capped at 7,500 ac)	12,000 ac	28,000 ac
BCVI *(acres of habitat loss or degradation within Enrolled Properties)*	4,000 ac	4,000 ac	3,800 ac (Bexar County capped at 2,400 ac)	4,000 ac	9,400 ac
Listed Karst *(acres of Karst Zone 1-4 within Enrolled Properties and the number of associated occupied karst features)*	7,700 ac (Z1&2) 8,100 ac (Z3&4) 37 occupied features	7,800 ac (Z1&2) 8,700 ac (Z3&4) 37 caves	7,800 ac (Z1&2) 8,700 ac (Z3&4) 37 caves	7,700 ac (Z1&2) 8,100 ac (Z3&4) 37 occupied features	52,000 ac (Z1&2) 57,500 ac (Z3&4) 249 caves
MITIGATION MEASURES					
GCWA					
Mitigation Ratio	2 : 1 direct impact 0.5 : 1 indirect impact	2 : 1 direct impact 0.5 : 1 indirect impact	2 : 1 direct impact 0.5 : 1 indirect impact	2 : 1 direct impact 0.5 : 1 indirect impact	3 : 1 direct impact (Bexar County) 2 : 1 direct impact (rural counties) 0.5 : 1 indirect impact
Preserve Size	30,000 ac	30,000 ac	29,500 ac	30,000 ac	89,000 ac

October 2015

	Proposed SEP-HCP Full Implementation	First Draft Alternative	CAC Workshop Alternative	Limited Karst Alternative	Complete Coverage Alternative
Preserve Distribution	Anticipated to be in mostly rural areas	Goal for 5,000 ac in/adjacent to Bexar County with the remaining 25,000 in rural areas	Require up to 5,000 ac in Bexar County with remaining 24,500 ac in rural areas	Anticipated to be in mostly rural areas	Commitment to acquire at least 60% in/adjacent to Bexar County (53,400 ac) with no more than 40% in rural counties (35,600 ac)
Credit Fee	$4,000 per credit ($8,000 per acre of direct loss)	$5,000 per credit ($10,000 per acre of direct loss)	$4,000 per credit ($8,000 per acre of direct loss)	$4,000 per credit ($8,000 per acre of direct loss)	$5,000 per credit (calculates to $15,000 per acre of direct loss in Bexar County and $10,000 per acre of direct loss outside Bexar County)
<u>BCVI</u>					
Mitigation Ratio	2 : 1 direct impact 0.5 : 1 indirect impact	1 :1 direct impact 0.5 : 1 indirect impact	2 : 1 direct impact 0.5 : 1 indirect impact	2 : 1 direct impact 0.5 : 1 indirect impact	2 :1 direct impact 0.5 : 1 indirect impact
Preserve Size	10,000 ac	5,000 ac	9,500 ac	10,000 ac	23,400 ac
Preserve Distribution	Anticipated to be mostly in rural areas	Anticipated to be mostly in rural areas	Anticipated to be mostly in rural areas	Anticipated to be in mostly rural areas	Anticipated to be mostly in rural areas
Credit Fee	$4,000 per credit (calculates to $8,000 per acre of direct loss)	$5,000 per credit (calculates to $5,000 per acre of direct loss)	$4,000 per credit (calculates to $8,000 per acre of direct loss)	$4,000 per credit (calculates $8,000 per acre of direct loss)	$5,000 per credit (calculates to $10,000 per acre of direct loss)
<u>Listed Karst Invertebrates</u>					
Conservation Goal	1x of preserves needed to achieve draft downlisting criteria for most species	2x of preserves needed to achieve draft downlisting criteria for most species	2x of preserves needed to achieve draft downlisting criteria for most species	1x of preserves needed to achieve draft downlisting criteria for the 3 relatively common listed karst species	2x of preserves needed to achieve draft downlisting criteria for all species
Preserve Size	Approx. 1,000 ac of new preserves; based on acquisition of 3 new karst preserves in each of 5 KFRs	Approx. 2,400 acres of new preserves; based on acquisition of 6 new karst preserves in each KFR	Approx. 2,400 acres of new preserves; based on acquisition of 6 new karst preserves in each KFR	Approx. 1,000 acres of new preserves; based on acquisition of 1 high quality and 2 medium quality karst preserves in each of 5 KFRs comprising the range of these species	Approx. 4,800 acres of new preserves; based on acquisition of 12 new karst preserves in each KFR
Preserve Distribution	Distributed across Bexar County Karst Zones	Distributed across Bexar County KFRs	Distributed across Bexar County KFRs	Distributed across Bexar County KFRs, excluding the Alamo Heights KFR	Distributed across Bexar County KFRs

October 2015

	Proposed SEP-HCP Full Implementation	First Draft Alternative	CAC Workshop Alternative	Limited Karst Alternative	Complete Coverage Alternative
Participation Fees	Avoidance required 750 ft from feature until regional downlisting criteria achieved OCZ B (345 to 750 ft buffer) = $40,000 OCZ A (0 to 345 ft buffer) = $400,000	Avoidance required 345 ft from feature until regional downlisting criteria achieved Karst Zone 3 & 4 = $100 per acre Karst Zone 1 & 2 = $500 per acre OCZ B (0 to 150 ft) = $40,000 OCZ A (150 to 345 ft) = $400,000	Avoidance required 345 ft from feature until regional downlisting criteria achieved Karst Zone 3 & 4 = $100 per acre Karst Zone 1 & 2 = $500 per acre OCZ B (0 to 150 ft) = $40,000 OCZ A (150 to 345 ft) = $400,000	Avoidance required 750 ft from feature until regional downlisting criteria achieved OCZ B (345 to 750 ft buffer) = $40,000 OCZ A (0 to 345 ft buffer) = $400,000	Avoidance required 345 ft from feature until regional downlisting criteria achieved Karst Zone 3 & 4 = $100 per acre Karst Zone 1 & 2 = $500 per acre OCZ B (0 to 150 ft) = $40,000 OCZ A (150 to 345 ft) = $400,000
Special Conditions for Features Discovered During Construction	Stop construction for at most 7 days within 50 ft of feature to allow for Plan-sponsored investigations.	Stop construction for at least 1 week within 345 ft of feature and determine if feature contains listed species (including genetic analysis for taxanomic identification, if necessary); consult with Service if feature contains any one of the 6 very rare listed karst species; additional conservation measures may be required.	Stop construction for at least 1 week within 345 ft of feature and determine if feature contains listed species (including genetic analysis for taxanomic identification, if necessary); consult with Service if feature contains any one of the 6 very rare listed karst species; additional conservation measures may be required.	Stop construction for at most 7 days within 50 ft of feature to allow for Plan-sponsored investigations.	Stop construction for at least 1 week within 345 ft of feature and determine if feature contains listed species (including genetic analysis for taxanomic identification, if necessary); consult with Service if feature contains any one of the 6 very rare listed karst species; additional conservation measures may be required.
ESTIMATED BUDGET (alternatives rounded to nearest $10,000)					
Plan Costs					
Preserve Acquisition Costs	$202,219,107	$437,600,000	$448,040,000	$202,220,000	$2,248,170,000
Plan Administration	$13,758,935	$14,360,000	$15,750,000	$13,760,000	$47,580,000
Preserve Mgt. and Monitoring	$51,819,272	$50,480,000	$60,130,000	$51,820,000	$187,510,000
Other Conservation Measures	2,717,610	$2,820,000	$3,050,000	$2,720,000	$8,350,000
Contingency Fund Contributions	$2,200,825	$1,940,000	$2,600,000	$2,200,000	$8,440,000
Mgt. Endowment Contributions	$95,781,667	$92,950,000	$112,170,000	$95,780,000	$352,070,000
Total Estimated Plan Costs	$368,497,418	$600,150,000	$641,740,000	$368,500,000	$2,852,120,000
Plan Revenues					
Participation Fee					
Application Fees	$53,501	$50,000	$50,000	$50,000	$250,000
GCWA Credit Sales	$161,512,827	$201,890,000	$158,820,000	$161,510,000	$597,260,000
BCVI Credit Sales	$53,837,609	$33,650,000	$51,150,000	$53,840,000	$159,830,000
Karst Participation Fees	$4,449,737	$13,140,000	$13,140,000	$4,450,000	$68,540,000

October 2015

	Proposed SEP-HCP Full Implementation	First Draft Alternative	CAC Workshop Alternative	Limited Karst Alternative	Complete Coverage Alternative
Total Participation Fee Revenue	$219,853,674	$248,730,000	$223,160,000	$219,850,000	$825,880,000
Public Funding					
Bexar County	$74,196,092	$175,600,000	209,180,000	$74,200,000	$1,013,080,000
Bexar County TID%	2.4%	5.7%	6.8%	2.4%	32.8%
City of San Antonio	$74,196,092	$175,600,000	209,180,000	$74,200,000	$1,013,080,000
City of San Antonio TID%	1.8%	4.3%	5.1%	1.8%	24.5%
GCWA Credit Savings	$251,560	$220,000	220,000	$250,000	$100,000
Total Public Funding	$148,643,744	$351,420,000	418,580,000	$148,650,000	$2,026,260,000
Total Estimated Plan Revenues	$368,497,418	$600,150,000	$641,750,000	$368,500,000	$2,852,130,000
% Participation Fees	60%	41%	35%	60%	29%
% Public Funding	40%	59%	65%	40%	71%

Area counties over 30 years. The amount of incidental take allocated for the Covered Karst Invertebrates represents approximately 15 percent of the area of potential karst habitat (and the estimated number of associated occupied karst features) that would be affected by new development over 30 years.
Impacts to GCWA and BCVI habitat are assessed on the basis of the area of potential habitat that occurs within and adjacent to the boundaries of voluntarily enrolled properties. Compensation for direct impacts to this habitat are assessed at a rate of two acres of mitigation for each acre impacted and indirect impacts are assessed at a rate of 0.5 acre of mitigation for each acre impacted. Participants purchase GCWA or BCVI conservation credits that are created by the SEP-HCP Administrator from acres of habitat protected in SEP-HCP preserves, whereby each acre of protected habitat yields one conservation credit. Credits will be sold for $4,000 per credit, which corresponds to $8,000 per acre of habitat directly impacted and $2,000 per acre of habitat indirectly impacted.

It is assumed that the GCWA and BCVI preserve systems will include some areas of non-habitat buffers and that the SEP-HCP Administrator will purchase 25 percent more land than it needs to generate the appropriate number of conservation credits. Therefore, at full implementation, the GCWA and BCVI preserve systems will include approximately 40,000 acres protected and managed for those species in perpetuity. The SEP-HCP Full Implementation Alternative assumes that the GCWA and BCVI preserve systems will be composed of large tracts acquired in relatively rural parts of the Plan Area.

Impacts to the Covered Karst Invertebrates will be assessed based on the distance of Covered Activities from known occupied karst features that occur within or adjacent to voluntarily enrolled properties. Unless and until the Service's draft downlisting criteria have been met for the Covered Karst Invertebrates occurring within a particular karst feature, evaluated on a region-by-region basis, Plan Participants will be required to avoid conducting Covered Activities within 750 feet of that occupied feature. If the draft downlisting criteria have been met for those species in that region, then compensation for incidental take would be assessed by participation fees of $40,000 for impacts between 345 to 750 feet of the feature entrance and $400,000 for impacts within 345 feet of the feature entrance. Plan Participants would be required to avoid conducting Covered Activities within designated Critical Habitat until the draft downlisting criteria for the affected species were met range-wide. Participants would be fully covered for incidental take of the Covered Karst Invertebrates that might occur as a result of activities conducted beyond 750 feet of the entrance to a known occupied karst feature, including any take associated with any previously unknown features encountered during construction. The SEP-HCP Full Implementation Alternative budgets for the acquisition and perpetual management of approximately 1,000 acres of new karst preserves, with an emphasis on acquiring new preserves that help achieve any unmet draft downlisting criteria for the Covered Karst Invertebrates. Given the location of potential karst habitats, it is assumed that these acres will be acquired in relatively urban parts of Bexar County.

This alternative is designed to meet the purpose and need and the biological goals and objectives for the Covered Species in a manner that is consistent with the issuance criteria for an incidental take permit under Section 10 of the ESA. Private and public funding levels are practicable and are likely to win political support from the Project Sponsors and encourage robust levels of voluntary participation; however, since five of the seven counties in the Plan Area formally requested to be removed from the Enrollment Area of the SEP-HCP and declined the opportunity to opt-in to the SEP-HCP, this alternative was eliminated from further consideration.

3.2.2 First Draft Alternative

The First Draft Alternative covers 12,000 acres of incidental take associated with the GCWA, and 4,000 acres associated with the BCVI, and all nine of the Bexar County listed karst invertebrates within a 7-county plan area (Table 3-1). The amount of incidental take authorization allocated to the First Draft Alternative would be similar to the amount allocated to the SEP-HCP Full Implementation Alternative; however, slightly more take authorization would be allowed for the karst invertebrates to address the additional two species occurring in the Alamo Heights Karst Fauna Region.

Participation in the First Draft Alternative would initially be limited to properties located within Bexar County or within any of the adjacent SEP-HCP sectors (excluding those sectors covering Comal County), unless or until other jurisdictions outside of Bexar County opt to become formal plan partners. However, the full amount of the plan's take authorization could be utilized within the initial Enrollment Area, even if no other jurisdictions become formal plan partners.

The First Draft Alternative would include reduced mitigation ratios for direct impacts to BCVI habitat and increased fees for GCWA and BCVI conservation credits. The First Draft Alternative also included a biological objective to acquire approximately 5,000 new acres of GCWA preserve within Bexar County or the adjacent SEP-HCP sectors (largely high-growth, suburban areas), which would be provided for in the funding plan.

With respect to the listed karst species, the First Draft Alternative would cover incidental take within 345 feet of a known occupied feature after regional downlisting criteria have been met for the affected species, but would require special conditions with potentially severe restrictions (including indefinite stoppage of covered activities and additional Service consultation) if participants encountered other karst features during construction. The First Draft Alternative would only cover take within designated critical habitat after two times the regional draft downlisting criteria were achieved for the affected species. Participation fees would be assessed for per acre impacts to potential karst zone habitat, in addition to fees for impacts within occupied cave zones (including 0 to 150 feet of a cave footprint and 150 to 345 feet of a cave footprint). The target size of the karst preserve system for the First Draft Alternative would be 2,400 acres, or approximately two high quality and four medium quality karst preserves in each of the six Karst Fauna Regions.

The First Draft Alternative does not adequately create a streamlined process for achieving ESA compliance for the Covered Karst Invertebrates, which is an important purpose for seeking a regional habitat conservation plan. The enrollment process for listed karst invertebrates would involve a complicated process of reevaluating the current status of the affected species with each new application and exposed participants in full compliance with their participation agreements to potentially indefinite suspensions of covered activities and additional consultation with the Service (see Table 3.1 for a list of these special conditions). These measures would have substantially eroded a participant's regulatory assurances in ways that conferred little benefit to the participant for having voluntarily enrolled in the plan. Therefore, this alternative was dismissed from further analysis.

3.2.3 CAC Workshop Alternative

The CAC Workshop Alternative is based on the First Draft Alternative, with the following adjustments: slightly reduced amount of maximum incidental take authorization (Table 3-1), a cap on the amount of incidental take authorization for the GCWA and BCVI that could occur in Bexar County, an increase to 2:1 for BCVI mitigation ratios, and a decrease in participation fees for GCWA and BCVI.

This alternative received tentative approval from the SEP-HCP's CAC members who participated in a day-long facilitated workshop held on June 15, 2011. However, the alternative did not receive official approval from the CAC at their July 11, 2011 meeting. As with the First Draft Alternative, the CAC Workshop Alternative would not provide a streamlined ESA compliance mechanism for karst species and would not have provided reliable regulatory assurances to voluntary plan participants. The enrollment process to take karst species will involve a re-evaluation of the current status of affected species with each new application, and additional USFWS consultation which could result in indefinite suspension of covered activities. This alternative was eliminated in favor of another CAC alternative which included increased mitigation (The Increased Mitigation Alternative).

3.2.4 Limited Karst Species Alternative

The Limited Karst Species Alternative is based on the SEP-HCP Full Implementation Alternative; however, it only includes incidental take authorization for the GCWA, BCVI, and three of the least rare listed karst invertebrates (*C. madla, R. infernales,* and *R. exilis*). Coverage would not be provided for any of the other six rarer listed karst invertebrates. Under this alternative, potential participants would need to demonstrate that their projects would not impact any of the six karst species not addressed by the plan. The participation process for this alternative would require participants to conduct karst faunal surveys in all caves and voids encountered in a project area, including features accidentally discovered during construction. Participants would be required to consult directly with the Service any time that non-covered karst species were found in, or were known to occur near their project area. Participants and the Service would determine on a case-by-case basis the most appropriate way to avoid taking the non-covered karst species or initiate a separate consultation to cover incidental take of those species not covered by the plan.

Like the karst enrollment process for the First Draft Alternative, the Limited Karst Species Alternative would substantially erode a participant's regulatory assurances in ways that confer little benefit to the participant for having voluntarily enrolled in the plan. Therefore, this alternative does not meet an important purpose for seeking a regional plan and it may not meet the Service's standards for issuance of an incidental take permit, so it was eliminated from further consideration.

3.2.5 Complete Coverage Alternative

The Complete Coverage Alternative is generally based on the First Draft Alternative, but assumes that all projected habitat losses for the GCWA, BCVI, and all nine listed karst invertebrates within the plan area over 30 years are covered for incidental take by the plan. This alternative would seek to achieve full compliance with the ESA for all anticipated habitat losses across the plan area over the next 30 years. The Complete Coverage Alternative also assumes that the conservation program achieves the equivalent of regional or range-wide recovery for all of the covered species. Detailed elements of the Complete Coverage Alternative are presented in Table 3-1.

To implement this alternative, it is assumed that participation in the plan would either be mandatory through a new regulatory process or that substantial public funding would be needed to provide automatic coverage for plan area residents, without relying on a voluntary enrollment process.
The level of mitigation proposed for the Complete Coverage Alternative and the target preserve sizes are based on the recommendations of the SEP-HCP's Biological Advisory Team (BAT) for the amount of conservation needed to achieve or substantially contribute to the recovery of these species. This alternative would also require at least 60 percent of the GCWA mitigation to be located in Bexar County

or within five miles of the county boundary.
The complete coverage alternative would require a level of funding that far exceeds the maximum extent practicable, both with respect to the fees assessed to individual participants and for the amount of public revenue needed to adequately ensure sufficient funding and, therefore, was not considered practicable and was eliminated from further study.

DESCRIPTION OF ALTERNATIVES CONSIDERED FOR DETAILED STUDY

3.2.6 No Action Alternative

NEPA regulations (section 1502.14(d)) require an EIS to include an alternative of no action. No action means "the proposed activity would not take place and the resulting environmental effects from taking no action would be compared with the effects of permitting the proposed activity or an alternative activity to go forward" (CEQ 1981). The No Action Alternative is defined as the conditions that can be expected if the Service does not issue an ITP to the Applicants for the SEP-HCP.

Under the No Action Alternative, compliance with the ESA will continue to occur on an individual basis through project-specific consultations with the Service. Local governments, business entities, private landowners, and others will independently determine whether or not ESA permitting is necessary for a project and, if needed, will work with the Service to obtain authorization for incidental take. Individual permitting actions will occur at the level and scope of an individual project. Mitigation requirements will be individually negotiated with the Service based on the level of impact to listed species and the maximum practicable mitigation options available to each individual applicant.

Individuals seeking an ITP from the Service for non-federal actions will prepare their own HCP and the Service will have to comply with NEPA on each ITP. Assembling the necessary project-related and species information, negotiating the details of the conservation program, and preparing the required documentation to apply for an ITP can take several years, depending on the circumstances of the individual project. The preparation of the appropriate documentation to support an individual permit application may require the developer to hire professional services including: biologists, NEPA professionals, legal counsel, and real estate professionals. Each application for incidental take will be individually reviewed before the issuance of a permit. Developers will be responsible for bearing all the costs of preparing the individual permit application package.

3.2.7 Common Characteristics of the Action Alternatives

The four Action Alternatives share several common characteristics:

ITP Process - All four Action Alternatives are an alternate means to comply with the ESA which will be administered by the Applicants.

Covered Species - All four Action Alternatives propose the incidental take of nine federally listed endangered species.

Enrollment Area - All four Action Alternatives contemplate an Enrollment Area that includes the jurisdictions of Bexar County and the City of San Antonio including its ETJ and the area where the City of San Antonio's ETJ will likely be expanded over the 30 year timeframe of the SEP-HCP (except in Comal County). Use of the SEP-HCP's incidental take authorization will be limited to Covered Activities conducted on properties within the Enrollment Area (**Figure 1-1**).

Covered Activities: All four Action Alternatives would authorize a limited amount of incidental take of the Covered Species for otherwise lawful construction activities conducted in the Enrollment Area. Examples of different types of non-federal projects or actions that will be Covered Activities include the following:

- The construction, use, and/or maintenance of public or private land development projects, including but not limited to single- and multi-family homes, residential subdivisions, farm and ranch improvements, commercial or industrial projects, government offices, and park infrastructure;
- The construction, maintenance, and/or improvement of roads, bridges, and other transportation infrastructure;
- The installation and/or maintenance of utility infrastructure, including but not limited to transmission or distribution lines and facilities related to electric, telecommunication, water, wastewater, petroleum or natural gas, and other utility products or services;
- The construction, use, maintenance, and/or expansion of schools, hospitals, corrections or justice facilities, and community service development or improvement projects;
- The construction, use, or maintenance of other public infrastructure and improvement projects (e.g., projects by municipalities, counties, school districts); and
- The construction, use, maintenance and/or expansion of quarries, gravel mining, or other similar extraction projects.

Direct and Indirect Impacts to GCWA and BCVI Species: All acres of suitable GCWA and BCVI habitat within the boundaries of a property to be enrolled are assumed to be directly impacted by Covered Activities, unless such habitat occurs within an area where habitat will be preserved and such habitat meets a minimum set of preserve criteria. All acres of suitable GCWA and BCVI habitat located up to 300 feet outside the boundaries of a property to be enrolled are assumed to be indirectly impacted by Covered Activities. The 300 feet assumption follows the rationale and approved practices of other approved HCPs in the region (USFWS 2010) and is the measure to account for potential indirect impacts to the species from Covered Activities, since the exact extent of potential indirect habitat losses or degradations from fragmentation or edge effects is unknown. This buffer takes into account the potential indirect effects associated with Covered Activities which may be associated with construction activities or other land use practices conducted within an Enrolled Property after the authorized habitat loss/degradation has occurred. Construction activities and other types of human land uses that cause noise or other disturbances can harass neighboring GCWAs or BCVIs. Human activities within Enrolled Properties can also cause changes to local populations of predator or competitor species, thereby degrading the adjacent habitat and harming adjacent individuals of the Covered Species.

Mitigation Measures for GCWA and BCVI: Preservation Credits will be created by the SEP-HCP for each acre of GCWA and BCVI habitat protected, such that each acre of protected habitat yields one Preservation Credit. All Action Alternatives assume that the GCWA and BCVI preserve systems will be composed of consolidated tracts (smaller tracts of land will be consolidated into larger tracts) and will include some areas of non-habitat; as such the SEP-HCP will purchase more land than needed to generate the appropriate number of Preservation Credits.

Direct and Indirect Impacts to Covered Karst Invertebrates: Direct impacts to known locations of Covered Karst Invertebrates will only occur once certain conservation baselines are met. The conservation baselines are derived from the Service's recovery standards for downlisting each of the

Covered Karst Invertebrates; these baselines include preservation of high and medium quality karst preserves (as described in the Service's *Karst Preserve Design Recommendations*) within each karst faunal region where each Covered Karst Invertebrate is currently known to occur (Service 2012). Without those conservation baselines, the landowner would have to maintain a minimum distance of 750 feet around the feature, including those features on adjacent properties that are within 750 feet. Additionally, each landowner would have to conduct extensive karst feature surveys on their property prior to applying to be covered under the SEP-HCP to identify any previously unknown features. Parcels in Karst Zones 1 through 4 could contain occupied features with no surface expression. Therefore, there is an expectation that direct and indirect impacts to previously unknown and undetectable subsurface features will occur upon clearing and construction. There is no way to know exactly what the extent of these impacts would be.

Mitigation Measures for Covered Karst Invertebrates: For all Action Alternatives, the SEP-HCP will establish new preserves with Covered Karst Invertebrates which will be distributed across the Bexar County KFR (except the Alamo Heights KFR). These preserves would be established in accordance with the Service's (2012) *Karst Preserve Design Recommendations* and would contribute to meeting recovery criteria for the Covered Karst Invertebrates.

Adaptive Preserve Management and Monitoring: The primary conservation measure for the Covered Species is the acquisition, permanent protection, and management of their habitats within the Plan Area. In order to ensure the permanent protection and management of Covered Species' habitat, the Applicants will establish an adaptive preserve management and monitoring process. This process includes establishing a baseline condition for each preserve, planning property-specific management strategies and practices, implementing management strategies and practices on an on-going basis, and evaluating the effectiveness of the management actions and adapting the management practices as needed. In addition, the HCP will contribute to the understanding of the biology, ecology and conservation of the Covered Species by providing access, on a limited basis, to preserves for research purposes.

Plan Administration: All Action Alternatives will require the Applicants to develop and follow an administrative process. The specific roles and responsibilities of each Applicant will be detailed in an Interlocal Agreement between Bexar County and the City of San Antonio. It is expected that Bexar County will be responsible for most of the tasks needed to implement the HCP, including enrolling Participants, acquiring and managing the preserve system, and coordinating with the Service. The City of San Antonio is expected to provide approximately 50 percent of the public funding needed to support the implementation of the Plan.

The Applicants may convene at least two standing advisory committees to provide on-going input on the implementation of the HCP: a scientific advisory committee and a stakeholder advisory committee. The operational rules for these committees will include opportunities for regular public involvement. Public input may also be received via other special public meetings or hearings called by the Applicants. The HCP would include a number of reporting and coordination tasks to demonstrate that the Plan is being properly implemented. Annual reports on Plan enrollment, the preserve system, monitoring activities, financial status, and compliance issues will be submitted to the Service. Regular coordination with the Service regarding the enrollment of new Participants, new preserve acquisitions, adaptive preserve management, and secondary uses of preserve lands is also expected. Upon request the annual

reports will be made available to federal and state agencies and the public in compliance with 40 CFR 1505.3.

Cost Estimates: The cost estimates for all Action Alternatives assume that the entire allocation of incidental take authorization will be used by the Participants within the 30-year timeframe of the ITP. As such, the cost estimates represent the maximum costs for acquisition of preserve land; HCP administration; preserve management, monitoring, and other conservation measures; as well as contributions to a contingency fund and management endowment.

Financing Options
All four Action Alternatives will require some level of public funding. The Applicants will be responsible for providing this public funding.

3.2.8 Proposed SEP-HCP Alternative

The Proposed SEP-HCP Alternative assumes 50 percent of the development activities requiring an ITP for the Covered Species over the next 30 years will participate in the SEP-HCP. This participation percentage is based on other regional HCPs in the region for similar species that have shown this to be an appropriate estimate (for example Williamson County's and Comal County's RHCPs) and . This amount represents 50 percent of the projected GCWA and BCVI habitat loss and 20 percent of loss of potential habitat for the Covered Karst Invertebrates resulting from land development projects within the Enrollment Area over the next 30 years (**Table 3-2**).

Table 3-2: Take Request, Proposed Conservation & Mitigation – Proposed SEP-HCP Alternative

Covered Species	Take Request	Proposed Conservation	Participation Fees & Mitigation Requirement
GCWA	9,371 acres	23,430 acres of preserve Goal to acquire preserve land in Bexar County	$4,000 per credit 2:1 mitigation ratio for direct impacts 0.5:1 mitigation ratio for indirect impacts
BCVI	2,640 acres	6,600 acres of preserve Goal to purchase preserve land in Bexar County	$4,000 per credit 2:1 mitigation ratio for direct impacts 0.5:1 mitigation ratio for indirect impacts
Covered Karst Invertebrates	10,234 acres (Zone 1 & 2) 10,852 acres (Zone 3 & 4) 49 occupied features	1,000 acres distributed across Bexar karst zones (excludes Alamo Heights KFR) *Note: It's likely that the 1,000 acres will be distributed over Karst Zones 1 & 2, based on the unlikelihood that Recovery Quality Karst Preserve will be found in Karst Zones 3 &4.*	Avoid activity within 750 feet until a certain number of preserves needed to achieve the conservation baseline for that species are met. $400,000 in Occupied Cave Zone A (0 to 345 feet radius) $40,000 in Occupied Cave Zone B (345 to 750 feet radius)

Source: SEP-HCP 2015.

The total estimated cost to implement the Proposed SEP-HCP Alternative is $299,474,000 over the life of the permit of which 74 percent will be paid for through participation fees and 26 percent will be

sourced from public funding. Sources of public funding could include impact fees, grants, sales tax revenue, tax increment finance zones (TIFs), or other real estate transfer taxes.

3.2.9 10% Participation Alternative

The 10% Participation Alternative represents the alternative with a reduced amount of take. It assumes 10 percent of the development activities requiring an ITP for the Covered Species over the next 30 years will participate in the SEP-HCP. The incidental take request represents 10 percent of the projected GCWA and BCVI habitat loss and 10 percent of the loss of Karst Zones 1-4 resulting from development within the Enrollment Area over the next 30 years (**Table 3-3)**.

Table 3-3: Take Request, Proposed Conservation & Mitigation – 10% Participation Alternative

Covered Species	Take Request	Proposed Conservation	Participation Fees & Mitigation Requirement
GCWA	2,100 acres	5,250 acres of preserve	$4,000 per credit 2:1 mitigation ratio for direct impacts 0.5:1 mitigation ratio for indirect impacts
BCVI	556 acres	1,390 acres of preserve	$4,000 per credit 2:1 mitigation ratio for direct impacts 0.5:1 mitigation ratio for indirect impacts
Covered Karst Invertebrates	5,117 acres (Zone 1 & 2) 5,426 acres (Zone 3 & 4) 25 occupied features	750 acres distributed across Bexar karst zones concentrated in Zones 1 & 2 (excludes Alamo Heights KFR)	Avoid activities within 750 feet Avoid, minimize, mitigate to maximum practicable extent
			$400,000 in Occupied Cave Zone A (0 to 345 feet radius) $40,000 in Occupied Cave Zone B (345 to 750 feet radius)

Source: SEP-HCP 2015.

The total estimated cost to implement the 10% Participation Alternative is $131,060,000 over the life of the permit of which 47 percent will be paid for through participation fees and 53 percent will be sourced from public funding.

3.2.10 Single-County Alternative

The Single-County Alternative proposes the preserve system will be located within Bexar County and within 10 miles of the Bexar County border. This mitigation requirement was modeled after other single-county HCPs in Central Texas, such as the Williamson County HCP. This alternative proposes the same amount of take for the Covered Species as the Proposed SEP-HCP Alternative; however, it proposes one-half of the preserve for GCWA and BCVI and greater participation fees. The reduced conservation levels are based on a 1-to-1 direct impact mitigation ratio (**Table 3-4**). This alternative will have higher costs per acre of habitat preserve than the other Action Alternatives because the land in Bexar County has a higher appraisal value.

The total estimated cost to implement the Single-County Alternative is $564,010,000 over the life of the permit of which 46 percent will be paid for through participation fees and 54 percent will be from public funding.

Table 3-4: Take Request, Proposed Conservation & Mitigation – Single-County Alternative

Covered Species	Take Request	Proposed Conservation	Participation Fees & Mitigation Requirement
GCWA	9,371 acres	11,714 acres of preserve Requires all preserves to be within Bexar County or within 10 miles of the county border	$10,000 per credit 1:1 mitigation ratio for direct impacts 0.5:1 mitigation ratio for indirect impacts
BCVI	2,640 acres	3,300 acres of preserve Requires all preserves to be within Bexar County or within 10 miles of the county border	$10,000 per credit 1:1 mitigation ratio for direct impacts 0.5:1 mitigation ratio for indirect impacts
Covered Karst Invertebrates	10,234 acres (Zone 1 & 2) 10,852 acres (Zone 3 & 4) 49 occupied features	1,000 acres distributed across Bexar karst zones but concentrated in Zones 1 & 2 (excludes Alamo Heights KFR)	Avoid activity within 750 feet until a certain number of preserves needed to achieve the conservation baseline for that species are met. $400,000 in Occupied Cave Zone A (0 to 345 feet radius) $40,000 in Occupied Cave Zone B (345 to 750 feet radius)

Source: SEP-HCP 2015.

3.2.11 Increased Mitigation Alternative

The Increased Mitigation Alternative incorporates input received from the CAC and the BAT. These advisory groups suggested greater protection measures for some of the Covered Species than the other Action Alternatives. This includes higher proposed habitat conservation for the GCWA, and two times that suggested in the Proposed SEP-HCP for the Covered Karst Invertebrates. The advisory groups also suggested that 60 percent of the GCWA preserve should be within Bexar County and within 5 miles of the county border. Like the Proposed SEP-HCP Alternative, the Increased Mitigation Alternative assumes 50 percent of the development activities requiring an ITP for the Covered Species over the next 30 years will participate in the SEP-HCP which represents 50 percent of the projected GCWA and BCVI habitat loss and 20 percent of the loss of Karst Zones 1-4 resulting from development within the enrollment area over the next 30 years (**Table 3-5**).

Table 3-5: Take Request, Proposed Conservation & Mitigation – Increased Mitigation Alternative

Covered Species	Take Request	Proposed Conservation	Participation Fees & Mitigation Requirement
GCWA	9,371 acres	35,141 acres of preserve Requires 60 percent (21,085 acres) to be within Bexar County or within 5 miles of the county border	$5,500 per credit 3:1 mitigation ratio for direct impacts 0.5:1 mitigation ratio for indirect impacts
BCVI	2,640 acres	6,600 acres of preserve	$5,500 per credit 2:1 mitigation ratio for direct impacts 0.5:1 mitigation ratio for indirect impacts
Covered Karst Invertebrates	10,234 acres (Zone 1 & 2) 10,852 acres (Zone 3 & 4) 49 occupied features	2,000 acres distributed across Bexar karst zones (excludes Alamo Heights KFR)	Avoid activity within 750 feet until 2 times the number of preserves needed to achieve the conservation baseline for that species is met. $400,000 in Occupied Cave Zone A (0 to 345 feet radius)

Covered Species	Take Request	Proposed Conservation	Participation Fees & Mitigation Requirement
			$40,000 in Occupied Cave Zone B (345 to 750 feet radius)

Source: SEP-HCP 2015.

The total estimated cost to implement the Increased Mitigation Alternative is $1,122,090,000 over the life of the permit of which 37 percent will be paid for through participation fees and 63 percent will be sourced from public funding.

3.3 COMPARISON OF PROPOSED ALTERNATIVES

Table 3-6: Comparison of Proposed Alternatives

Covered Species	No Action Alternative	Proposed SEP-HCP Alternative	10% Participation Alternative	Single-County Alternative	Increased Mitigation Alternative
Incidental Take Request					
GCWA	Compliance with the ESA will continue to occur on an individual basis through project-specific consultations with the Service. Applicants will independently determine whether or not ESA permitting is necessary for a project and, if needed, will work with the Service to obtain authorization for incidental take.	9,371 acres	2,100 acres	9,371 acres	9,371 acres
BCVI		2,640 acres	556 acres	2,640 acres	2, 640 acres
Covered Karst Invertebrates		10,234 acres (Zone 1 & 2) 10,852 acres (Zone 3 & 4) 49 occupied features	5,117 acres (Zone 1 & 2) 5,426 acres (Zone 3 & 4) 25 occupied features	10,234 acres (Zone 1 & 2) 10,852 acres (Zone 3 & 4) 49 occupied features	10,234 acres (Zone 1 & 2) 10,852 acres (Zone 3 & 4) 49 occupied features
Proposed Conservation					
GCWA	Individual permitting actions will occur at the level and scope of an individual project. Mitigation requirements will be individually negotiated with the Service. Possible forms of mitigation could include on-site conservation of habitat, acquisition of off-site preserve lands, or purchase of Preservation Credits from an independent Service-approved conservation bank.	23,430 acres	5,250 acres	11,714 acres (Bexar County or within 10 miles)	35,141 acres 21,085 acres in Bexar County or within 5 miles 14,056 acres in mostly rural areas
BCVI		6,600 acres	1,390 acres	3,300 acres (Bexar County or within 10 miles)	6,600 acres
Covered Karst Invertebrates		1,000 acres	750 acres	1,000 acres	2,000 acres

Covered Species	No Action Alternative	Proposed SEP-HCP Alternative	10% Participation Alternative	Single-County Alternative	Increased Mitigation Alternative
Participation Fees					
GCWA	Compliance with the ESA will continue to occur on an individual basis through project-specific consultations with the Service. Applicants will be responsible for bearing all the costs of preparing the individual permit application package.	$8,000 per acre (Direct Impacts) $2,000 per acre (Indirect Impacts)	$8,000 per acre (Direct Impacts) $2,000 per acre (Indirect Impacts)	$10,000 per acre (Direct Impacts) $5,000 per acre (Indirect Impacts)	$16,500 per acre (Direct Impacts) $2,750 per acre (Indirect Impacts)
BCVI		$8,000 per acre (Direct Impacts) $2,000 per acre (Indirect Impacts)	$8,000 per acre (Direct Impacts) $2,000 per acre (Indirect Impacts)	$10,000 per acre (Direct Impacts) $5,000 per acre (Indirect Impacts)	$11,000 per acre (Direct Impacts) $2,750 per acre (Indirect Impacts)
Covered Karst Invertebrates		$40,000 (345 to 750 ft. radius), $400,000 (0 to 345 ft. radius)			
Total Costs and Revenue Sources					
Total SEP-HCP Cost	The No Action will not result in costs beyond those that an individual incurs to comply with ESA, nor will it generate revenues.	$299,474,000	$131,060,000	$564,010,000	$1,122,090,000
Participation Fees		74%	47%	46%	37%
Public Funding		26%	53%	54%	63%

Source: SEP-HCP 2015.

CHAPTER 4

AFFECTED ENVIRONMENT & ENVIRONMENTAL CONSEQUENCES

4.1 THE AFFECTED ENVIRONMENT

The description of the affected environment establishes the current environmental conditions considered by the Service to be potentially affected by the Proposed Action. In order to provide a succinct description of those resources that may be affected by the Proposed Action and a level of analysis that is commensurate with the importance of the impact, some resources and topics are analyzed in detail and others are considered but eliminated from further study. As stated in CEQ regulation 40 CFR 1502.2(b), a succinct discussion shall be provided for the issues and topics that were considered but dismissed from detailed study, describing why more study is not warranted. The following provides a brief discussion of the issues and resources considered but dismissed from detailed analysis followed by the resources analyzed in detail.

4.1.1 Issues and Resources Considered but Dismissed from Detailed Analysis

Several of the resources listed below could be affected by individual land development or land use activities conducted in the Plan Area; however, the Proposed Action cannot be shown to cause such impacts, even indirectly, because the same activities could, and will likely, continue with or without the implementation of the SEP-HCP. Therefore, issuance of an ITP with the SEP-HCP is not likely to cause more than negligible impacts to the following resources.

Energy and Depletable Resource Requirements and Conservation Potential

The Proposed Action does not include an energy or resource extraction component and will not require energy or resources to be depleted; therefore, this topic is dismissed from detailed analysis.

Prime and Unique Farmlands

The *Farmland Protection Policy Act* (FPPA), Subtitle I of Title XV of the *Agricultural and Food Act of 1981*, Pub. L. 97-98, provides protection to prime and unique farmlands. Prime and unique farmlands are defined by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) as "land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops" (NRCS 2011). The purpose of the FPPA is to minimize the extent to which federal programs contribute to the unnecessary and irreversible conversion of prime, unique, and other farmlands of statewide or local importance to non-agricultural uses.

According to the NRCS soil data there is prime farmland in the Plan Area located primarily east of the Balcones Escarpment; which is typically delineated by the I-35. In analyzing the impacts of the Proposed Action on prime and unique farmlands, consideration is given to the impacts of taking Covered Species habitat as well as conserving habitat. Suitable habitat for the Covered Species includes woodland, shrubland, and Karst Zones 1-4. These habitats are not generally used for agricultural production; woodlands and shrubland habitats are sometimes used as rangeland. The Covered Activities could impact prime and unique farmland; however, these impacts would be minimal because there is little prime farmland that overlaps the Covered Species habitat in the Enrollment Area. The incidental inclusion of prime farmlands into the preserve system will not convert the use of the land to a non-

agricultural purpose. As such the Proposed Action is not anticipated to have an effect on prime and unique farmlands.

Public Health and Safety

The Proposed Action will not likely detract from or contribute to public health or safety. While there may be an expectation that preserve lands, purchased by public entities, will have some level of public access, the primary purpose of the preserve system is for the long-term conservation of the Covered Species. Secondary use of preserve lands will not be authorized if the use will have a reasonable likelihood of materially reducing the long-term conservation value of the protected habitat for the Covered Species. As such, it is unlikely that public recreational use of the preserve system for public health purposes will be authorized. The effects to public health and safety are dismissed from further analysis.

Wetlands and Floodplains

Wetlands and floodplains are generally associated within the water resources in the Plan Area, which are discussed in more detail in **Section 4.3.**

Activities causing the loss of suitable habitat for the Covered Species or the designation of preserve lands could affect wetlands and floodplains where these resources overlap such activities. However the potential for overlap is slight because suitable habitat for the Covered Species does not typically occur in wetland or floodplain areas. And, the incidental inclusion of wetlands and floodplains within the preserve system will protect such resources from future land development.

Wetlands and all waters of the U.S. are protected by section 404 of the *Clean Water Act*, which is administered by the U.S. Army Corps of Engineers (the Corps). Projects that affect jurisdictional wetlands or waters of the U.S. may be required to obtain a permit from the Corps prior to construction and may be required to provide compensatory mitigation to offset any adverse environmental effects. As one of its responsibilities, the Federal Emergency Management Agency (FEMA) manages the National Flood Insurance Program (NFIP) and oversees the floodplain management and mapping components of the program. NFIP was created by the *National Flood Insurance Act of 1968* to provide an insurance alternative to government-sponsored disaster assistance to help pay for damages that result from flooding. In order to participate, local jurisdictions must adopt a floodplain management ordinance to manage construction activities within special flood hazard areas (SFHA), which include floodplains. All seven counties and several local jurisdictions in the Plan Area participate in NFIP and have established an authority, through the adoption of a flood damage prevention court order, to monitor and permit development within floodplains. The Bexar Regional Watershed Management Program is a collaborative effort between Bexar County, the City of San Antonio, the San Antonio River Authority and other suburban jurisdictions to manage watershed issues including flood control within the region. All projects occurring within the Plan Area, including those that might enroll in the SEP-HCP must comply with all applicable regulations regarding wetlands and floodplains. Because wetlands and floodplains are already protected by existing regulations, the Proposed Action is not expected to have an impact, and as such, these resources are not analyzed in detail.

Cultural Resources

Projects that are federally permitted, licensed, funded, or partially funded with federal money must comply with section 106 (36 CFR 800.16) of the *1966 National Historic Preservation Act* (NHPA). Section 106 requires that every federal agency consider the impacts of their actions on historic properties.

According to section 106 of the NHPA, 'historic properties' include those that are at least fifty years old and that are listed on or eligible for inclusion in the National Register of Historic Places (NRHP). This includes both historic properties and archeological properties. The NRHP, which is maintained by the Secretary of the Interior, is a historic resources inventory that includes buildings, structures, objects, sites, and districts. Section 106 also requires federal agencies to seek comments from an independent reviewing agency, the Advisory Council on Historic Preservation (ACHP). The ACHP has developed a process for carrying out section 106 responsibilities which is defined in its regulations entitled Protection of Historic Properties, 36 CFR 800. The NHPA also provides for the designation and appointment of a State Historic Preservation Officer (SHPO) in each state to administer the state's historic preservation program of maintaining inventories of historic properties and authorizes Native American tribal organizations to assume all or part of SHPO functions with regard to tribal historic preservation and heritage. The SHPO and Tribal Historic Preservation Officers (THPO) must be consulted with on federal undertakings that may affect historic properties. In Texas the state historic preservation program is administered by the Texas Historical Commission (THC). The THC also maintains a list of federally-recognized Indian tribes who have concerns in the state of Texas.

In addition to federal regulations, cultural resources located on land owned or controlled by the State of Texas, one of its cities or counties, or other political subdivisions, are protected by the Texas Antiquities Code (TAC). Cultural resources may include archeological, historic, architectural sites, and places of particular significance to traditional cultures. Under the TAC, any historic or prehistoric property located on publicly-owned or other lands under the jurisdiction of the State of Texas may be determined eligible as a State Antiquities Landmark (SAL). Conditions for formal landmark designation are covered in Chapter 26 of the SHPO/THC's *Rules of Practice and Procedure for the Antiquities Code of Texas*. All groundbreaking activities affecting public land must be authorized by the THC Department of Antiquities Protection. Authorization includes a formal Antiquities permit, which stipulates the conditions under which survey, discovery, excavation, demolition, restoration, or scientific investigations will occur.

In Texas, archeological and historical properties that are on private property are not protected by federal or state law, unless a federal undertaking is involved, or a subdivision of the state has jurisdiction through an easement or ownership. As previously stated, state public lands are under the purview of the TAC. As the preserve system established under the SEP-HCP will be administered by and under the jurisdiction of the Applicants, any cultural resources eligible for SAL designation on these lands will be protected under the TAC. Moreover, any significant historic or archeological resources on enrolled properties will be protected by the NHPA. However, since historical and archeological resources are location specific and enrolled properties and preserve lands are not identified in the SEP-HCP, the effects of the Proposed Action on cultural resources cannot be determined.

In order to determine whether American Indian tribes show an interest within the 7-county plan area, the THC's web-site was consulted (THC 2015). The website includes a list of federally-recognized Native American tribes affiliated with Texas, and eight tribes have provided maps exhibiting counties with

tribal cultural affiliations. The list identifies 11tribes with cultural affiliation to the 7-county plan area. A letter was sent to each of the tribes to initiate consultation. One tribe responded to the letter: The Caddo Nation of Oklahoma. The response stated that they had no concerns within the Plan Area. The letter and a list of contacted tribes are in **Appendix F**.

SEP-HCP Participants and Applicants will have to comply with federal and state laws protecting cultural resources. It will be their responsibility to conduct inventories, consider the effects of permitting and maintenance on cultural resources within the Enrollment Area and within preserves, and consult with the THC and Native American tribes on historical, archaeological and other culturally sensitive sites.

Since these laws provide protection for cultural resources both within preserves and on permitted land, and the location of such lands cannot be identified further, analysis of impacts to cultural resources is not conducted in this EIS.

Geology

The geology of the Plan Area includes Cretaceous limestone and Quaternary alluvial terrace deposits. The Cretaceous rock includes limestone of the Edwards Aquifer and confining units above and below the primary water bearing units of the Edwards Group and Georgetown Formation. Other significant aquifer units in the local region include the Trinity Aquifer, consisting of older Cretaceous limestone, primarily in the Glen Rose Formation, and to a lesser extent some usable groundwater is found in the Austin Chalk in rocks younger than the Edwards Group. In areas with significant surface water streams, alluvial terrace and associated clastic sediments provide a thin cover over the limestone.

Impacts to geology are not addressed except as they pertain to groundwater. Texas Commission on Environmental Quality (TCEQ) regulations protect groundwater resources and the geologic features that provide recharge, including caves. If a construction project would impact a cave that does not provide recharge, the TCEQ regulations prescribe that these caves be filled. Because there are existing rules that regulate geology, as it pertain to groundwater, the SEP-HCP would not result in an impact. Impacts to groundwater resources are addressed in the water resources analysis below.

Air Quality

Air pollution may contribute to adverse human health impacts and ecosystem degradation. Major sources of air pollution come from point sources, such as stationary industrial, commercial, and construction and mining equipment and non-point sources such as lawn and garden equipment and motor vehicles. The *Clean Air Act of 1970* (CAA), as amended, resulted in requirements to consider the impact that proposed federal actions may have on air quality. Under the CAA, the EPA sets national ambient air quality standards (NAAQS) for seven air pollutants to protect public health and the environment, with an adequate margin of safety: carbon monoxide (CO), ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter, 10 and 2.5 microns and less (PM_{10} and $PM_{2.5}$) and lead (Pb). EPA delegated authority for monitoring and enforcing air quality regulations in Texas to the TCEQ Office of Air Quality.

In 2002 there were 13 regions in the state of Texas that were not in attainment with the 8-hour ozone standard including the San Antonio region (Bexar and Comal counties). As such the state of Texas, along with 33 other states, submitted an agreement to the EPA pledging to meet the 1997 8-hour ozone standard earlier than required. The most significant milestone in this agreement was that the State had to be in attainment by December 31, 2007, based on air quality data from 2005, 2006, and 2007. The San

Antonio region submitted a plan or early action compact (EAC) in 2004 to demonstrate achievement of the ozone standards to TCEQ for inclusion in the State Implementation Plan.

On April 15, 2008, the EPA issued final action which designated the San Antonio EAC area as in attainment with the 8-hour ozone standard; the San Antonio region had met all the milestones of their EAC program and demonstrated attainment of the eight-hour ozone standard by the December 31, 2007 deadline. Provided that the area continues to monitor their attainment status no further action is required. However, the EPA has been contemplating a reduction in the eight-hour ozone standard and is in the process of gathering input from the agency's science advisors. Upon enactment of a new standard, it is possible that the San Antonio region will no longer be in attainment with the eight-hour ozone standard. As such, actions, including the Covered Activities, which could result in impacts to air quality, are of concern.

The conservation of habitat for the Covered Species could result in beneficial impacts to air quality. Conservation of open space has been shown to improve air quality by protecting the plants that naturally create oxygen and filter out air pollutants such as ozone, sulfur dioxide and carbon monoxide (Sherer 2003; Coder 1996). However the extent of these benefits is largely tied to location of the open spaces as well as the density and type of vegetation. At this time, the location of habitat preserve lands, and the size of the preserve tracts has not been identified for the proposed SEP-HCP and as such, the effects of the Proposed Action on air quality cannot be measured, although they are expected to be negligibly beneficial. The issuance of the Permit cannot be shown to cause air quality impacts, even indirectly, because ESA compliance and conservation of habitat will occur whether or not the SEP-HCP is implemented.

The Covered Activities contemplated in the SEP-HCP could have an adverse effect on air quality such as from the temporary use of heavy machinery and other construction activities, and the removal of existing vegetation. However, the magnitude of any potential effects from machinery or burning activities related to the clearing of habitat for the Covered Species would be negligible, since these types of activities already occur in the SEP-HCP Plan Area for agricultural and development activities, and would be temporary in nature. The Proposed Action is not a prerequisite for or a catalyst to land development activities; land development is anticipated to occur whether or not the SEP-HCP is implemented; therefore, the impacts of the Proposed Action on air quality will be negligible.

Nevertheless, although the San Antonio area is currently in attainment of all NAAQS, it is vulnerable to being designated as nonattainment for ozone in the next few years. In addition to the long-range planning initiatives for managing congestion, the Alamo Area Council of Governments has applied to and been accepted by EPA into the EPA Ozone Advance program. The advance program is a collaborative effort between EPA, states, and local governments to enact expeditious emission reductions to help near nonattainment areas remain in attainment of the NAAQS. This further reflects the sensitivity of ozone levels in the area, and the need for federally funded or permitted projects in the San Antonio area to consider emissions which contribute to the formation of ozone.

Because of the air quality concerns of significant population centers within the Plan Area, EPA recommends certain mitigation measures to reduce potential short-term air quality impacts associated with construction activities, and that these measures are included in a Construction Emissions Mitigation Plan (CEMP). These measures are expected to reduce impacts associated with emissions of NO_2, CO, PM, $S0_2$, and other pollutants from construction-related activities and include:

Fugitive Dust Source Controls:

- Stabilize open storage piles and disturbed areas by covering and/or applying water
- or chemical/organic dust palliative where appropriate at active and inactive sites during workdays, weekends, holidays, and windy conditions;
- Install wind fencing and phase grading operations where appropriate, and operate water trucks for stabilization of surfaces under windy conditions; and
- Prevent spillage when hauling material and operating non-earthmoving equipment and limit speeds to 15 miles per hour. Limit speed of earth-moving equipment to 10 miles per hour.

Mobile and Stationary Source Controls:

- Plan construction scheduling to minimize vehicle trips;
- Limit idling of heavy equipment to less than 5 minutes and verify through unscheduled inspections;
- Maintain and tune engines per manufacturer's specifications to perform at EPA certification levels, prevent tampering, and conduct unscheduled inspections to ensure these measures are followed;
- If practicable, utilize new, clean equipment meeting the most stringent of applicable Federal or State Standards. In general, commit to the best available emissions control technology. Tier 4 engines should be used for project construction equipment to the maximum extent feasible;
- Lacking availability of non-road construction equipment that meets Tier 4 engine standards, the responsible agency should commit to using EPA-verified particulate traps, oxidation catalysts and other appropriate controls where suitable to reduce emissions of diesel particulate matter and other pollutants at the construction site; and
- Consider alternative fuels and energy sources such as natural gas and electricity (plug-in or battery).

Administrative Controls:

- Prepare an inventory of all equipment prior to construction and identify the suitability of add-on emission controls for each piece of equipment before groundbreaking;
- Develop a construction traffic and parking management plan that maintains traffic flow and plan construction to minimize vehicle trips; and
- Identify sensitive receptors in the project area, such as children, elderly, and infirmed, and specify the means by which impacts to these populations will be minimized (e.g. locate construction equipment and staging zones away from sensitive receptors.

Compliance with the EPA, as well as other federal and state laws, will be necessary regardless of the Proposed Action. Additionally, land development activities are expected to continue regardless of whether or not the SEP-HCP. Therefore, impacts associated with the Proposed Action cannot be shown to cause such impacts.

Noise

Land development activities, including the removal or alteration of vegetation with heavy machinery, could temporarily add to the ambient noise levels. As such, development projects enrolled in the SEP-HCP may also result in noise impacts; however, the magnitude of these potential effects are expected to be negligible, and any increases in ambient noise resulting from clearing activities will be temporary in

nature. Land development activities are expected to continue regardless of whether or not the SEP-HCP is implemented and impacts associated with the Proposed Action cannot be shown to cause such impacts.

Environmental Justice

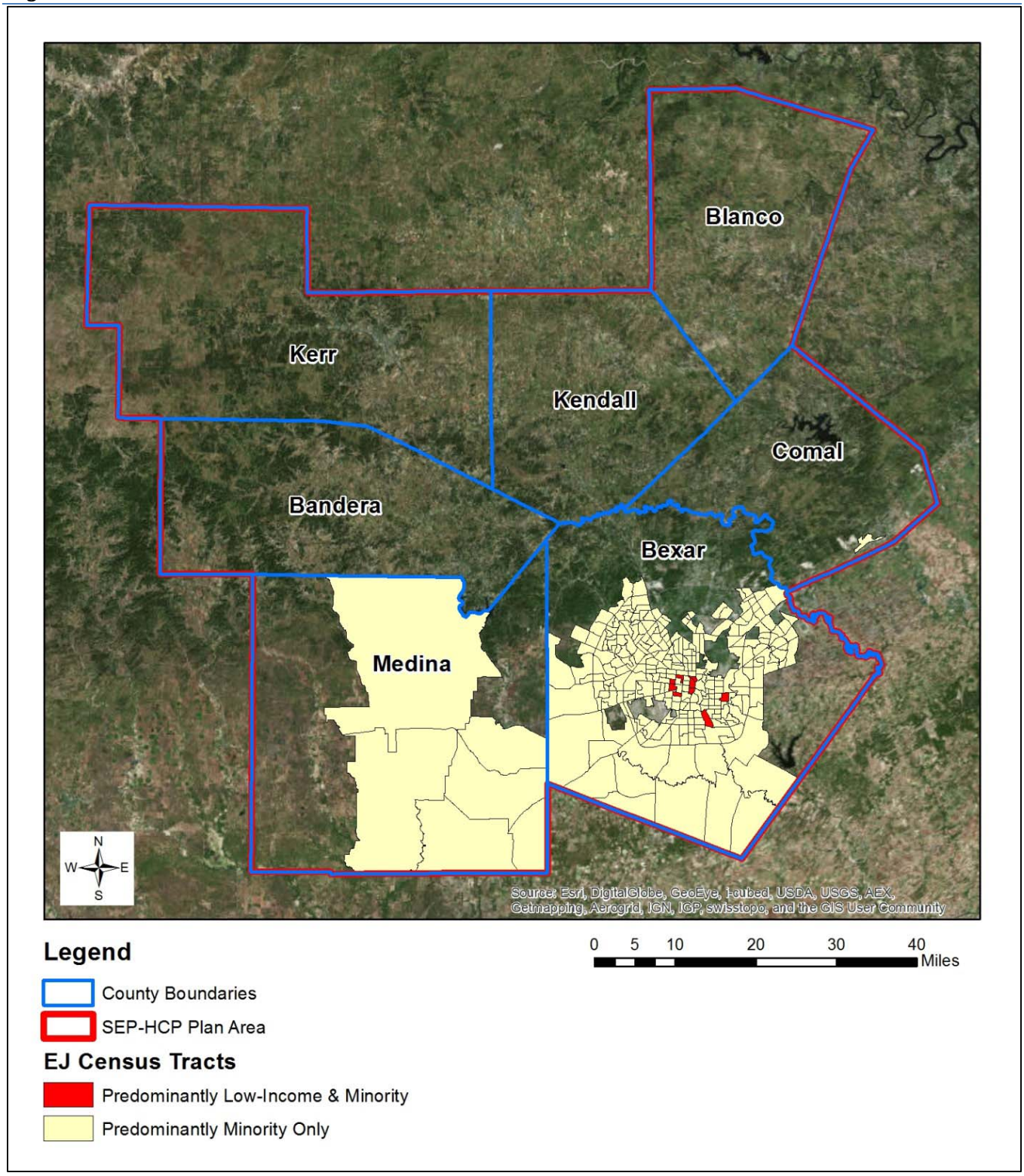
Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, provides that "each federal agency shall make achieving Environmental Justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental impacts of its programs, policies, and activities on minority and low-income populations" (Federal Register 1994). Minority and low-income populations do live in the Plan Area. Data from the 2010 Census shows that almost 2 million people live in the Plan Area of which 64.5 percent, or almost 1.28 million people, are minority.

The minority population accounts for 19.1 percent of the population in Bandera County; 69.7 percent in Bexar County; 20.6 percent in Blanco County; 28.7 percent in Comal County; 22.9 percent in Kendall County; 27.8 percent in Kerr County; and 53.5 percent in Medina County (USCB 2010a). Of the 421 Census tracts in the Plan Area, 290 contain a population that is greater than 50 percent minority. These 290 Census tracts are predominantly located in the south and central region of Bexar County and the southeast and central region of Medina County (see **Figure 4-1**).

Based on the 2009 to 2013 5-year American Community Survey conducted by the USCB, more than 131,000 people surveyed in the Plan Area, or 19.4 percent, earn an income that is less than the 2012 poverty guidelines for a 3-person household, as established by the U.S. Department of Health and Human Services and are considered low-income (USCB 2013; USDHHS 2015). The 2013 median household income in the Plan Area was: Bandera County ($49,215); Bexar County ($50,112); Blanco County ($49,487); Comal County ($65,839); Kendall County ($73,790); Kerr County ($43,601); and Medina County ($55,326) (USCB 2013). The average household size in the Plan Area is three people per household. According to the US Department of Health and Human Services, the 2015 poverty guideline for a three-person household is $20,090. Of the 421 Census tracts in the Plan Area, 9 have a median household income that is below the $20,090 poverty guideline. These tracts are located within the urban core of San Antonio as shown in **Figure 4-1**.

The implementation of the SEP-HCP would extend incidental take authorization to development projects that qualify (projects that contain suitable habitat for the Covered Species located within the Enrollment Area) and the preservation of habitat as mitigation in the Plan Area. The SEP-HCP would have no significant influence on the type, amount, timing or location of land development anticipated over the next 30 years; its only influence would be to facilitate compliance with the ESA for qualified projects in a more timely and cost-effective fashion when compared with the process for project-by-project compliance. **Figure 4-2** highlights the areas where potential habitat may exist in the Plan Area for the Covered Species relative to the areas that are predominantly minority. Those areas that are predominately low income and minority do not overlap with Covered Species habitat; therefore, no impacts from the Proposed Action are expected to affect them. The development projects that could voluntarily make use of the SEP-HCP as a means to comply with the ESA would be limited to areas with suitable habitat for the Covered Species that occur in the Enrollment Area.

Figure 4-1: EJ Census Tracts in the Plan Area



Source: USCB 2010 and 2013.

The preservation of suitable habitat for the purposes of mitigation could occur throughout the Plan Area. While some potentially suitable habitat in the Plan Area overlaps areas that are predominantly minority, most potentially suitable habitat for the Covered Species is located in areas that are not predominantly minority. As such, the effects of the enrolled development projects and the preservation lands would be predominantly borne by non-environmental justice populations and would not result in disproportionately high and adverse impacts to low-income or minority populations.

Another environmental justice issue considered is impacts to places important to Native American tribes. There are no federally recognized Native American tribes in the Plan Area; however, there are numerous tribes which have historical ties to Central Texas, including the Plan Area. Consultation with Native American tribes affiliated with the Plan Area is addressed in **Section 4.1.1 - Cultural Resources**. SEP-HCP Participants and the Applicants will have to comply with federal and state laws protecting traditional cultural places, as well as other cultural resources.

Studies have suggested that the conservation of open space could have the effect of increasing property values of the surrounding land (McConnell and Walls 2005). In addition, the effects associated with land development activities could adversely affect environmental justice populations. These effects however are not likely to adversely impact environmental justice populations in the SEP-HCP Plan Area because minority or low-income populations live predominantly in the urbanized area of Bexar County and central and southern Medina County and largely in areas that do not overlap Covered Species' habitat. The adverse effects of the Covered Activities would impact all people, environmental justice populations and non-environmental justice populations alike. As such, the Covered Activities and the acquisition of preserve lands will not result in disproportionately high and adverse human health or environmental impacts to environmental justice populations; therefore, environmental justice is dismissed from detailed analysis in this EIS.

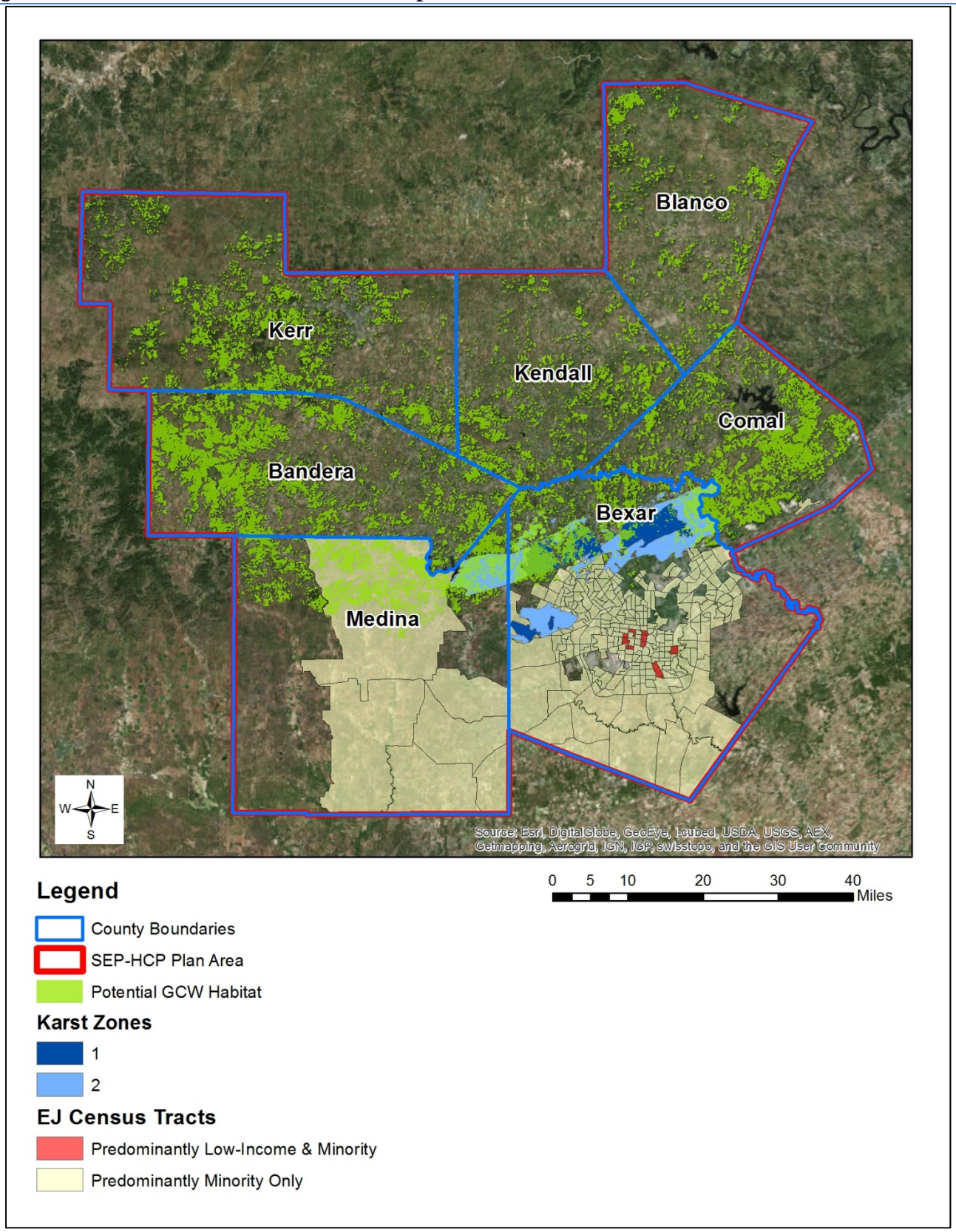
Wild and Scenic Rivers

The Wild and Scenic Rivers Act, as amended requires that selected rivers in the U.S., including their immediate environments, that possess outstandingly remarkable scenic, recreational, geologic, fish and wildlife, historic, cultural, or other similar values, be preserved in free-flowing condition, and that they and their immediate environments be protected for the benefit and enjoyment of present and future generations. A 191-mile segment of the Rio Grande, which passes through Big Bend National Park and the Chihuahuan Desert, is the only river segment in the state of Texas designated as a wild and scenic river. This segment of the Rio Grande is not located in the Plan Area and, therefore, impacts to wild and scenic rivers are not analyzed further (National Wild and Scenic Rivers System 2011).

National Forests and Grasslands

According to the U.S. Department of Agriculture (USDA) Forest Service, in the state of Texas there are four National Forests: Angelina, Davy Crockett, Sabine and Sam Houston, all of which are located in East Texas. The Caddo-Lyndon B. Johnson National Grasslands and the Rita Blanco Grasslands are the only National Grasslands in the state. None of these protected resources are located within the Plan Area (USDA 2015). Therefore, the Proposed Action would not impact National Forests or Grasslands, which is why these resources are not analyzed in detail in the EIS.

Figure 4-2: EJ Census Tracts and Covered Species Habitat in the Plan Area



Source: USCB 2010 and 2013; Diamond *et al.* 2010; Veni 1994

4.2 ASSESSMENT OF IMPACTS

4.2.1 Types of Impacts

The following sections provide a description of the current environmental condition of the resources being potentially impacted by the Proposed Action followed by an analysis of the impacts that the Proposed Alternatives, discussed in **Chapter 3 - Alternatives,** could have on these resources. Each resource is analyzed for several types of impacts: direct, indirect, beneficial, and adverse. These terms have been defined in the CEQ's NEPA regulation 40 CFR 1508, as shown below:

- **Direct effect:** An impact that occurs as a result of the proposed action or alternatives in the same place and at the same time as the action.
- **Indirect effect:** An impact that is caused by the proposed action or alternative and is later in time or farther removed in distance than the action, but is still reasonably foreseeable. Indirect impacts may include growth inducing impacts and other impacts related to induced changes in the pattern of land use, population density or growth rate, and related impacts on air and water and other natural systems, including ecosystems.
- **Beneficial impacts:** A positive change in the condition or appearance of the resource or change that moves the resource toward a desired condition.
- **Adverse effect:** A change that moves the resource away from a desired condition or detracts from its appearance or condition.

Per 40 CFR 1508.27, the significance of an impact must be considered in terms of both its context as well as the intensity of the impact. These terms are defined as:

- **Context:** the significance of an action must be analyzed in several contexts such as society as a whole (human, national), the affected regions, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance will usually depend upon the impacts in the locale rather than in the world as a whole. Both short-term and long-term impacts are relevant.
- **Intensity:** refers to the severity of the impact.

In this EIS the context of an impact is described in the narrative for each resource and is based on the above requirements. The intensity of an impact is ranked as negligible, minor, moderate or major and is defined for each resource topic. Following the direct and indirect analysis for each resource, this chapter concludes with an analysis of cumulative impacts, unavoidable adverse impacts, irreversible and irretrievable commitment of resources, and short-term use of the environment versus long-term productivity.

4.3 WATER RESOURCES

4.3.1 Affected Environment

Groundwater Resources

Four major aquifers, the Carrizo, Edwards Balcones Fault Zone (BFZ), Edwards-Trinity, and Trinity; and two minor aquifers, the Ellenburger-San Saba and Hickory aquifers, underlie the Plan Area. The most significant aquifer, in terms of the volume of water pumped for human use, is the Edwards BFZ Aquifer (Edwards Aquifer).

The Edwards Aquifer supplies water to millions of users including users in Bexar, Medina, and Comal counties in the Plan Area, and is the primary water source for the City of San Antonio. The Edwards

Aquifer is known to store and transmit large quantities of water, and is subject to very rapid recharge in the area where the aquifer is unconfined; or where the upper limit of the aquifer is located at the water table. This zone is referred to as the recharge zone (**Figure 4-3**), and is extremely sensitive to environmental impact. Contaminants originating from human activities that occur in the recharge zone have the potential to degrade the groundwater quality.

The Edwards Aquifer also provides the source water for many major springs in Texas, including the two largest: Comal Springs in Comal County and San Marcos Springs in Hays County. These spring systems serve as the sole known habitat for a number of federally listed aquatic species. The confined portion of the Edwards Aquifer has a slower recharge rate than the unconfined portion because the surrounding rock and soil, above and below, are less permeable and let less water pass through. The confined zone of the Edwards Aquifer extends to the south and southeast of the recharge zone and is where the highest capacity wells and largest springs exist (Collins and Hovorka 1997).

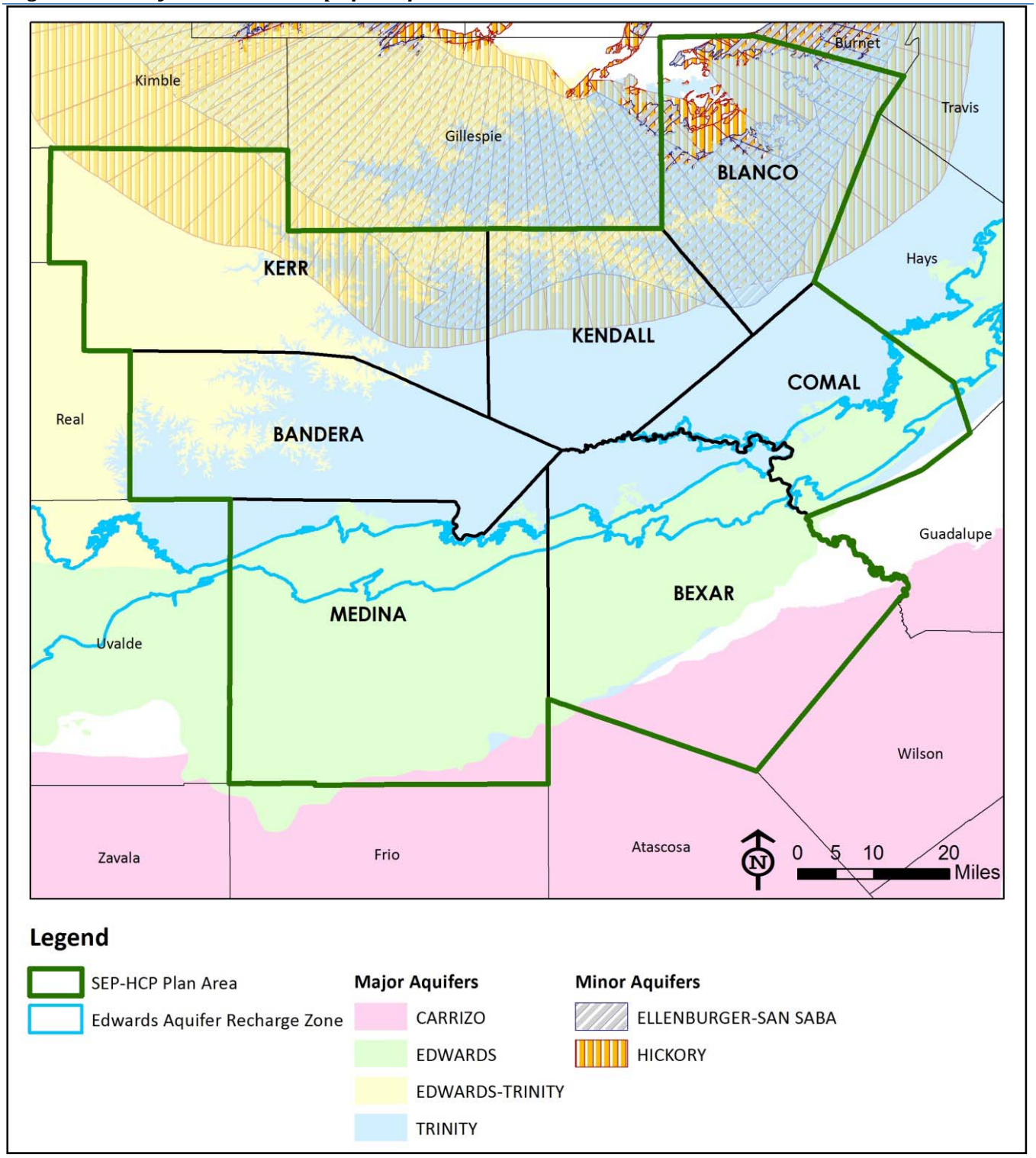
The limestone of the Edwards Group has excellent water quality conditions, and the focused recharge zones and enhanced secondary porosity (additional fractures in the rock that occurred after the limestone was formed) allow more water to pass through. These factors make the Edwards Aquifer one of the most productive groundwater reservoirs in the country (Sharp and Banner 1997). In the northwestern portion of the Plan Area, the Edwards Group rocks have been eroded away and are not present. Here, the Upper Glen Rose is exposed; this area is classified as a contributing zone to the Edwards Aquifer. Heading southeast from the contributing zone, the limestone of the Edwards Group becomes exposed to the surface and is referred to as the recharge zone. Southeast of the recharge zone, the Edwards Aquifer become confined by the Del Rio unit above and the Glen Rose unit below. The Glen Rose and Del Rio units have low permeability and therefore less recharge is possible in these areas (Ferrill *et al.* 2004).

The Trinity Aquifer is located within older rocks than those in the Edwards Group limestone, and lies below the Edwards Aquifer in areas where the Edwards is present. In the southeast portion of the Plan Area, the Trinity Aquifer is below the Edwards Aquifer recharge and confined zones. North and northwest of the Edwards Aquifer recharge zone is the outcrop section of the Trinity Aquifer, where the bedrock is visible exposed, which is also considered the contributing zone to the Edwards Aquifer. The Trinity Aquifer in this area is karstic, and numerous minor springs exist, primarily in areas that have been cut into by surface streams. The water in this portion of the Trinity Aquifer is generally of very good quality.

The western-most portion of Kerr County and a limited portion of northern Kendall County are included in the Edwards-Trinity Aquifer system. This aquifer is located where the Edwards Group limestone caps the underlying Trinity limestone. Water quality in the Edwards-Trinity Aquifer is generally good, but the amount of available water is less than from the Edwards BFZ Aquifer.

Much of Blanco County and portions of Kendall and Kerr counties are included in the extent of the Ellenburger-San Saba Aquifer. This aquifer is located in much older Paleozoic limestone and provides usable amounts of high quality groundwater. This aquifer underlies the Edwards-Trinity and Trinity Aquifers in much of this area. Also in northern Blanco County, the Hickory Aquifer is found in isolated outcrops. This is a sandstone aquifer of good quality and moderate quantity.

Figure 4-3: Major and minor aquifers of the Plan Area



Source: Texas Water Development Board 2010.

To the southeast of the Edwards lies the Carrizo-Wilcox Aquifer, which is a sandstone aquifer supplying water to much of the Interior Coastal Plain Region. The Carrizo-Wilcox Aquifer is characterized by relatively slow transport time and has a high degree of storage. The quality of the water is good.

Groundwater Recharge

Approximately 80 percent of recharge into the Edwards Aquifer occurs in losing streams, where surface water flows into faults, fractures, and karst features that have been made more porous through weathering and erosion as the water passes through (Sharp and Banner 1997). Periods of recharge are intermittent as most streams in south-central Texas are ephemeral and only flow briefly after rainfall events; however, the recharge capacity of surface water into the aquifer is extremely efficient due to the porous nature of the system. Water passing over the contributing zone (Glen Rose outcrop) and into major fault zones and exposed, heavily karstified Edwards Group limestone (recharge zone), is rapidly transferred directly to the aquifer with little or no filtration.

The geologic mechanisms that form karst are complex, and many factors affect how karst is expressed. These factors control the way the groundwater flow system evolves, and ultimately how groundwater is recharged, transmitted, and naturally discharged through the aquifer system.

Groundwater movement is generally west to east in the Plan Area, based on groundwater elevations (Lindgren *et al.* 2004). Aquifer flow models for the entire Edwards Aquifer show groundwater flows from Uvalde and Medina counties east-northeast eventually discharging at the Comal, Hueco, and San Marcos springs, and numerous other small springs (Kuniansky *et al.* 2001). However, recent tracer studies in northern Bexar County performed by the Edwards Aquifer Authority (EAA) indicate water flows from north to south with very rapid flow velocities (Johnson *et al.* 2009). These observations indicate that flow paths may be more complex than originally thought, and rapid groundwater transport is dominated by karstic conduit flow.

Groundwater Management

Groundwater in Texas is managed through a system of local or regional entities created by the Texas Legislature in Chapter 36 of the Texas Water Code to regulate usage and conservation of groundwater resources. In the Plan Area, there are six groundwater districts. The Medina Groundwater Conservation District manages groundwater resources of the Trinity and Carrizo aquifers in that county. The Bandera County River Authority and Groundwater Conservation District (Bandera County), Headwaters Groundwater Conservation District (Kerr County), Cow Creek Groundwater Conservation District (Kendall County), and Blanco-Pedernales Groundwater Conservation District (Blanco County) regulate Trinity Aquifer pumping and management in these respective counties. No groundwater conservation district exists in northwestern Comal County to manage that section of the Trinity Aquifer.

The EAA was created in 1993 (implemented in 1996) by the Texas Legislature as a special groundwater district with the purpose to manage and regulate the San Antonio segment of the Edwards Aquifer. The EAA jurisdiction includes all of Medina, Bexar, and southeastern Comal County. The TCEQ requires a Edwards Aquifer Protection Plan be produced in conjunction with any development within its defined Edwards Aquifer Recharge Zone regulatory area (TCEQ 2009). Components of a plan include a Geological Assessment, Water Pollution Abatement Plan, Sewage Collection System Plan, and above and below ground Storage Tank Facility Plans. Regulations regarding storage tanks also apply over the transition zone of the Edwards Aquifer.

Significant Recharge Features

A significant recharge feature is defined by the TCEQ as a karst feature with a well-defined surface opening (such as a cave) or a sinkhole (without a surface opening) that has a catchment area greater than 1.6 acres (0.6 hectare) (TCEQ 2004). Most of the recharge into the Edwards Aquifer occurs where

surface water flows over faults, fractures, and karst features (Sharp and Banner 1997). However, the total number of recharge features in the Plan Area is not known.

Factors Influencing the Amount of Aquifer Recharge

There are numerous ways to decrease or degrade water that enters (or recharges) aquifers. One way is to cover, cap, or fill recharge features, thereby preventing water from entering them and recharging the aquifer. Similarly, impervious cover (such as from pavement and buildings) may decrease aquifer recharge by reducing the area of soil into which rainfall can infiltrate. While much of the water flowing off impervious surfaces is directed to nearby streams, storm water runoff often occurs in short bursts of high volume flows that provide few opportunities for runoff to infiltrate recharge features before it leaves the recharge zone. Large stands of woody vegetation may reduce the amount of precipitation reaching groundwater. Dense canopy cover intercepts rainwater, may inhibit infiltration into the soil by dropping leaf litter, and may draw off soil moisture through transpiration (Owens and Lyons 2004). On the other hand, this retained rainwater moisture may result in decreased transpiration rates and lesser needs for soil moisture (Owens and Lyons 2004).

Groundwater Quality

The State of Texas has not developed specific standards for pollutant discharge to groundwater; however, state policy requires that "…groundwater be kept reasonably free of contaminants that interfere with present and potential uses of groundwater… [and that] discharges of pollutants,…be conducted in a manner that will maintain present uses and not impair potential uses of groundwater or pose a public health hazard" (Texas Water Code § 26.401). Groundwater contamination, as defined by the Texas Groundwater Protection Committee, is "…the detrimental alteration of the naturally occurring physical, thermal, chemical, or biological quality of groundwater reasonably suspected of having been caused by the activities of entities under the jurisdiction of the various state agencies" (Texas Groundwater Protection Committee [TGPC] 2006). The state agencies of the Committee systematically monitor groundwater quality at selected sites (e.g., underground storage tanks and landfills) throughout the state to determine if levels of specific contaminants vary from baseline conditions for that site. The Texas Groundwater Protection Committee (2013) reported that 3,627 groundwater contamination cases were documented or under enforcement across the state during the 2012 calendar year.

Surface Water

Water Features

The Plan Area is located within the Texas-Gulf Geographic Region, which is the drainage area of a number of rivers that flow into the Gulf of Mexico and includes parts of Louisiana, New Mexico, and Texas (Seaber *et al.* 1987). According to the National Hydrography Dataset (NHD), parts of four major river basins are present within the Plan Area boundaries: the Colorado, Guadalupe, Nueces, and San Antonio river basins (**Figure 4-4**). Within the Plan Area, these four river basins are further divided into sixteen subbasins: Atascosa, Austin-Travis Lakes, Buchanan-Lyndon B. Johnson Lakes, Cibolo, Hondo, Llano, Lower San Antonio, Medina, Middle Guadalupe, Pedernales, San Marcos, San Miguel, South Llano, Upper Frio, Upper Guadalupe, and Upper San Antonio (**Figure 4-4**).

The Colorado River Basin includes the drainage area for the Colorado River, which is the largest river completely within Texas (Texas State Historical Association [TSHA] 2010). The Colorado River Basin encompasses approximately 13 percent of the Plan Area and covers portions of Blanco, Kendall, and Kerr counties. Within the Plan Area, five sub-basins occur within the Colorado River Basin: Buchanan-Lyndon B. Johnson Lakes, Austin-Travis Lakes, Llano, South Llano, and Pedernales. The Guadalupe

River Basin encompasses approximately 30 percent of the Plan Area and covers portions of Blanco, Comal, Kendall, and Kerr counties. Within the Guadalupe River Basin, the San Marcos, Upper Guadalupe, and Middle Guadalupe sub-basins occur within the Plan Area. The San Antonio River Basin encompasses approximately 35 percent of the Plan Area and covers portions of Bandera, Bexar, Comal, Kendall, Kerr, and Medina counties. Within the Plan Area, four sub-basins (the Cibolo, Upper San Antonio, Lower San Antonio, and Medina sub-basins) occur within the San Antonio River Basin. The Nueces River Basin encompasses approximately 22 percent of the Plan Area and occurs in portions of Bandera, Kerr, and Medina counties. Four sub-basins occur within the Nueces River Basin within the Plan Area: Upper Frio, Hondo, San Miguel, and Atascosa.

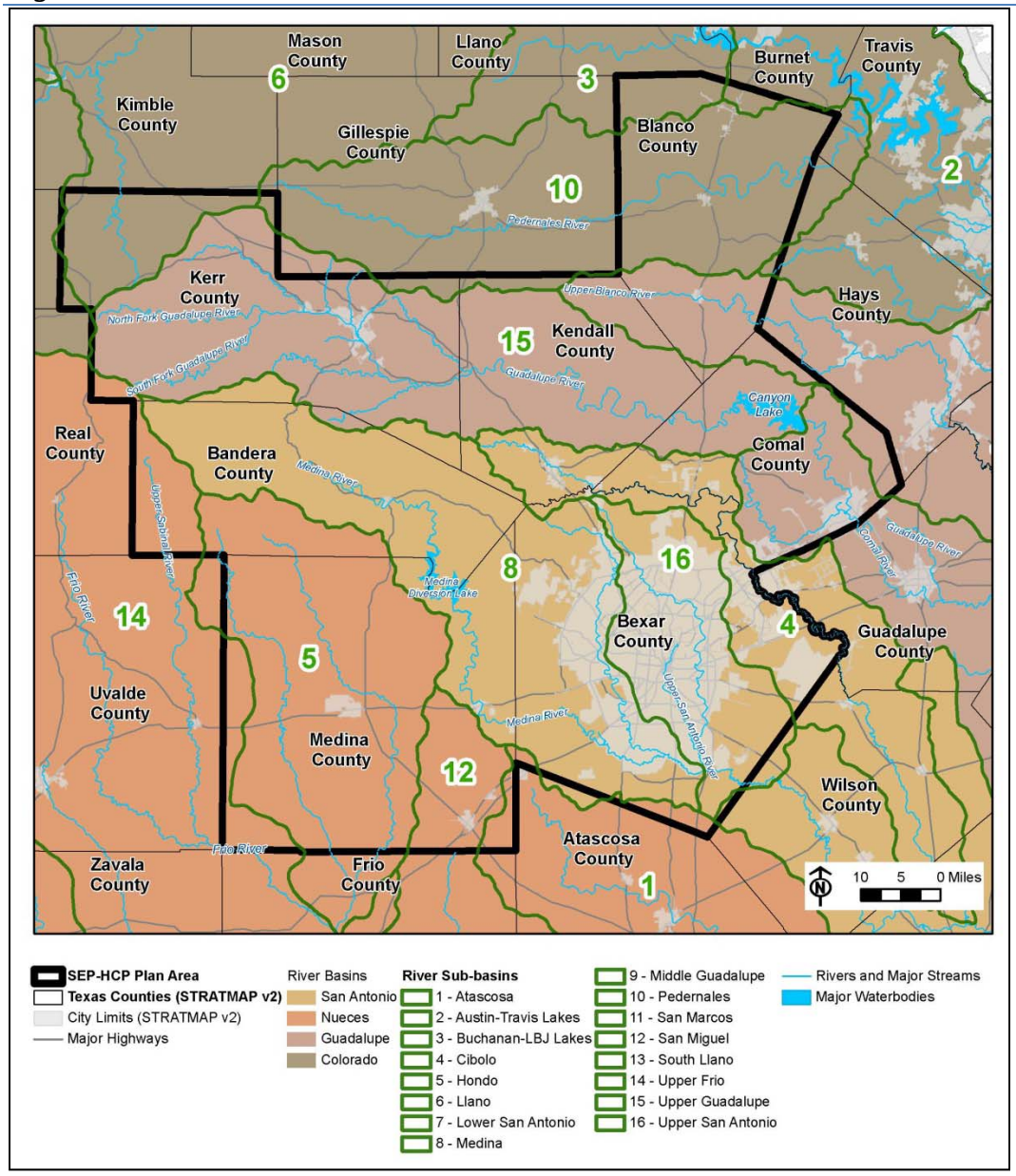
Four major rivers (the Guadalupe, Medina, Pedernales, and San Antonio rivers) bisect the Plan Area, and represent approximately 323 miles of waterway within the Plan Area (**Figure 4-4**). These major waterways, and the numerous streams and creeks that feed them, are valuable surface water resources for the Plan Area and support wildlife, riparian habitat, recreational uses, and scenic vistas. Of the four major rivers within the Plan Area, the Guadalupe, Medina, and Pedernales are included in the Nationwide Rivers Inventory (NRI). The NRI is a database of over 3,400 free-flowing river segments in the U. S. that are believed to possess one or more remarkable natural or cultural value that has more than local or regional significance (National Park Service [NPS] 2008).
The Medina River originates from springs in northwest Bandera County and travels southeast for approximately 116 miles to its mouth at the San Antonio River in southern Bexar County (TSHA 2010). The Medina Dam impounds the Medina River to form Medina Lake in Medina County. The NRI identifies the Medina River from the head of Medina Lake upstream to the State Highway (SH) 173 bridge in Bandera as the fourth most popular river to float in Texas (NPS 2008).

The Pedernales River bisects Blanco County and originates from springs in Kimble County. The river courses northeast for approximately 106 miles to its mouth on Lake Travis in western Travis County. Approximately 45 miles of the Pedernales River occur within the Plan Area. From its confluence with Lake Travis upstream to its headwaters, the Pedernales River is recommended as a potential component of the National Wild and Scenic Rivers System and it is rated as the fifth best recreational river in the state according to the NRI (NPS 2008).

The San Antonio River begins at a group of springs in central Bexar County approximately 4 miles north of downtown San Antonio (TSHA 2010). The river flows southeast for approximately 180 miles before its confluence with the Guadalupe River north of Tivoli, Texas (TSHA 2010). Approximately 34 miles of the San Antonio River occur within the Plan Area. Principal tributaries include Medina River and Cibolo Creek, and two reservoirs impound the river – one for flood control and the other for irrigation (TSHA 2010).

Surface Water Quality
Under the Clean Water Act, the State of Texas (through the TCEQ) has developed and enforces a comprehensive set of surface water quality standards that includes chemical, physical, and biological criteria. The Texas Surface Water Quality Standards are found in the Texas Administrative Code (TAC) under Title 30, Chapter 307 and establish explicit water quality goals throughout the state for all types of surface water sources.

Figure 4-4: River Basins and Sub-Basins



Source: TCEQ 2013.

The state standards are set in an effort to maintain the quality of water in the state, consistent with public health and enjoyment, the protection of aquatic life, and the operation of existing industries and economic development. Surface waters are evaluated for the following five categories: aquatic life, contact recreation, public water supply, fish consumption, and general uses. Standards related to drinking water also apply to groundwater that is used as a public water supply.

Every two years, the TCEQ assesses water quality across the state and submits a report to the EPA regarding how each body of water meets the state water quality standards. This water quality inventory is the basis of the Clean Water Act 303(d) list, which identifies all impaired water bodies that do not meet the water quality criteria established to support designated uses. The following table lists the

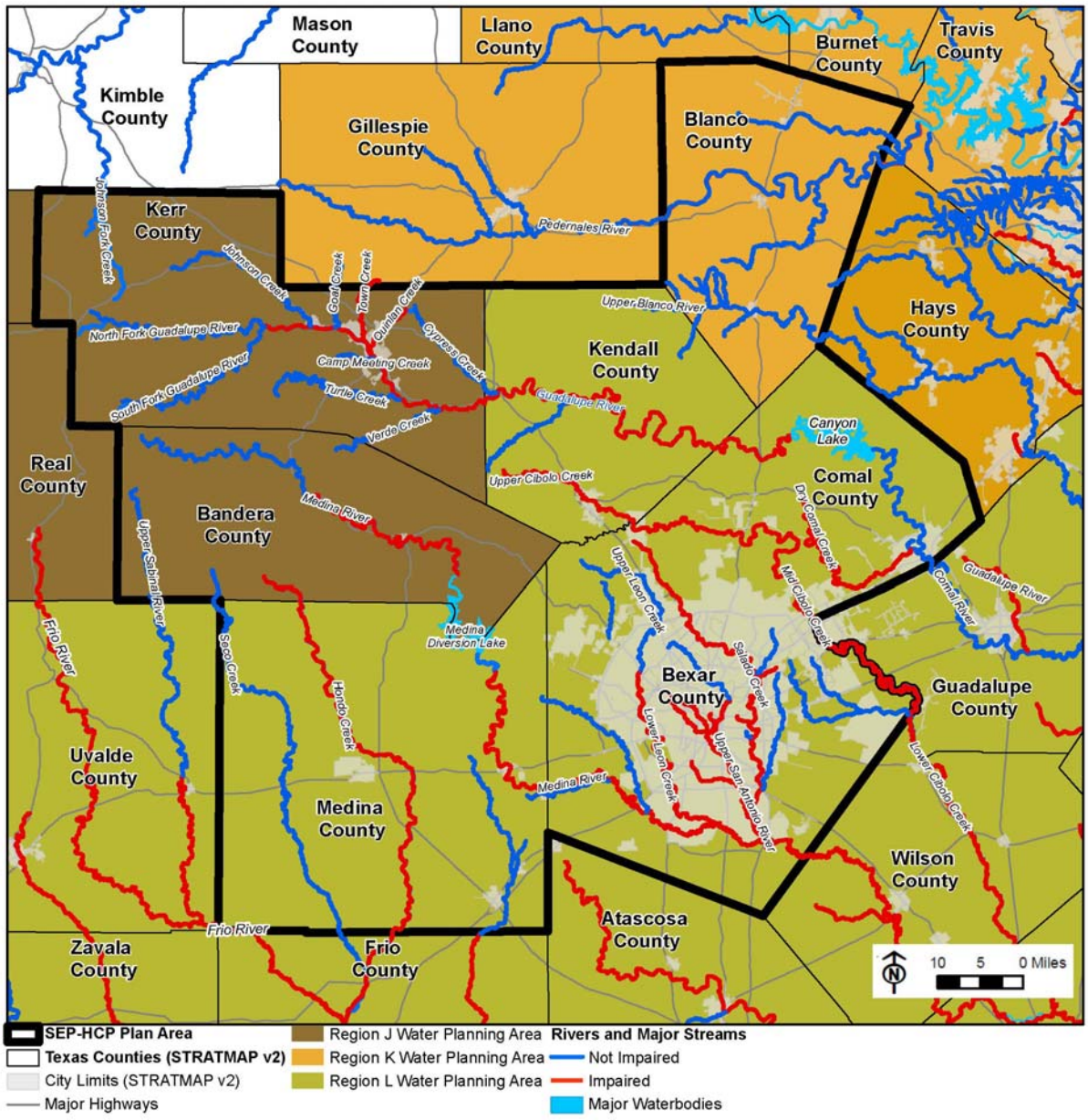
impaired waters in the Plan Area from the 2012 Texas Water Quality Inventory and 303(d) List (**Table 4-1**) and **Figure 4-5** illustrates the location of these impaired waters.

Table 4-1: 2012 impaired waters in the Plan Area and their associated impairment category

Water Bodies by County	Bacteria	Impaired Fish Community	Depressed Dissolved Oxygen	Impaired Macrobenthic Community	Mercury or PCBs In Edible Tissue	Chloride
Bandera						
Medina River above Media Lake		X				
Hondo Creek						X
Bexar						
Lower Cibolo Creek	X	X				
Alazan Creek	X					
Lower Leon Creek			X		X	
Upper San Antonio River		X				
Medina River below Medina Diversion Lake	X					
Blanco						
none listed						
Comal						
Upper Cibolo Creek	X					X
Canyon Lake					X	
Dry Comal Creek	X					
Guadalupe River above Canyon Lake	X					
Kendall						
Upper Cibolo Creek	X					X
Kerr						
Guadalupe River above Canyon Lake	X					
Quinian Creek	X					
Town Creek	X					
Medina						
Medina River below Medina Diversion Lake	X					

Source: TCEQ 2013.

Figure 4-5: Impaired Waters in the Plan Area



Source: TCEQ 2013.

Water Use

Communities within the Plan Area, including but not limited to San Antonio, New Braunfels, Boerne, Bandera, Hondo, Johnson City, and Kerrville, use surface water from area reservoirs for municipal, industrial, agricultural, and other non-consumptive uses. The San Antonio River Authority, Nueces River Authority, Guadalupe-Blanco River Authority, Upper Guadalupe River Authority, and Lower Colorado River Authority are the primary wholesale water providers in the Plan Area. River Authorities were established by the Texas Legislature, section 59, Article 16 of the Constitution of Texas, as water conservation and reclamation districts and public corporations. They were given powers to conserve, store, control, preserve, utilize, and distribute the waters of a designated geographic region for the benefit of the public (TSHA 2010).

Surface water use is publicly owned and governed by the State of Texas, and permits are required from the TCEQ to use surface water with the exception of use for domestic and livestock purposes (TGPC 2008). To facilitate water resources planning, the Texas Water Development Board (TWDB) conducts an annual survey of ground and surface water use by municipal and industrial entities (TWDB 2012).

According to studies conducted between 1998 and 2008 by the TWDB there has been an increase in surface water use by all the counties within the Plan Area with the exception of Bandera County. Blanco, Kendall, and Medina counties are decreasing groundwater use, and Blanco and Medina counties are decreasing water use overall regardless of source. For 2008, surface water use for municipal purposes in Comal County exceeded groundwater use, and Medina County exclusively used groundwater for municipal purposes (TWDB 2012).

4.3.2 Environmental Consequences

Methodology

For the purposes of analyzing the impacts to water resources, surface water impacts are considered in terms of their effect on the continuation of designated uses, as defined in the Texas Surface Water Quality Standards. Groundwater impacts are analyzed in terms of impacts that could affect the water's ability to meet the state's policy established in section 26.401 of the Texas Water Code, which calls for the protection of groundwater quality for present and potential uses, or affect measurable changes in groundwater availability.

The intensity of impacts to water resources is measured utilizing the following terms and definitions:

Negligible: Impacts to water quality and water availability that are either not detectable or well below the thresholds of water quality standards for designated uses. Water quality, water availability, and groundwater recharge will remain within historical baselines and normal variability.

Minor: Detectable impacts to water quality and availability that vary from historical baselines but remain well within the thresholds of water quality standards for designated uses and which will not threaten future uses of surface and groundwater resources.

Moderate: Impacts will be readily apparent with measurable change from historical norms. Water quality, the condition of recharge features, and water availability will not consistently meet the standards for designated uses but will not be permanently impaired for future use such as a permanent degradation of water quality or the complete loss of groundwater recharge or surface water features. Moderate impacts will likely require mitigation measures that will have a reasonable likelihood of successfully offsetting the adverse impacts.

Major: Like moderate impacts, major impacts are also readily apparent impacts with measurable change from historical baseline conditions. However, for impacts to be considered major, water quality, the condition of recharge features, and water availability will frequently or permanently exceed the standards for designated uses and could result in permanent impairment. Major impacts will require extensive mitigation measures, although they may not have a reasonable likelihood of successfully offsetting the adverse impacts.

No Action Alternative

Under the No Action Alternative the Service will not issue an ITP, Bexar County and the City of San Antonio will not implement the SEP-HCP, and land development projects in the Plan Area will follow the standard procedures for complying with the ESA. The No Action Alternative represents the status quo whereby land development projects will also be subject to the existing federal and state regulations that protect ground and surface water quality and manage the availability of the state's water resources.

Impacts to water resources resulting from the No Action Alternative are projected based on the historic and forecasted population growth within the Plan Area. In 2010 the Plan Area was home to almost 2 million people and is projected to increase to a forecasted 2.8 to 3.2 million people by 2040 (WDA 2010a, TSDC 2009). Based on the demographic trends noted between 2000 and 2010, the more rural counties in the Plan Area, particularly Comal and Kendall counties, have seen the greatest percentage of growth (USCB 2000 and 2010a). As the Plan Area grows, forest, shrublands, and grasslands will continue to be converted to developed land uses to support the increasing need for residences, places of work, and infrastructure and utilities. Between 1992 and 2001 the Plan Area has witnessed a conversion of over 40,000 acres of land to urban uses, primarily from forest and grassland or shrub cover (USGS 2003). And, between 2010 and 2040 it is anticipated that almost 7,800 acres of land will be converted to urban uses each year (WDA 2010b). Construction activities associated with land development also include grading soil, soil compaction, altering the existing topography, paving surfaces, and constructing buildings and other structures. A total of 241,152 acres between 2010 and 2040 will experience construction activities with or without the SEP-HCP.

Vegetation anchors soil and filters the runoff that flows across it, allowing sediment to settle out and removing some contaminants. The removal of vegetation can increase the velocity of the overland flow of water and can increase the probability of erosion and therefore the amount of sediment likely to be found in stormwater runoff. Removal of vegetation also eliminates the natural water filtration that plants provide; vegetation removes some of the contaminant from stormwater before it enters water bodies or recharge features. Stormwater runoff from urbanized areas generally has higher concentrations of pesticides, volatile organic compounds, nitrates, trace elements, and sediment when compared to undeveloped rangeland. The higher concentrations are partially a result of more contaminants in an urban environment and in part due to the conversion of vegetation and water resources to impervious cover (Ging 1999, Bush *et al.* 2000).

Construction activities and the associated impervious cover could also result in the closure of recharge features, which would reduce the quantity of infiltration of precipitation into the soil and groundwater recharge. While TCEQ guidelines have provisions for protecting recharge features, a project-specific review could result in the closure of karst features in an effort to protect groundwater quality because the Edwards Aquifer is particularly susceptible to contamination.

Runoff from urban areas is discharged into local springs and approximately 80 percent of the recharge in the Edwards Aquifer occurs from losing streams (Sharp and Banner 1997). Bush *et al.* (2000) found a correlation between the quality of recently recharged groundwater in the urbanized areas of the Edwards and the quality of surface water in the same areas.

With respect to regulating impacts to water resources, future land development projects in the Plan Area will be required to comply with applicable existing local, state, and federal regulations protecting water quality on a project-by-project basis. For example, some municipalities within the Plan Area have

impervious cover limits, erosion control standards, and requirements for water protection plans that apply to development projects within their jurisdictions. Under the Edwards Aquifer Protection Program, the TCEQ requires preparation of a Water Pollution Abatement Plan for any development on the Edwards Aquifer recharge zone and enforces minimum setbacks for development near recharge features. The Corps regulates dredge and fill into waters of the U.S. under section 404 of the *Clean Water Act*. These measures, and other programs, standards, and regulations that manage and oversee impacts to water quality and quantity, help to minimize the negative impacts of land development on surface waters and groundwater resources. Even with these programs, an overall increase in land development and urbanization could be expected to cause direct and indirect adverse impacts on water resources, including: 1) increased contamination of both surface water and groundwater, 2) reduced aquifer recharge, and 3) an overall decrease in water availability as current water resources become fully allocated. The intensity of these potentially adverse impacts over 30 years, considering the existing regulatory environment, will likely be minor to moderate under the No Action Alternative because they would be detectable but still within the thresholds of water quality standards for designated uses and not threatening to future uses of surface water and groundwater resources.

Proposed SEP-HCP Alternative

The SEP-HCP will not substantially affect the amount, timing, or location of land development over the next 30 years, with the exception of preventing future development from occurring in areas that are designated as preserve. Therefore, the adverse impacts to water resources that will be expected under the Proposed SEP-HCP Alternative will be similar to those described for the No Action Alternative. Future land development projects under this alternative, as with the No Action Alternative, will be expected to comply, on a case-by-case basis, with existing local, state, and federal water quality regulations, standards, and programs.

The Proposed SEP-HCP Alternative is expected to result in greater beneficial impacts to water resources than the No Action Alternative because a greater level of land conservation would occur. It is anticipated that approximately 30,130 acres of undeveloped land containing habitat for the Covered Species will be permanently protected under the Proposed SEP-HCP Alternative. Protection of natural/native vegetation will protect surface and groundwater resources by conserving the natural process whereby stormwater runoff is filtered and flood waters are absorbed for aquifer recharge. Conservation of consolidated, large tracts of open space in the Plan Area is likely to beneficially impact natural streams and their riparian corridor as well as groundwater recharge features, assuming that the selected preserve land contains water resources.

As described above, natural buffers along creeks and streams filter pollutants and absorb flood waters. These vegetated areas will slow down water and allow some pollutants to settle out of the stormwater before they reach surface waters and groundwater. The protection of thousands of acres of natural vegetation in the Plan Area under the Proposed SEP-HCP Alternative will protect surface and groundwater resources by conserving the natural ecological processes that filter stormwater runoff and absorb flood waters for aquifer recharge. Therefore, the protection of natural vegetation in the SEP-HCP preserve system will likely yield some indirect beneficial impacts to water resources, compared to the No Action Alternative.

Overall, implementation of the SEP-HCP will result in more assured long-term protection of the water resources contained within the 30,130 acre preserve system. Despite the conservation achieved with the Proposed SEP-HCP Alternative, it is anticipated that almost 7,800 acres of land will be converted in the

Plan Area to urban uses each year between 2010 and 2040 (WDA 2010b). As such, the Proposed SEP-HCP Alternative would result in only negligible to minor beneficial effects to the water resources in the Plan Area compared to the No Action Alternative because these impacts would be either undetectable or well below the thresholds of water quality standards for designated uses or would be detectable but still within the thresholds of water quality standards for designated uses and not threatening to future uses of surface and groundwater resources.

10% Participation Alternative

Like the No Action Alternative, the 10% Participation Alternative will not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years. Therefore, the potentially adverse impacts to water resources resulting from anticipated land development will be similar to the impacts described for the No Action Alternative. Future land development projects under this alternative will be expected to comply, on a case-by-case basis, with existing local, state, and federal water quality regulations, standards, and programs.

The 10% Participation Alternative would create a 7,390-acre preserve system which is one-quarter of the conserved size of the Proposed SEP-HCP Alternative. As mentioned above, the conservation of natural landscapes and vegetation along creeks and streams would help improve water quality by filtering pollutants from stormwater and absorbing flood waters. While some habitat conservation will occur under the No Action Alternative as the result of individual ESA compliance actions, the distribution and size of the preserve under the 10% Participation Alternative will likely create a more effective buffers for streams than will be achieved with fewer, smaller, and more scattered protected areas under the No Action Alternative. The difference will be small however, as the total area that will be conserved under this alternative will be small compared to the total size of the area of potential effect. Therefore, the beneficial impacts of the 10% Participation Alternative on water resources will likely be negligible compared to the No Action Alternative because they would not be detectable or they would be well below the thresholds of water quality standards for designated uses.

Single-County Alternative

The Single-County Alternative will not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years. Therefore, the potentially adverse impacts to water resources resulting from anticipated land development will be similar to the impacts described for the No Action Alternative. Future land development projects under this alternative will be expected to comply, on a case-by-case basis, with existing local, state, and federal water quality regulations, standards, and programs.

The primary difference between the Single-County Alternative and the No Action Alternative is the establishment and long-term management of a 16,014-acre preserve system. Of the Action Alternatives, the Single-County Alternative is unique in that all of the preserve system will be located within Bexar County and up to 10 miles outside of Bexar County; whereas all other alternatives could preserve land throughout the seven-county Plan Area. Like the other Action Alternatives, the water resources that are located within the preserve system of the Single-County Alternative would benefit from the conservation of preserves of natural landscapes and vegetation along creeks and streams greater than the No Action Alternative. Unlike the other Action Alternative, these benefits will be primarily focused within Bexar County. While some habitat conservation will occur under the No Action Alternative as the result of individual ESA compliance actions, the extent of these individual preserves will likely be less than the assured protection of 16,014 acres under the Single-County Alternative. The beneficial

impacts of the Single County Alternative on water resources will likely be negligible to minor compared to the No Action Alternative because impacts would be within the thresholds of water quality standards for designated uses and not threatening to future uses of surface and groundwater resources.

Increased Mitigation Alternative
The Increased Mitigation Alternative will not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years. Therefore, the potentially adverse impacts to water resources resulting from anticipated land development will be similar to the impacts described for the No Action Alternative. Future land development projects under this alternative will be expected to comply, on a case-by-case basis, with existing local, state, and federal water quality regulations, standards, and programs.

The establishment and long-term management of a 43,741-acre preserve system, as proposed under this alternative, will yield beneficial impacts to water resources in the Plan Area similar to those described for the other Action Alternatives. Of the Action Alternatives, the Increased Mitigation Alternative would protect the most amount of land in its preserve system; and therefore, it has the potential to have the greatest benefits to water resources (provided that water resources are located within the preserve system). Therefore, the Increased Mitigation Alternative could have a minor to moderate benefit to water resources in the Plan Area, compared to the No Action Alternative, due to the increased size of the expected preserve system.

4.4 VEGETATION

4.4.1 Affected Environment

4.4.1.1 Environmental Protection Agency Ecoregions

The EPA has delineated ecoregions within the United States to serve as a framework for the management of environmental resources. The boundaries of the ecoregions are based on common ecosystem characteristics, including the type, quality and quantity of environmental resources. Additionally, there are subregions within each ecoregion. The Plan Area includes parts of four ecoregions (Edwards Plateau, South Texas Plains, East Central Texas Plains and Texas Blackland Prairie) and six subregions (

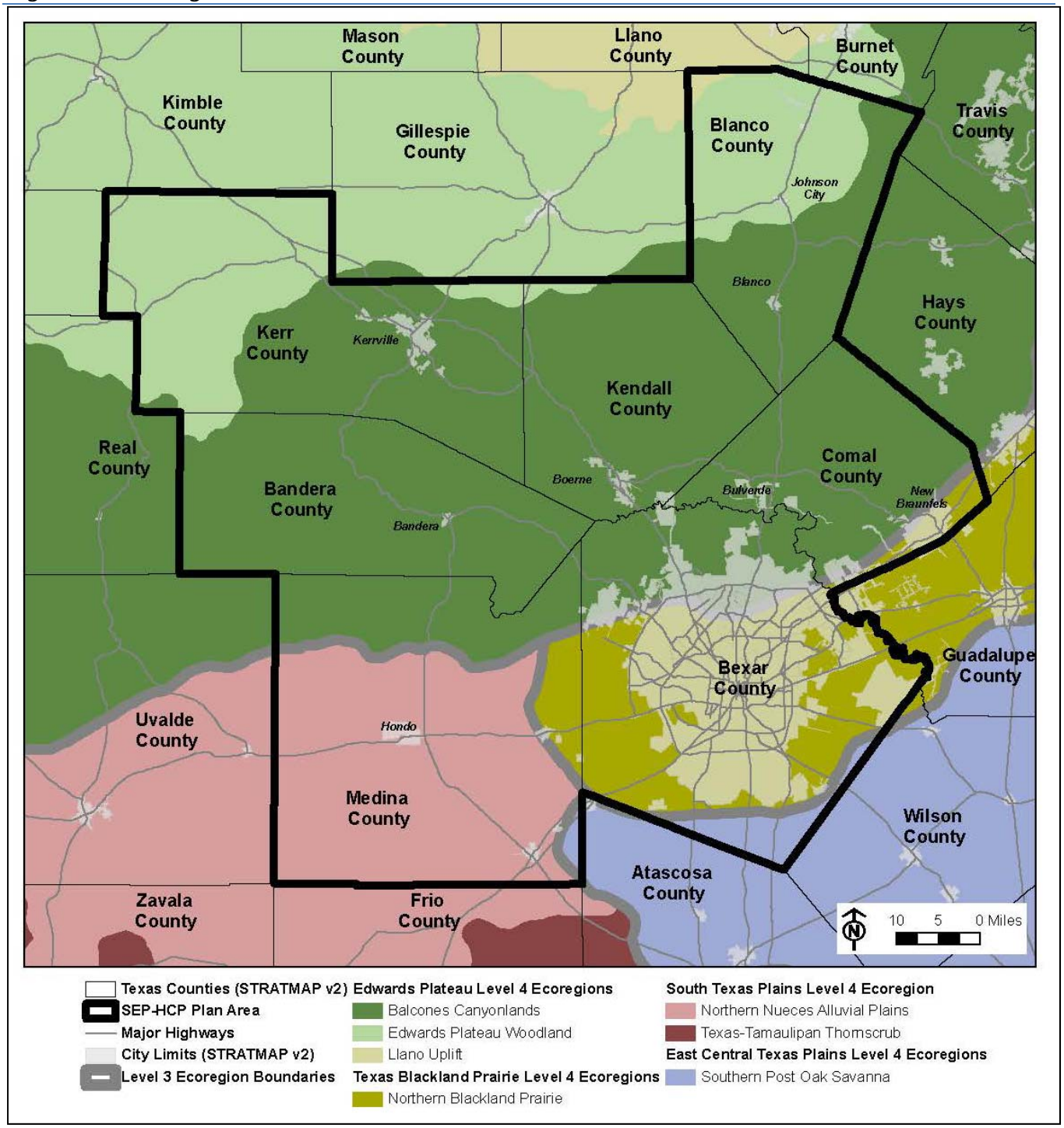
Table *4-2* and **Figure 4-6**).

Table 4-2: Ecoregions within the Plan Area

Subregion	Acres within the Plan Area	% of Plan Area
Balcones Canyonlands	2,226,318	54.0%
Northern Blackland Prairie	641,541	16.0%
Northern Nueces Alluvial Plains	598,310	14.0%
Edwards Plateau Woodlands	580,093	14.0%
Southern Post Oak Savanna	74,334	2.0%
Llano Uplift	7,373	0.2%

Source: Griffith *et al.* 2004.

Figure 4-6: Ecoregions in the SEP-HCP Plan Area



Source: Griffith *et al.* 2004.

The Llano Uplift subregion is a basin that is up to 1,000 feet below the surrounding limestone escarpment and is distinguished from other parts of the Edwards Plateau by areas of exposed granite. Soils in this subregion tend to be acidic, unlike the alkaline soils of the Edwards Plateau Woodland subregion. Typical woodland vegetation on the Llano Uplift includes plateau live oak (*Quercus virginiana*), honey mesquite (*Prosopis glandulosa*), post oak (*Quercus stellata*), blackjack oak (*Quercus marilandica*), cedar elm (*Ulmus crassifolia*), and (occasionally) black hickory (*Carya texana*). Common grasses of this region include little bluestem (*Schizachyrium scoparium*), yellow indiangrass (*Sorghastrum nutans*), silver bluestem (*Bothriochloa saccharoides*), and switchgrass (*Panicum virgatum*). Drier areas of the Llano Uplift may include species more characteristics of west Texas, such as catclaw mimosa (*Acacia greggii*) and soaptree yucca (*Yucca elata*). The Llano Uplift typically lacks Ashe juniper (*Juniperus ashei*) and Spanish oak (*Quercus falcate*), except within areas where limestone outcrops (Griffith *et al.* 2004). There are 7,373 acres of Llano Uplift in the Plan Area.

The Northern Blackland Prairie subregion of the Texas Blackland Prairie ecoregion accounts for 641,541 acres of the Plan Area. This subregion is characterized by rolling to nearly level, deep and productive soils. Historically, this subregion was dominated by large expanses of grasses; however, most of the native prairie habitat has been converted to cropland, non-native pasture, and developed land uses. Common grasses include little bluestem, big bluestem (*Andropogon gerardii*), yellow indiangrass, and tall dropseed (*Sporobolus compositus*), with lowland sites represented by eastern gamagrass (*Tripsacum dactyloides*) and switchgrass. Common forbs species include asters, prairie bluet, prairie clovers, and blackeyed susan. Occasional woodland species are found along riparian corridors, such as Shumard oak (*Quercus shumardii*), sugar hackberry (*Celtis laevigata*), elm (*Ulmus* spp.), ash (*Fraxinus* spp.), eastern cottonwood (*Populus deltoides*), and pecan (*Carya illinoinensis*) (Griffith *et al.* 2004).

The Northern Nueces Alluvial Plains, a subregion of the Southern Texas Plains ecoregion, covers 598,310 acres of the Plan Area. The characteristics of the Northern Nueces Alluvial Plains are influenced by streams draining from the Balcones Canyonlands subregion. Alluvial fans and alluvial plains deposits are common features of the landscape and soils in this subregion are generally very deep. Typical vegetation in the Northern Nueces Alluvial Plains includes mesquite-live oak-bluewood parks within the northern part of the subregion and mesquite-granjeno parks in the southern part. These parks are interspersed with grasslands and scattered honey mesquite, plateau live oak, and other trees in areas with deep soils and short brush, and guajillo (*Acacia berlandieri*), blackbrush (*Acacia rigidula*), elbowbush (*Forestiera pubescens*), and kidneywood (*Eysenhardtia texana*), in areas with shallower soils. Some floodplain forests may include hackberry, plateau live oak, pecan, cedar elm, black willow (*Salix nigra*), and eastern cottonwood along the banks. Common grasses in this subregion include little bluestem, sideoats grama (*Bouteloua curtipendula*), lovegrass tridens (*Tridens eragrostoides*), multiflowered false rhodesgrass (*Trichloris pluriflora*), Arizona cottontop (*Digitaria californica*), plains bristlegrass (*Setaria vulpiseta*), and green sprangletop (*Leptochloa dubia*). Many areas in the Northern Nueces Alluvial Plains are used to grow crops, which are frequently irrigated (Griffith *et al.* 2004).

The southeastern corner of the Plan Area is represented by the Southern Post Oak Savanna subregion of the East Central Texas Plains ecoregion. There are approximately 74,334 acres of Southern Post Oak Savanna in the Plan Area. This area is a mosaic of post oak savanna, improved pasture, and rangeland. Some areas in the southern portion of this subregion are being invaded by mesquite, while other areas have a thick understory of yaupon (*Ilex vomitoria*) and eastern red cedar (*Juniperus virginiana*) (Griffith *et al.* 2004).

Texas Parks and Wildlife Department Vegetation Map

In 1984, TPWD mapped vegetation communities within Texas (McMahan *et al.* 1984). While somewhat outdated, *The Vegetation Types of Texas* still provides a useful summary of the general vegetation communities across the state. McMahan *et al.* (1984) identified 13 vegetation types in the Plan Area including forests, woods, parks, brush, grasslands, crops, lakes, and urban lands (**Table 4-3**).

Over the last 10 years, conversion to grassland or shrubland vegetation was the most common fate of lost forest cover across the Plan Area, particularly outside of Bexar County. Conversion of forest cover to other, non-urban, land cover types accounted for approximately 87 percent of the forest cover loss across the Plan Area, and as much as 97 percent of the loss occurred in Blanco, Bandera, Kerr, Kendall and Medina counties (USGS 2003).

Table 4-3: Vegetation Types within the Plan Area

Vegetation Type	Acres within the Plan Area	% of Plan Area
Live Oak - Ashe Juniper Parks	1,256,474	30.4%
Live Oak - Ashe Juniper Woods	796,302	19.3%
Live Oak - Mesquite - Ashe Juniper Parks	791,526	19.2%
Crops	565,781	13.7%
Mesquite - Live Oak - Bluewood Parks	190,004	4.6%
Mesquite - Granjeno Woods	163,271	4.0%
Urban	159,376	3.9%
Post Oak Woods, Forest, and Grassland	76,918	1.9%
Mesquite - Blackbrush Brush	41,105	1.0%
Live Oak - Mesquite Parks	34,646	0.8%
Post Oak Woods and Forest	23,969	0.6%
Lake	17,296	0.4%
Pecan - Elm Forest	11,300	0.3%

Source: McMahan *et al.* 1984.

4.4.2 Environmental Consequences

Methodology

The implementation of any of the Action Alternatives will have an effect on vegetation such that potentially suitable habitat for the Covered Species could be lost or modified by authorizing incidental take while other suitable habitat for the Covered Species could be conserved and managed in perpetuity through conservation.

The intensity of impacts to vegetation are measured based on the definition of the following terms:

Negligible: Individual native plants may be affected however measureable changes to plant community size, integrity or continuity will not occur.

Minor: Measurable impacts to native plants will occur however will be localized to a small percentage of the native plant community. The integrity and continuity of the native plant community will not be adversely affected.

Moderate: A relatively large percentage of the native plant community will experience measureable change in terms of species composition, vegetation structure, or habitat quality for native wildlife. Moderate impacts will likely require mitigation

measures and will have a reasonable likelihood of successfully offsetting the adverse impacts.

Major: Substantial changes to large portions of native vegetation communities will be apparent. Major impacts will require extensive mitigation measures that may not have a reasonable likelihood of successfully offsetting the adverse impacts.

No Action Alternative

As previously described, approximately 241,152 acres in the Plan Area will be developed with or without the SEP-HCP over the next 30 years. While the location, magnitude, and nature of specific activities associated with future commercial, residential, and other types of development cannot be predicted, most of the construction is expected to occur in northern Bexar County, southwestern Comal County and eastern Medina County. It can be assumed that the new development will require clearing of vegetation prior to construction and alteration of vegetation types, via landscaping, after construction is complete. Soil structure is important because it determines the ability of a soil to hold and conduct water, nutrients, and air necessary for plant root activity. Increased urbanization results in soil compaction which reduces its efficiency of the soil to provide a healthy environment for plants. In dry years, soil compaction can lead to stunted, drought-stressed plants due to decreased root growth. Soil compaction in the surface layer can increase runoff, thus increasing soil and water losses (DeJong-Hughes *et al.* 2001).

The fragmentation of native vegetation communities by land development will facilitate the invasion and establishment of non-native plants. Areas of native vegetation will be replaced with impervious cover and landscaping that is frequently composed of non-native vegetation, such as turfgrass and ornamental plants. Also, the introduction of non-native species (competitors, diseases) in the Plan Area will degrade the surrounding native vegetation communities. Additionally, under the No Action Alternative the conversion of forest cover to grassland or shrubland vegetation would be expected to continue at its current rate over the next 30 years, resulting in the reduction in wildlife habitat. With the exception of certain vegetation communities that afford habitat for species listed under the ESA, impacts to vegetation communities are generally not regulated under federal or state law. Under the No Action Alternative, the impacts of development to vegetation that provides habitat for endangered species will be mitigated on a case-by case basis when landowners individually comply with the ESA. Other natural vegetation communities, such as riparian plant communities along water ways, could also be protected through compliance with other local, state, and federal regulations. As a result, some parcels containing natural vegetation communities will be conserved on a case-by-case basis and result in negligible beneficial impacts to vegetation in the Plan Area. Overall, however, moderate adverse impacts to vegetation will result from the No Action Alternative because of soil compaction and a relatively large percentage of the native plant community would be anticipated to experience measureable change in terms of species composition, vegetation structure, or habitat quality for native wildlife.

Proposed SEP-HCP Alternative

The Proposed SEP-HCP Alternative will not substantially affect the amount, timing, or location of land development over the next 30 years, with the exception of preventing future development from occurring in areas that are designated as preserve. Therefore, the adverse impacts to vegetation associated with land development under the Proposed SEP-HCP Alternative will be similar to those described for the No Action Alternative.

Compared to the No Action Alternative, the Proposed SEP-HCP Alternative will be expected to result in a greater level of habitat conservation due to the 31,031 acres of undeveloped land containing habitat for the Covered Species that will be permanently protected under this alternative. Preserve land will be primarily forest and shrubland vegetation communities used by the GCWA and BCVI. It is likely that this level of open space conservation will not occur under the No Action Alternative. As a result, the Proposed SEP-HCP Alternative could have a moderate benefit to vegetation resources in the Plan Area, compared to the No Action Alternative, because a larger percentage of the native plant community will be preserved and maintained.

10% Participation Alternative

The 10% Participation Alternative will not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years, with the exception of preventing future development from occurring in areas that are designated as preserve. Therefore, the potentially adverse impacts to vegetation resulting from anticipated land development will be similar to the impacts described for the No Action Alternative.

The primary difference between the 10% Participation Alternative and the No Action Alternative is the establishment and long-term management of a 7,390-acre preserve system, which will include approximately 5,250 acres of GCWA habitat, 1,390 acres of BCVI habitat, and 750 acres of karst lands. While some habitat conservation will occur under the No Action Alternative as the result of individual ESA compliance actions, the extent of these individual preserves will likely be less than the assured protection of 7,390 acres under the 10% Participation Alternative. The concentration of preserve land with more assured protection and guided management is likely to create a more effective protection for vegetation contained within the 7,390-acre preserve system than will likely be achieved with fewer, smaller, and more scattered protected areas under the No Action Alternative. Thus, these larger blocks of conserved native vegetation protected from development by the SEP-HCP will be more likely to yield benefits to vegetation than the mitigation measures that will result from project-by-project incidental take authorizations with the Service. The difference will be small, however, as the total area that will be conserved under this alternative will be small compared to the total size of the area of potential effect. Therefore, the beneficial impacts of the 10% Participation Alternative on vegetation will likely be only minor because they are likely to be localized to a small percentage of the native plant community.

Single-County Alternative

The Single-County Alternative will not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years, with the exception of preventing future development from occurring in areas that are designated as preserve. The potentially adverse impacts to vegetation resources resulting from anticipated land development will be similar to the impacts described for the No Action Alternative.

The primary difference between the Single-County Alternative and the No Action Alternative is the establishment and long-term management of a preserve system of up to 16,014 acres. While some habitat conservation will occur under the No Action Alternative as the result of individual ESA compliance actions, the extent of these individual preserves will likely be less than the assured protection of 16,014 acres under the Single County Alternative. Larger blocks of conserved native vegetation protected from development by the Single-County Alternative will be more likely to yield benefits to the ecosystem than the mitigation measures that likely will result from project-by-project incidental take authorizations with the Service under the No Action Alternative. Compared to the other

Action Alternatives, all of the preserve lands proposed for the Single-County Alternative will be concentrated closer to the urbanized areas within Bexar County and, therefore, the threat of invasion and establishment of non-native plants as a result of exposure to adjacent land uses could be higher. Overall, the beneficial impacts of the Single County Alternative on vegetation will likely be minor to moderate compared to the No Action Alternative because they could range from being localized to a small percentage of the native plant community in smaller preserves to a larger preserve that would protect native vegetation and more readily buffer it against change.

Increased Mitigation Alternative

The Increased Mitigation Alternative will not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years, with the exception of preventing future development from occurring in areas that are designated as preserve. The potentially adverse impacts to vegetation resources resulting from anticipated land development will be similar to the impacts described for the No Action Alternative.

The establishment and long-term management of up to 43,741-acre preserve system, as proposed under this alternative, will yield beneficial impacts to vegetation in the Plan Area. There will be less fragmentation of native vegetation communities by land developments which facilitate the invasion and establishment of non-native plants. Therefore, the potential beneficial impacts of the Increased Mitigation Alternative will be greater than those expected under the No Action Alternative. Like the Single-County Alternative, the Increased Mitigation Alternative includes a requirement that some of the preserve land be located within or adjacent to Bexar County. For the Increased Mitigation Alternative, the preserves for the BCVI will be mostly located in rural areas of the Plan Area; whereas, the majority (60 percent) of the GCWA habitat preserve will be contained within five miles of Bexar County. The more urbanized land uses found in Bexar County elevate the risk of invasion and establishment of invasive plant species within these preserve lands. However, this alternative will likely contain larger areas of contiguous, undeveloped land throughout the Plan Area than the No Action Alternative. The Increased Mitigation Alternative would have a moderate benefit to vegetation resources in the Plan Area compared to the No Action Alternative because it would protect large, contiguous areas that would maintain habitat characteristics and discourage invasive species through buffering.

4.5 GENERAL WILDLIFE

4.5.1 Affected Environment

The Plan Area crosses parts of six different ecological subregions, as described by the EPA (Griffith *et al.* 2004). These six distinct ecological subregions include the following communities: Balcones Canyonlands, Edwards Plateau Woodland, Northern Blackland Prairie, Llano Uplift, Northern Nueces Alluvial Plains, and Southern Post Oak Savanna.

Wildlife communities associated with these ecological subregions are as diverse as the ecological subregions themselves. A total of approximately 520 species of amphibians, reptiles, mammals, and birds make up the various vertebrate wildlife communities within the Plan Area (Dixon 2000, Schmidly 1994, Lockwood and Freeman 2004). Wildlife communities within the Balcones Canyonlands subregion are the most diverse, with approximately 95 percent of the total wildlife species within the Plan Area occurring within this region. However, over the past decade, conversion of forested land cover to other non-urban land cover types, such as grassland or shrubland, accounted for approximately 87 percent of the forest cover loss across the Plan Area, and most of this loss occurred in Blanco, Bandera, Kerr, Kendall and Medina counties (USGS 2003).

The 2005 Texas Wildlife Action Plan prepared by TPWD identified 301 native wildlife species of conservation concern that may occur in the Edwards Plateau ecoregion (TPWD 2005). These lists identify species with low or declining populations that are important to the health and diversity of the State's wildlife resources (**Table 4-4**).

Table 4-4: Native Vertebrate Wildlife Communities by Taxon and Ecological Region within the Plan Area (Species Diversity)

Taxon	Plan Area	Balcones Canyonlands	Edwards Plateau Woodlands	Llano Uplift	Northern Blackland Prairies	Northern Nueces Alluvial Plains	Southern Post Oak Savanna
Amphibians	33	33	25	22	30	21	28
Reptiles	79	77	65	63	76	72	74
Mammals	76	72	71	56	65	60	63
Birds	332	311	289	276	303	263	298
Total	520	493	450	417	474	416	463

Source: SEP-HCP 2015.

In addition to the Covered Species, other special status species occur in the Plan Area. Seventeen Voluntarily Conserved Species are addressed in the SEP-HCP including one mammal, six reptiles, one amphibian, three mollusks, and six plants (**Table 4-5**). The Voluntarily Conserved Species occur in habitats that are generally associated with areas used by the Covered Species. Habitats for the Voluntarily Conserved Species may be incidentally taken by the Covered Activities in the Enrollment Area or protected by preserve acquisitions for the Covered Species. None of Voluntarily Conserved Species are proposed to be covered for incidental take in the SEP-HCP, but some may benefit from the conservation measures described in the SEP-HCP. The SEP-HCP conservation program will consider the protection and management of habitats for these species as secondary priorities during the evaluation of potential preserve acquisitions and in preserve management plans. However, the conservation needs of the Covered Species will take precedence over the needs of the Voluntarily Conserved Species.

Table 4-5: Voluntarily Conserved Species

Common Name	Scientific Name	Taxa	Status	Basic Habitat Type
Cave myotis bat	*Myotis velifer*	Mammal	Non-listed	Roosts in clusters of up to thousands of individuals in a variety of natural and man-made structures; winters in limestone caves.
Cagle's map turtle	*Graptemys caglei*	Reptile	State Threatened	Guadalupe River system; short stretches of shallow water with swift to moderate flow and gravel or cobble bottom, connected by deeper pools with a slower flow rate and a silt or mud bottom.
Texas tortoise	*Gopherus berlandieri*	Reptile	State Threatened	Open brush with a grass understory; when inactive occupies shallow depressions at base of bush or cactus.
Indigo snake	*Drymarchon corais*	Reptile	State Threatened	Thornbush-chaparral woodlands of south Texas, in particular dense riparian corridors; requires moist microhabitats, such as rodent burrows, for shelter.

Common Name	Scientific Name	Taxa	Status	Basic Habitat Type
Spot-tailed earless lizard	*Holbrookia lacerata*	Reptile	Non-listed	Moderately open prairie brushland; fairly flat areas free of vegetation or other obstructions, including disturbed areas.
Texas horned lizard	*Phrynosoma cornutum*	Reptile	State Threatened	Open, arid and semi-arid regions with sparse vegetation, including grass, cactus, scattered brush or scrubby trees.
Texas garter snake	*Thamnophis sirtalis annectens*	Reptile	Non-listed	Wet or moist microhabitats are conducive to the species occurrence, but are not necessarily restricted to them.
Eurycea Salamanders	*Various species*	Amphibian	State & Federally Threatened	Karst-dependent; associated with aquifers, spring outfalls and spring runs.
Golden orb	*Quadrula aurea*	Mollusk	State Threatened & Petitioned for Federal Listing	Flowing waters of moderate-sized streams and rivers of the San Antonio, Guadalupe, Colorado, Brazos, Nueces, and Frio River systems.
Texas pimpleback	*Quadrula petrina*	Mollusk	State Threatened & Petitioned for Federal Listing	Flowing water of moderate-sized streams and small rivers; historically known from the San Antonio and Guadalupe River systems; not currently known to occur in the Plan Area.
Texas fatmucket	*Lampsilis bracteata*	Mollusk	State Threatened & Petitioned for Federal Listing	Flowing water of moderate-sized streams and small rivers in the San Antonio, Guadalupe, and Colorado River systems.
Tobusch fishhook cactus	*Sclerocactus brevihamatus ssp tobuschii*	Plant	Federally Endangered & State Endangered	Open areas within a mosaic of oak-juniper woodlands; sites are usually open with only herbaceous cover.
Big red sage	*Salvia penstemonoides*	Plant	Petitioned for Federally Endangered	Associated with seeps and creeks within steep limestone canyons; occasionally on clayey to silty soils of creek banks and terraces.
Bracted twistflower	*Streptanthus bracteatus*	Plant	Non-listed	Oak juniper woodlands over limestone and associated openings; on steep to moderate slopes and in canyon bottoms.
Longstalk heimia	*Nesaea longipes*	Plant	Non-listed	Moist alkaline or gypsiferous clayey soils along non-shaded margins of wetlands; moderately alkaline clay soils along perennial streams and in sub-irrigated wetlands; sparingly found on terraces of spring-fed streams in grassland.
Correll's false dragon-head	*Physostegia correllii*	Plant	Non-listed	Wet, silty clay loams on streamsides, in creek beds, irrigation channels and roadside drainage ditches.

Common Name	Scientific Name	Taxa	Status	Basic Habitat Type
Canyon rattlesnake-root	*Prenanthes carrii*	Plant	Non-listed	Rich humus soils over limestone in upper woodland canyon drainages; typically near springs in deep soils around the springs and on limestone shelves or honeycomb rock.

Source: SEP-HCP EIS Team 2011.

Texas Wildlife Action Plan

The 2005 Texas Wildlife Action Plan developed by TPWD identifies threats to the State's wildlife resources associated with changing demands on land resources (such as land development and fragmentation that threaten the viability of natural habitats and the sustainability of wildlife populations), introduced species (non-native plants and animals that displace native species and threaten habitat integrity for native wildlife), noxious brush and invasive plants (excessive quantities of even native plants can reduce the quality of wildlife habitat), overgrazing and fire suppression (improper application of these management tools or uses have contributed to a drastic alteration of the historic landscape), and limited understanding of complex natural systems (lack of reliable knowledge about the function of natural systems can lead to inappropriate conservation or management decisions) (TPWD 2005). The Action Plan identifies a list of species with low or declining populations that are important to the health and diversity of the State's wildlife resources; there are 514 native wildlife species of conservation concern that may occur in the SEP-HCP Plan Area. This Action is used by the TPWD to prioritize and plan wildlife management and conservation efforts.

Potential Impacts to Wildlife from Land Development Activities

Impacts to wildlife may depend on whether a particular wildlife species thrives or deteriorates as a result of human encroachment. Urban-adapted or tolerant wildlife species (such as raccoons, squirrels, grackles, and blue jays) could benefit from an increase in human activity, while other species (such as cave-dependent bats, bobcats, forest dwelling birds, and many reptiles) would decrease as humans convert or encroach upon natural landscapes.

Impacts to the over 520 species listed in the Plan Area will vary based on the type of habitat impacted by development activities and the sensitivity of each species to human-induced changes to native habitats or wildlife communities. Land development impacts natural environments in several ways, such as replacing native vegetation with buildings, pavement, and other man-made structures; decreasing the amount of continuous open-space (e.g., fragmentation); and increasing vegetational disturbance, erosion, and soil compaction (Bradley 1995). Development often results in the introduction of non-native vegetation through invasion or landscaping with non-native, ornamental plants (Whitney and Adams 1980; Mills *et al.* 1989; Bolger *et al.* 1997). Physical changes to the natural landscape, and possible alteration in predator or competitor interactions, will result from increased urbanization. Most animals in urban areas are not seasonally hunted or treated as game, while the hunting of game animals such as white-tailed deer are restricted to specific seasons and heavily regulated. Some avian species are protected by both the provisions of the *Texas Parks and Wildlife Code*, and the *Migratory Bird Treaty Act*, which prohibits the taking, killing, or possession of all migratory birds (with the exception of several non-native species). While these regulations protect birds to some degree, they provide no protection to the habitat required for their survival. In general, the natural composition and stability of native wildlife communities will decline concurrently with the expansion of the human population into their habitats. Should this projected future development incorporate areas of natural green space, this

anticipated decline could be minimized. Title 5 of the Texas Parks and Wildlife Code describes laws and matters regarding forests, water district and river authority parks, Texas trails systems, wildlife and plant conservation, hunting and fishing licenses, commercial and fish farmer's licenses, the Uniform Wildlife Regulatory Act, hunting, endangered species, crustaceans and mollusks, wildlife management areas, sanctuaries, and preserves, including federal-state agreements. The code also establishes special standards for non-game species, such as bats (Parks and Wildlife Code, Section 63.101). While certain species may benefit from human activities, land development typically alters the processes that maintain balance in native wildlife communities, resulting in adverse effects to self-sustaining native wildlife communities. Therefore, projected future land development activities have the potential to adversely impact wildlife populations through habitat changes, introduction of non-native species, and other alterations to the natural balance of native wildlife species within the SEP-HCP Plan Area.

4.5.2 Environmental Consequences

Methodology

In addition to the Covered Species, other wildlife species can be found to occupy the same habitat in the Plan Area. Loss or modification of habitat as a result of an ITP will also adversely affect wildlife while conservation of other areas of habitat for the Covered Species will beneficially affect wildlife.
The intensity of potential impacts to wildlife is described using the following definitions:

Negligible: No measureable impacts to self-sustaining wildlife communities will be detected.

Minor: Some measureable changes such as slight shifts in species composition or population numbers will occur but will be localized within a small area. The integrity and continuity of the wildlife community will not be adversely affected.

Moderate: Measureable changes in species composition, individual species abundance, or distribution of a particular self-sustaining native wildlife community will occur over a relatively large area. Moderate impacts likely will require mitigation measures and will have a reasonable likelihood of successfully offsetting the adverse impacts.

Major: Substantial changes of species composition, individual species abundance, or distribution of a particular self-sustaining native wildlife community will be apparent over a large area. Major impacts will require extensive mitigation measures that may not have a reasonable likelihood of successfully offsetting the adverse impacts.

No Action Alternative

As previously described, a total of 241,152 acres in the Plan Area will experience construction activities with or without the SEP-HCP over the next 30 years. The precise location, magnitude, and nature of specific activities associated with future commercial, residential, and other types of development cannot be predicted; however, most of the new development (55 percent) is predicted occur in Bexar County followed by Comal County (24.1 percent), and Medina County (10.4 percent). The areas anticipated for the greatest amount of development generally correspond to the SEP-HCP Enrollment Area. New development will include clearing vegetation prior to construction which will alter the processes that maintain the balance in native wildlife communities, resulting in adverse impacts to self-sustaining native wildlife communities. The No Action Alternative will not increase these impacts, but this condition will continue to degrade and have the potential to cause moderate, direct, and indirect adverse impacts to wildlife populations through habitat changes, introduction of non-native species, and other alterations to the natural balance of native wildlife species.

Under the No Action Alternative, development on land that provides habitat for endangered species may be mitigated on a case-by-case basis, but most land development that occurs outside of endangered species habitat will likely commence without conservation of open spaces. As ESA-related mitigation will be specific to the affected listed species, these lands will likely not be suitable for all wildlife species. Thus, any mitigation under the No Action Alternative will generally result in negligible beneficial impacts to native self-sustaining wildlife communities because they will likely not be measureable.

Proposed SEP-HCP Alternative

The Proposed SEP-HCP Alternative will not be expected to substantially affect the amount, timing, or location of land development over the next 30 years, so impacts to wildlife communities will also be similar to the No Action Alternative, with the exception of preventing future development from occurring in areas that are designated as preserve. Although many wildlife species thrive in urbanized environments, future development pressure will cause most wildlife communities currently present in the Plan Area to experience a decrease in habitat and likely decline in population sizes. Therefore, consolidation of mitigation lands in the Proposed SEP-HCP Alternative will likely result in moderately beneficial impacts on many wildlife species, although the true impacts of the proposed SEP-HCP on wildlife communities will be tied to the size and location of proposed preserve lands.

Many wildlife species depend on numerous habitats throughout their lives, so protecting contiguous open space is crucial. In addition, contiguous forest habitat supports native wildlife species that require large open space to survive. Such habitat supports natural ecological processes, such as predator/prey interactions and natural disturbance. The Proposed SEP-HCP Alternative will conserve up to 31,030 acres and it is likely that this level of open space conservation will not occur under the No Action Alternative. The preserve lands may also serve to buffer species against the negative consequences of habitat fragmentation. When habitat is fragmented, many birds are affected by increased rates of nest predation from raccoons, skunks, and squirrels, as well as nest parasitism from brown-headed cowbirds. Many of the native migratory songbird populations are now in decline due, in part, to the loss of contiguous forest habitat (Terborgh 1989).

The Proposed SEP-HCP Alternative will be expected to result in a greater level of land preservation over the No Action Alternative. The preserve system will be primarily forest and shrubland vegetation communities used by the GCWA and BCVI; however, it is likely that the preserve system will also contain substantial native vegetation communities that will support the sheltering, breeding, and foraging requirements for many other Voluntarily Conserved and wildlife species. Ongoing management of the preserve system will reduce the risk of adverse impacts from adjacent land uses.

The protection of thousands of acres of natural vegetation in the Plan Area under the Proposed SEP-HCP Alternative will conserve natural ecological processes. Although the preserve system is managed for listed species habitat, tracts that provide benefits to multiple species will rank higher during the SEP-HCP's evaluation of potential preserve lands. Therefore, the protection of natural habitat in the SEP-HCP preserve system will likely yield some moderate direct beneficial impacts to general wildlife communities, compared to the No Action Alternative, because the current species composition, individual species abundance, and distribution of a self-sustaining native wildlife community will maintained through these larger, more contiguous preserves.

10% Participation Alternative

As previously stated, the 10% Participation Alternative will not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years. Therefore, the potentially adverse impacts to wildlife resulting from anticipated land development will be similar to the impacts described for the No Action Alternative.

The primary difference between the 10% Participation Alternative and the No Action Alternative is the establishment and long-term management of a 7,390-acre preserve system which will include approximately 5,250 acres of GCWA habitat, 1,390 acres of BCVI habitat, and 750 acres of karst lands. Creating these large preserves and restricting public access will protect riparian habitat along creeks and streams. While some habitat conservation will occur under the No Action Alternative as the result of individual ESA compliance actions, the extent of these individual preserves will likely be less than the assured protection of 7,390 acres under the 10% Participation Alternative and the distribution of preserve lands under the No Action Alternative will likely be more scattered. The concentration of preserve land with more assured protection and guided management is likely to create a more effective habitat protection and biodiversity within the 7,390-acre preserve system than will be achieved with fewer, smaller, and more scattered protected areas under the No Action Alternative. Thus, these larger blocks of conserved habitat protected from development by the SEP-HCP will be more likely to yield benefits to general wildlife than the mitigation measures that will result from project-by-project incidental take authorizations with the Service. The difference will be small, however, as the total area that will be conserved under this alternative will be small compared to the total size of the area of potential effect. Therefore, the beneficial impacts of the 10% Participation Alternative on general wildlife communities will likely be only minor, compared to the No Action Alternative, because while the preserve size is likely more contiguous, it is still a relatively small area compared to the impacts expected from development.

Single-County Alternative

The Single-County Alternative will not significantly influence the amount, timing, or location of land development anticipated over the next 30 years. It will restrict the location of mitigation lands to Bexar County, plus 10-miles around Bexar County. The potentially adverse impacts to general wildlife resulting from anticipated land development will be similar to the impacts described for the No Action Alternative.

The primary difference between the Single-County Alternative and the No Action Alternative is the establishment and long-term management of a preserve system of up to 16,014 acres. Although the preserve locations have not been identified, it is assumed that habitat acquisition will be in large, more contiguous parcels. Creating these large preserves and restricting public access will protect habitat, and serve as a buffer from the negative consequences of habitat fragmentation and other disturbances. In the absence of contiguous habitat, many birds are affected by increased rates of nest predation from raccoons, skunks, and squirrels, as well as nest parasitism from brown-headed cowbirds. Many of the native migratory songbird populations are now in decline due, in part, to the loss of contiguous forest habitat (Terborgh 1989).

While some habitat conservation will occur under the No Action Alternative as the result of individual ESA compliance actions, the extent of these individual preserves will likely be less than the protection of up to 16,014 acres under the Single County Alternative and the distribution of preserve lands under the No Action Alternative will likely be more scattered. The preserve lands proposed for the Single-

County Alternative will be concentrated closer to San Antonio and could result in greater risk of invasion and establishment of non-native plants and wildlife predation as a result of exposure to adjacent urbanized land uses. Ongoing management of the preserve system, as described in **Chapter 1**, which will include public education, will reduce the chance of adverse edge effects of adjacent land uses such as ways to manage household pets, using native plants in landscaping, and appropriate ways to feed backyard wildlife. The larger preserves contained in this alternative will also reduce exposure to adjacent land uses. Therefore, the Single-County Alternative will yield moderate beneficial impacts to native wildlife populations, compared to the No Action Alternative, because of the establishment and long-term management of such a large preserve system that will contain numerous sizable areas of contiguous, undeveloped land throughout Bexar County, plus 10-miles .

Increased Mitigation Alternative

The Increased Mitigation Alternative, like the other alternatives, is not anticipated to influence land development trends in the Plan Area over the next 30 years. The potential adverse impacts on general wildlife species as a result of anticipated land development over the next 30 years will be the same as the No Action Alternative.

The Increased Mitigation Alternative proposes to establish up to 43,741 acres in a preserve. This much larger preserve, compared to the other Action Alternatives, will result in less fragmentation of native vegetation communities by land developments, invasion and establishment of non-native vegetation, and disruption of wildlife communities. The BCVI habitat mitigation will be mostly located in rural areas of the Plan Area, whereas, the majority (60 percent) of the GCWA habitat mitigation area in this system will be contained within five miles of Bexar County. When compared to the No Action Alternative, the GCWA habitat mitigation area contemplated for the Increased Mitigation Alternative is likely to contain larger areas of contiguous, undeveloped land in and within five miles of Bexar County. Some adverse edge effects from the rapidly urbanizing area could occur, but could be reduced through ongoing management, as described in Chapter 1, which includes public education on topics such as ways to manage household pets, using native plants in landscaping, and appropriate ways to feed backyard wildlife. Protecting potentially large, contiguous areas, tightly controlling public access and managing vegetation to maintain habitat characteristics will discourage invasive species and encourage native vegetation. In addition, contiguous forest habitat supports native wildlife species that require large areas to survive. Such habitat supports natural ecological processes, such as predator/prey interactions and natural disturbance. Many of the native migratory songbird populations are now in decline due, in part, to the loss of contiguous forest habitat (Terborgh 1989). As a result, the Increased Mitigation Alternative could have a moderate beneficial effect to wildlife resources in the Plan Area, compared to the No Action Alternative, due to the larger preserve parcels, which will buffer against negative edge effects.

4.6 THREATENED AND ENDANGERED SPECIES

4.6.1 Golden-cheeked Warbler – Affected Environment

The GCWA is a songbird that migrates annually between its wintering grounds in southern Mexico and Central America and its breeding grounds in central Texas. The Service published the final rule listing the GCWA as federally endangered on December 27, 1990 (55 FR 53153). The GCWA was listed as endangered by the State of Texas on February 19, 1991 (Executive Order No. 91-001). No critical habitat is designated for the GCWA.

See the SEP-HCP's **Appendix C – Biology of the Covered Species or** the Service's GCWA Recovery Plan (1992) for a detailed species description.

4.6.2 Golden-cheeked Warbler - Environmental Consequences

Methodology

The GCWA will be covered by the ITP requested for the proposed SEP-HCP. The definition of terms used to describe the intensity of impacts is the same for all Covered Species, as follows:

Negligible: The Covered Species will not be affected or there will be no measureable change to the population in the area of potential impacts.

Minor: Measureable changes to the Covered Species or their habitat will be relatively localized within the area of potential impacts.

Moderate: Noticeable adverse or beneficial impacts to the population or habitat of the Covered Species within the area of potential impacts.

Major: Obvious impacts to the population or habitat of the Covered Species within the area of potential impacts and severe consequences or exceptional benefits.

Impacts to the GCWA would be considered significant if they result in one or more of the following:

- The primary threats to health of mature juniper-oak woodland habitat used by the species would decrease resulting in beneficial impacts.
- The primary threats to the health of mature juniper-oak woodland habitat used by the species would increase resulting in adverse impacts.
- The size of the local GCWA population within the Plan Area would substantially increase resulting in beneficial impacts.
- The size of the local GCWA population within the Plan Area would substantially decrease resulting in adverse impacts.
- The goals and objectives of the GCWA recovery plan are advanced or met resulting in beneficial impacts.
- The goals and objectives of the GCWA recovery plan are hindered or precluded from being met resulting in adverse impacts.

No Action Alternative

Under the No Action Alternative, the recent trends in population growth, land development, and forest cover loss are likely to continue as projected. It is likely that the construction activities required to support future population growth within the Plan Area will impact GCWA habitat over the next 30 years. According to Groce *et al.* (2010) there is no evidence to indicate that the amount of GCWA breeding habitat is increasing or stable due to continued habitat loss and fragmentation from human development, shifts in land use, and construction of roads and utility transmission corridors. These threats are likely to be intensified by projected increases in human populations within the breeding range of the species.

Based on trends analyzed between 1992 and 2010 it is estimated that between 0.5 and 0.7 percent of GCWA habitat is lost each year in the Plan Area (Diamond *et.al.* 2010, Groce *et al.* 2010). If no action is taken, 51,150 acres, or 7.8 percent of the currently available GCWA habitat in the Plan Area is projected to be lost in the next 30 years. In Bexar County alone, excluding Camp Bullis, 14,883 acres, or approximately 25.2 percent, could be lost in the next 30 years directly to developed land uses (Diamond *et.al.* 2010). Under the No Action Alternative, individual projects within occupied GCWA habitat may pursue incidental take authorization from the Service in order to obtain an ITP and comply with the ESA. This ESA authorization will include the requirement that the impacts of any incidental

take of the GCWA be mitigated to the maximum extent practicable; therefore, the overall benefit to the species from habitat protection resulting from individual ESA incidental take authorizations is likely to be minor.

There are between approximately 1,110,000 and 989,000 acres of potential GCWA habitat in the Plan Area. Some of which is located on properties under public and private ownership (not including military installations such as Camp Bullis) that currently offer some protection from future land development activities. These properties contain between 50,000 and 60,000 acres of potential GCWA habitat (Morrison *et. al.* 2010, Diamond *et.al.* 2010). As stated above, approximately 51,150 acres of potential GCWA habitat could be lost under the No Action Alternative between 2010 and 2040 years (Diamond *et.al.* 2010). Therefore, this relatively small amount of loss indicates that the No Action Alternative will not be likely to preclude the attainment of recovery for the GCWA, but will also not be likely to substantially contribute to meeting these goals, due to the likely small mitigation parcels. The No Action Alternative assumes that the status quo will continue in the future in terms of the current level of compliance with the ESA. Additionally, the recent trends affecting the GCWA in the Plan Area, particularly related to the loss of potential habitat will be expected to continue through the next 30 years and result in a moderate adverse impact to the species under the No-Action Alternative because there would be measureable decreases in species distribution and abundance and increased fragmentation, which reduces reproductive success.

Proposed SEP-HCP Alternative

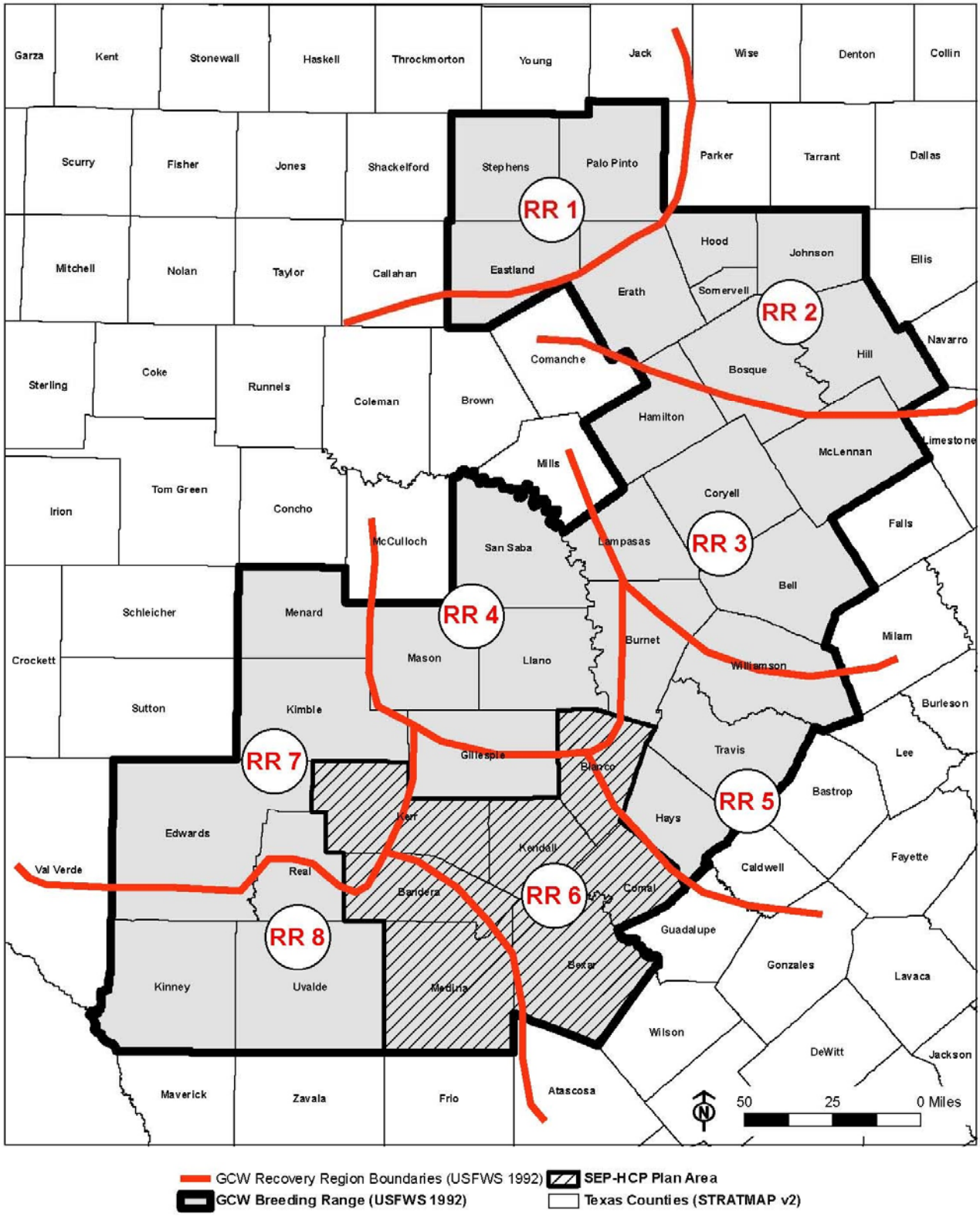
Under the Proposed SEP-HCP, the Applicants will be authorized to incidentally take the GCWA related to the loss or degradation of up to 9,371 acres of potential GCWA habitat in the Enrollment Area. It is expected that land development will be implemented in much the same manner as the No Action Alternative and will experience similar levels and patterns. Accordingly, anticipated land development activities in the Plan Area will be expected to have similar potentially adverse impacts to the species as described for the No Action Alternative. Since implementation of the Proposed SEP-HCP Alternative will not be expected to substantially influence the total amount of anticipated habitat loss in the Plan Area during the permit term, the impacts of the Proposed SEP-HCP Alternative on the GCWA will be primarily associated with the mitigation provided by the SEP-HCP.

To mitigate for impacts to GCWAs, the SEP-HCP will create a 23,430 acre GCWA preserve. Preservation Credits will be assembled on a phased basis, as needed over the next 30 years to provide sufficient credits to offset impacts from participating public and private projects. Under the phased mitigation approach, habitat protection will always occur in advance of authorized impacts through the SEP-HCP; however, no pre-determined preserve system will be designated under the SEP-HCP. The Service will award Preservation Credits to the SEP-HCP in proportion to the acreage of potential GCWA habitat contained within the preserve system. Credits can be accrued by acquiring parcels of habitat or purchasing them from an existing Service-approved conservation bank. It is anticipated that most preserves will generate at least one Preservation Credit for each acre of potential habitat included within it. However, the Service may alter this ratio if conditions (such as habitat quality, parcel size, or adjacent or interior land uses) warrant such action. Therefore, the actual mitigation value of each acre in the mitigation parcel will be based on the specific conditions of each site. In a similar fashion, the SEP-HCP will determine the mitigation needs for potential SEP-HCP Participants based on the specific conditions on each project site by conducting an on-site habitat assessment.

The direct and indirect impacts to potential habitat will be evaluated by reviewing site plans for SEP-HCP Participants. Direct impacts are assumed to apply to all areas of habitat within the boundaries of an Enrolled Property and are proposed to be assessed as two acres of mitigation for each acre of impact (a 2:1 mitigation ratio). Indirect impacts are assumed to apply to all areas of habitat within 300 feet of GCWA habitat, including outside of the boundaries of an Enrolled Property, and are proposed to be assessed as one-half acre of mitigation for each acre of impact (a 0.5-to-1 mitigation ratio). Mitigation needs for SEP-HCP Participants will be assessed in terms of Preservation Credits where one credit is equal to one acre of protected habitat. Therefore, it is anticipated that impacts to habitat authorized through the SEP-HCP will adequately be balanced by protected habitat in the preserve. The Proposed SEP-HCP Alternative may increase the amount of ESA compliance in the Plan Area, compared with the No Action Alternative, since compliance will be more efficient than obtaining incidental take authorization directly from the Service. Further, the Applicants propose to increase awareness of endangered species issues in the Plan Area (see Section 10 Education and Outreach of the SEP HCP), which may also lead to increased ESA compliance. Increased ESA compliance will benefit the species by ensuring that a larger portion of the anticipated habitat loss over the next 30 years will be balanced with conservation actions, such as habitat protection.

The GCWA Recovery Plan (Service 1992) identifies the criteria to be met for the GCWA to be considered for downlisting from endangered to threatened status. These recovery criteria include the protection of sufficient breeding habitat to ensure the continued existence of at least one viable, self-sustaining GCWA population in each of the eight recovery regions (**Figure 4-7**), where the potential for gene flow exists across regions to ensure long-term viability of the protected populations (Service 1992). Attaining the recovery goals for the GCWA includes the identification of focal areas for protection that include a single, viable GCWA population, or one or more smaller populations that are interconnected (Service 1992). While the ultimate size of the preserve system will be proportional to the amount of impact authorized through participation in the SEP-HCP, at full implementation at least 23,430 acres of GCWA habitat would be permanently protected and managed for the benefit of the GCWA. With regard to GCWA recovery goals (Service 1992), the Proposed SEP-HCP Alternative will likely protect a focal area for GCWA conservation. In Recovery Unit 6, this goal is being partially met in Bexar County by existing conservation actions. Approximately 6,400 to 7,400 acres are currently being protected and managed explicitly for the GCWA in Bexar County (SEP-HCP 2015). And, while not specifically protected and managed for the GCWA, the Edwards Aquifer Protection Program has protected tens of thousands of acres in the Plan Area from future development. The Proposed SEP-HCP Alternative is likely to result in a moderate beneficial impact to the GCWA, compared to the No Action Alternative, due to the protection and management of high quality habitats and reduced fragmentation, which maintains reproductive success rates.

Figure 4-7: 1992 GCWA Recovery Region Boundaries



Source: Service 1992.

10% Participation Alternative

The 10% Participation Alternative will authorize take of approximately 2,100 acres of potential GCWA habitat within the Enrollment Area associated with Covered Activities. As mitigation, the SEP-HCP will acquire approximately 5,250 acres of GCWA habitat, which is expected to occur within the first several years.

It is expected that land development will be implemented in much the same manner as the No Action Alternative and will experience similar levels and patterns. It is possible that the 10% Participation Alternative will increase the amount of ESA compliance in the Plan Area, compared with the No Action Alternative, since compliance may be easier than obtaining incidental take authorization directly from the Service. However, the potential benefits of increased ESA compliance will be limited by the modest level of incidental take authorization available under this alternative. Therefore, the potentially adverse impacts of this alternative will be similar to those described for the No Action Alternative (i.e., the alternative will provide ESA incidental take authorization for a portion of the total amount of anticipated habitat loss in the Plan Area over the next 30 years, but will not be expected to substantially increase or decrease the total amount of anticipated habitat loss during that time). The remaining impacts of this alternative on the GCWA will be primarily associated with the mitigation provided by the 5,250-acre preserve system.

The direct and indirect impacts will be assessed like those under the Proposed SEP-HCP Alternative. Additionally, preserves would be purchased, preserved, and managed like those under the Proposed SEP-HCP Alternative, protecting key areas of potential habitat in Bexar County and City of San Antonio jurisdictions from future land development, thereby decreasing the threat of habitat loss for GCWAs. Therefore, the mitigation provided under the 10% Participation Alternative will likely result in a preserve system with greater conservation value than will be achieved under the No Action Alternative. However, the overall size of the GCWA preserve system under the 10% Participation Alternative will be modest in comparison to the other Action Alternatives. Therefore, the preserve system will be likely to only have a minor beneficial impact on GCWAs. With regard to recovery goals, the likely benefits of the preserve system will be limited by the relative size of the preserve system when compared to the other Action Alternatives. Therefore, this alternative is not likely to have substantial influence on the ability of recovery goals to be met. Overall, the 10% Participation Alternative is likely to result in only minor beneficial impacts to the GCWA, due to the limited size of GCWA preserves.

Single-County Alternative

The Single-County Participation Alternative is designed to offset the impacts associated with up 9,371 acres of development activity on potential GCWA habitat in the Enrollment Area. At full implementation, the Single-County Alternative preserve system will include approximately 11,714 acres of GCWA habitat. It will restrict purchase of conservation lands to Bexar County and up to10 miles outside of Bexar County. The Single-County Alternative will not significantly influence the amount or timing of land development anticipated over the next 30 years. Therefore, potentially adverse impacts to the GCWA resulting from anticipated land development under the Single-County Alternative will be similar to the impacts described for the No Action Alternative.

The most significant difference between the Single-County Alternative and the other Action Alternatives is that direct impacts are proposed to be off-set at a 1-to-1 ratio (that is one acre of mitigation for one acre of directly impacted habitat). All other Action Alternatives include a higher proposed mitigation ratio. The mitigation provided under the Single-County Alternative will likely result in a preserve

system with greater conservation value than will likely be achieved under the No Action Alternative, due to the protection of larger blocks of potential habitat than will likely be achieved for smaller, individual mitigation actions. Overall, the Single-County Alternative will protect large areas of potential habitat in and around Bexar County from future land development, thereby decreasing the threat of habitat loss for many important areas of potential GCWA habitat and resulting in some beneficial effects to the species. It is possible that the habitat protection afforded by the Single-County Alternative, in combination with other conservation lands, would generate a focal area for GCWA conservation. Therefore, it is possible that this preserve system will have a minor beneficial impact on the GCWA population because the 11,714-acre preserve in Bexar County will no longer be developable and will be conserved in perpetuity. With regard to recovery goals, the Single-County Alternative may protect or create a new focal area for GCWA conservation, but only if contiguous within itself and established adjacent to or near other conservation lands supporting the GCWA. Therefore, this alternative will likely have a positive effect on the ability of recovery goals being met. The Single County Alternative is likely to result in minor to moderate beneficial impact to the GCWA, compared to the No Action Alternative, due to the size of the preserve and the permanent protections it will afford the GCWA.

Increased Mitigation Alternative
The Increased Mitigation Alternative will include approximately 35,141 acres of GCWA habitat preserve. In return for the commitment to acquire a very large-scale, well-designed, and managed preserve system, the Permittees will be authorized to incidentally take 9,371 acres of GCWA habitat within Bexar County and City of San Antonio jurisdictions.

It is expected that land development will be implemented in much the same manner as the No Action Alternative and will experience similar levels and patterns. The Increased Mitigation Alternative proposes a 3:1 direct impact-to-mitigation ratio. The Increased Mitigation Alternative will have the potential to protect more of the local population of GCWAs within and near Bexar County, since 60 percent of the GCWA preserves must be within Bexar County or within 5 miles of its border. When compared to the other Action Alternatives, the Preservation Credit fee for direct impacts to GCWA would be greater to account for the higher mitigation ratio and preserve location requirements; it is possible that the higher fee could result in lower participation. Additionally, this preserve system will also likely help achieve recovery goals for the GCWA by conserving and enhancing habitat connectivity across the landscape. The overall impact of the Increased Mitigation Alternative will likely be moderately beneficial for the GCWA, due to the larger size of permanently protected GCWA habitat.

4.6.3 Black-capped Vireo - Affected Environment
The BCVI is a migratory bird present in Texas during its breeding season (March to September). The species was given endangered status by the Service on October 6, 1987 and the rule became effective on November 5, 1987 (52 FR 37420). The Service has not designated critical habitat for the BCVI. The BCVI was state-listed as threatened on March 1, 1987 and endangered on December 28, 1987.

See the SEP-HCP's **Appendix C – Biology of the Covered Species** or the Service's BCVI Recovery Plan (1991) for a detailed species description.

4.6.4 Black-capped Vireo - Environmental Consequences

Methodology

The BCVI will be covered by the ITP requested for the SEP-HCP. Definitions of terms used to measure intensity of impacts are as follows:

Negligible: The Covered Species will not be affected or there will be no measureable change to the population in the area of potential impacts.

Minor: Measureable changes to the Covered Species or their habitat however relatively localized within the area of potential impacts.

Moderate: Noticeable adverse or beneficial impacts to the population or habitat of the Covered Species within the area of potential impacts.

Major: Obvious impacts to the population or habitat of the Covered Species within the area of potential impacts and severe consequences or exceptional benefits.

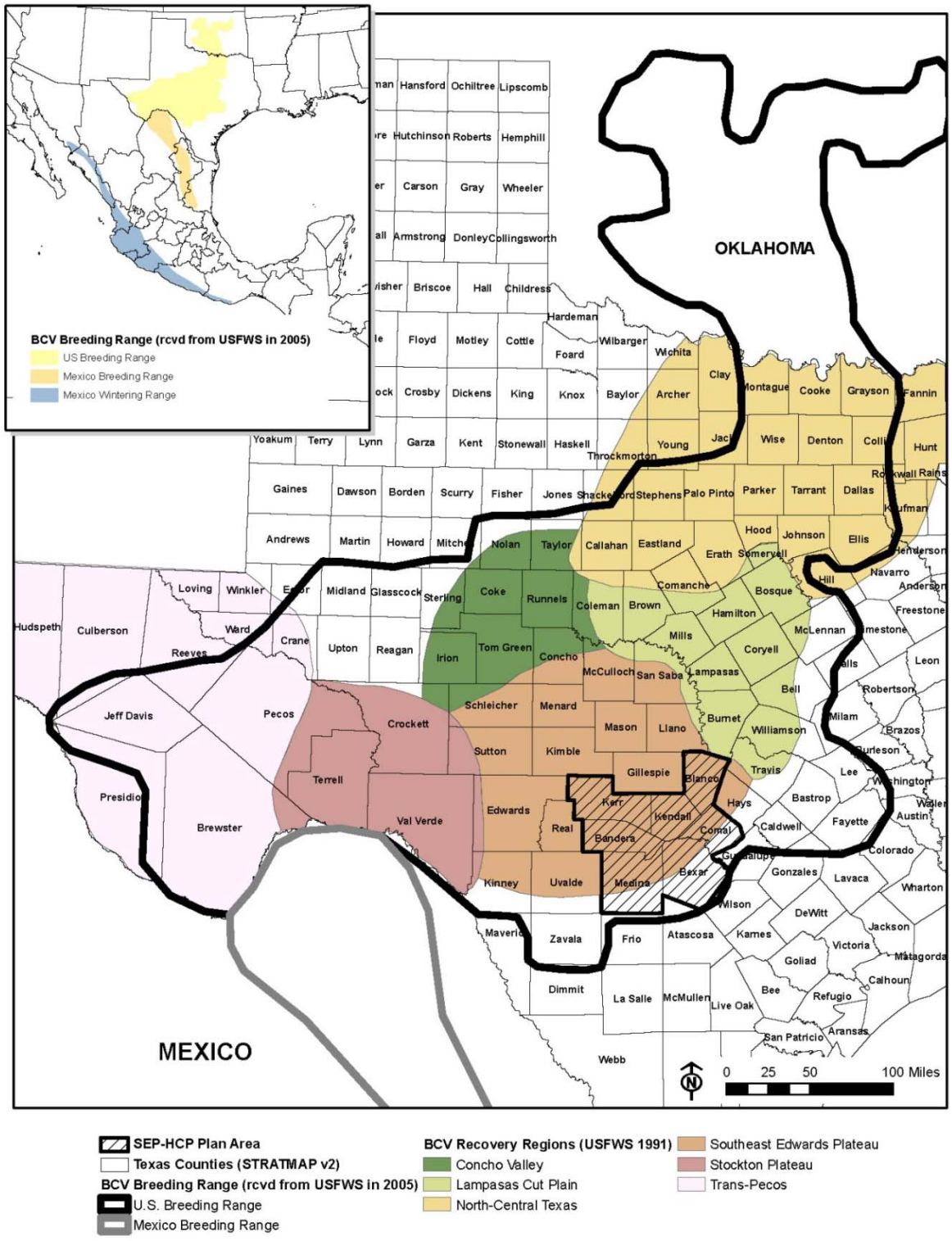
No Action Alternative

Under the No Action Alternative, the recent trends affecting the BCVI will be expected to continue through the next 30 years. In the Plan Area, developed land uses are increasing across the landscape, which is likely resulting in some loss of habitat for the BCVI. Under the No Action Alternative it is anticipated that 10,084 acres of BCVI habitat could be lost in the Plan Area between 2010 and 2040 with half of this loss occurring in Bexar County (Wilkins *et.al.* 2006). However, land cover changes tracked by the USGS (2003) suggest that large areas of forest cover are also being converted to more open grassland or shrubland habitats, which over time could create more habitat for the species. Therefore, given the lack of specific information regarding the status of the BCVI in the Plan Area, it is uncertain the extent to which land use changes and other regional trends will be expected to adversely or beneficially affect the species (both in terms of habitat availability and population size) under the No Action Alternative.

The recovery criteria in the BCVI Recovery Plan (Service 1991) calls for the protection of at least one viable BCVI population composed of at least 500 to 1,000 breeding pairs in four of six recovery regions in Texas, plus one each in Oklahoma and Mexico (see **Figure 4-8**). A status review by Wilkins *et al.* (2006) identified 1,018 BCVI observations in the Edwards Plateau recovery region. Most of these records were from protected lands, such as state parks and wildlife management areas, since most of the BCVI's breeding range occurs on private lands and was not accessible (Wilkens *et al.* 2006). The BCVI 5-year status review recommended the possible downlisting from endangered to threatened because the known BCVI population is currently much larger than known at the time of listing (Service 2007). Additionally, the primary threats to the species (habitat loss, grazing and browsing, brood parasitism, and vegetational succession) are not as great as they were at the time of listing (Service 2007).

While anticipated land development will result in the loss of BCVI habitat within the SEP-HCP Plan Area, historic land cover change suggests that BCVI habitat will also be created. . Regardless of the overall impacts of land use changes in the Plan Area, individual projects within occupied BCVI habitat may seek incidental take authorization from the Service for an ITP to comply with the ESA. While the impacts and mitigation likely to occur under the No Action Alternative are difficult to predict due to the lack of information regarding the precise location and nature of future land development in the Plan Area, the lack of reliable information regarding the status of the species in the Plan Area, and the inability to predict the level of compliance with the ESA, it is likely that some conservation efforts for the species will continue to take place, as they have in the past. Therefore, the overall benefit to the

Figure 4-8: 1991 BCVI Recovery Region Boundaries



Source: Service 1991.

species resulting from individual ESA incidental take authorizations under the No Action Alternative is likely to be minor, due to negligible adverse and beneficial impacts.

Proposed SEP-HCP Alternative

Land development is expected to be implemented in the same manner as the No Action Alternative and will experience similar levels and patterns. Accordingly, anticipated land development activities in the county are expected to have similar potentially adverse impacts to the species as described in the No Action Alternative.

Under the Proposed SEP-HCP Alternative, incidental take authorization will be given to incidentally take BCVI related to the loss or degradation of up to 2,640 acres of potential BCVI habitat in Bexar County and City of San Antonio jurisdictions over 30 years. To mitigate for those impacts, the SEP-HCP will create a preserve system with a target size of approximately 6,600 acres of BCVI habitat that will be managed in perpetuity. The preserve system will be developed on a phased basis as needed over the next 30 years to provide sufficient Preservation Credits to offset impacts from participating public and private projects. Under the phased mitigation approach, habitat protection will always occur in advance of authorized impacts through the SEP-HCP; however, no pre-determined preserve system will be designated under the SEP-HCP.

The direct and indirect impacts to potential habitat will be evaluated by reviewing site plans for SEP-HCP Participants. Direct impacts are assumed to apply to all areas of habitat within the boundaries of an Enrolled Property and are proposed to be assessed as two acres of mitigation for each acre of impact (a 2-to-1 mitigation ratio). Indirect Impacts are assumed to apply to all areas of habitat within 300 feet of BCVI habitat, including outside of the boundaries of an Enrolled Property, and are proposed to be assessed as one-half acre of mitigation for each acre of impact (a 0.5-to-1 mitigation ratio). Mitigation needs for SEP-HCP Participants will be assessed in terms of Preservation Credits where one credit is equal to one acre of protected habitat. Therefore, it is anticipated that impacts to habitat authorized through the SEP-HCP will adequately be balanced by protected habitat in the preserve. BCVI Preservation Credits under the Proposed SEP-HCP Alternative will be awarded to the SEP-HCP by the Service based on the number of acres of BCVI habitat within the preserve system. Areas protected and managed for the benefit of the BCVI under the Proposed SEP-HCP Alternative will likely be larger than the mitigation typically needed to offset impacts associated with individual projects. These areas will be regularly managed and monitored in accordance with a Service-approved plan that addresses the maintenance of appropriate vegetative structure for the BCVI and reduces threats from nest parasites and browsing wildlife, and the BCVI management areas will be buffered from the impacts of adjacent land uses by being located within a larger system of preserve lands.

It is possible that the Proposed SEP-HCP Alternative will increase the amount of ESA compliance in the Plan Area, compared with the No Action Alternative, since compliance may be more efficient than obtaining incidental take authorization directly from the Service. This may be particularly true with regard to BCVI mitigation, which requires long-term obligations for regular BCVI habitat management activities. The Proposed SEP-HCP Alternative will provide a moderate benefit to BCVIs in the Plan Area, compared to the No Action Alternative, because permanent protection and management of 6,600 acres of BCVI habitat will alleviate some of the major threats to the BCVI in the Plan Area and will significantly contribute to meeting recovery goals in this recovery unit.

10% Participation Alternative

Land development under the 10% Participation Alternative is expected to be implemented in the same manner as the No Action Alternative and will experience similar levels and patterns. Accordingly, anticipated land development activities in the county are expected to have similar potentially adverse impacts to the species as described in the No Action Alternative.

The 10% Participation Alternative will authorize the loss or degradation of approximately 566 acres of potential habitat for the BCVI within Bexar County's and the City of San Antonio's jurisdictions. As mitigation, at least 1,390 acres of BCVI habitat will be acquired and managed in perpetuity in the Plan Area. Like the Proposed SEP-HCP Alternative, the 10% Participation Alternative could increase the amount of ESA compliance in the Plan Area, compared with the No Action Alternative, since compliance may be more efficient than obtaining incidental take authorization directly from the Service. However, the potential benefits of increased ESA compliance will be limited by the modest level of incidental take authorization available under this alternative.

The remaining impacts of this alternative on the BCVI will be primarily associated with the 1,390 acres of BCVI habitat within the preserve system. The 10% Participation Alternative has the same direct and indirect impact ratios to Preservation Credits as the Proposed SEP-HCP Alternative. Therefore, it is anticipated that impacts to habitat authorized through this alternative will be adequately balanced by perpetually managed BCVI habitat within the preserve system. The mitigation provided under the 10% Participation Alternative will be provided in relatively large blocks within portions of the preserve system that are not managed as GCWA habitat. This alternative will create BCVI management areas that will be larger than the mitigation typically needed to offset impacts associated with individual projects. BCVI habitat within the preserve system will also be regularly managed and monitored in accordance with a Service-approved management plan that addresses the maintenance of appropriate vegetative structure for the BCVI and reduces threats from nest parasites and browsing wildlife. Further, the BCVI management areas under this alternative will be buffered from the impacts of adjacent land uses by being located within a larger system of preserve lands.

Therefore, the 10% Participation Alternative will be expected to alleviate some of the major threats to the species for a moderately sized area of BCVI habitat and will somewhat contribute to the recovery of the BCVI, thereby providing a minor benefit to the species in the Plan Area, compared to the No Action Alternative.

Single-County Alternative

The Single-County Alternative will not significantly influence the amount, timing, or location of land development anticipated over the next 30 years. It will restrict purchase of preserve lands to Bexar County, plus 10-miles around Bexar County. The potentially adverse impacts to the BCVI resulting from anticipated land development (whether authorized through the SEP-HCP or an individual ESA incidental take authorization) will be similar to the impacts described for the No Action Alternative. The Single-County Alternative is designed to offset the impacts associated with 2,640 acres of BCVI habitat in the Enrollment Area. At full implementation, the Single-County Alternative proposes a preserve system that will include approximately 3,300 acres of BCVI habitat. Because preserves will be located within and adjacent to an urban/suburban environment, BCVI may be more susceptible to adverse effects associated with proximity to human activities, such as noise, predation from pets or other animals such cowbirds and raccoons. The most significant difference in the Single-County Alternative and the other Action Alternatives is that the Single-County Alternative will have a 1-to-1 ratio of direct

take to mitigation while the others have a 2-to-1 ratio. The preserve size for the Single County Alternative will likely be greater than the No Action Alternative, double the size of the 10% Alternative, but much smaller than the Proposed SEP-HCP Alternative and Increased Mitigation Alternative.

The mitigation provided under the Single-County Alterative will likely result in a preserve system with greater conservation value than will likely be achieved under the No Action Alternative, even if similar acreage was protected and managed through individual ESA section 10(a)(1)(B) permits or section 7 authorizations. The enhanced conservation value of the Single-County Alternative's preserve system will result from the protection of larger blocks of habitat than will likely be achieved for smaller, individual mitigation actions under the No Action Alternative. Overall, the Single-County Alternative will protect large areas of potential habitat in and around Bexar County from future land development, thereby decreasing the threat of habitat loss for many important areas of potential BCVI habitat and resulting in a beneficial impact to the species. The ultimate size of the preserve system will be proportional to the amount of impact authorized through participation, and may ultimately include approximately 3,300 acres permanently protected and managed for the benefit of the BCVI. A preserve system of this size will be likely to have a moderate beneficial impact on the BCVI population in the Plan Area. It is difficult to predict precisely how BCVI populations will be affected by the protection of several thousand acres of potential habitat in the Plan Area. According to the SEP-HCP, the protection and management of approximately 6,600 acres of BCVI habitat would maintain a viable population for recovery purposes; the Single-County Alternative would conserve half of this amount.

It is likely that the Single-County Alternative will increase the amount of ESA compliance in the Plan Area, compared with the No Action Alternative, since compliance may be more efficient than obtaining incidental take authorization directly from the Service. This may be particularly true because ESA permittees could be required to engage in long-term obligations for regular BCVI habitat management activities with an individual ESA permit. Whereas habitat maintenance and monitoring will be the responsibility of the Applicants with an HCP and the SEP-HCP Participant would only be responsible for a one-time payment of the Preservation Credit fee, which could be an attractive alternative to obtaining an individual permit.

The mitigation provided under the Single-County Alternative will be provided in blocks that will support a moderate-sized, managed BCVI population or contribute to a cluster of adjacent properties that at a minimum support a moderate-sized managed population within portions of the preserve system that are not managed as GCWA habitat. This alternative will create BCVI management areas that will be larger than the mitigation typically needed to offset impacts associated with individual projects. BCVI habitat within the preserve system will also be regularly managed and monitored in accordance with a Service-approved management plan that addresses the maintenance of appropriate vegetative structure for the BCVI and reduces threats from nest parasites and browsing wildlife. Further, the BCVI management areas under this alternative will be buffered from the impacts of adjacent land uses by being located within a larger system of preserve lands than the 10% Participation Alternative or the No Action Alternative. This advantage is minimal because of the small size of the preserve system compared to the Proposed SEP-HCP Alternative or the Increased Mitigation Alternative. The mitigation provided under the Single-County Alternative will likely have a positive effect on the ability to meet recovery goals in this unit. The Single County Alternative is likely to result in a minor beneficial impact to the BCVI, compared to the No Action Alternative, due to the limited size of the preserves.

Increased Mitigation Alternative
The Increased Mitigation Alternative requests the same amount of take and would provide the same amount of preserve for the BCVI as the Proposed SEP-HCP Alternative. The sole difference between the two alternatives is the cost Participants would pay per credit for direct impacts. The Proposed SEP-HCP Alternative would cost $4,000 per credit whereas the Increased Mitigation Alternative would cost $5,500 per credit. These differences are not significant enough to result in different effects to the BCVI. As such, the effects of the Increased Mitigation Alternative to the BCVI would be the same as the Proposed SEP-HCP Alternative resulting in moderate beneficial impacts because permanent protection and management of 6,600 acres of BCVI habitat will alleviate some of the major threats to the BCVI in the Plan Area and will significantly contribute to meeting recovery goals in this recovery unit.

4.6.5 Covered Karst Invertebrates - Affected Environment

Seven federally listed species of karst invertebrates will be covered by the ITP requested under the Proposed Action: Government Canyon Bat Cave Spider, Madla Cave Meshweaver, Braken Cave Meshweaver, Government Canyon Bat Cave Meshweaver, *Rhadine exilis* (a beetle with no common name), *Rhadine infernalis* (a beetle with no common name), and Helotes Mold Beetle (collectively the Covered Karst Invertebrates). These species are known as troglobites and spend their entire life cycle underground and are characterized by reduced or absent eyes, lack of pigmentation, elongation of sensory appendages, and low metabolic rates. All species were listed by the Service as endangered on December 26, 2000 (65 FR 81419). Except Government Canyon Bat Cave spider and Government Canyon Bat Cave meshweaver, critical habitat was designated on April 8, 2003 (68 FR 17156). On February 14, 2012, the Service revised critical habitat designations, which included designating critical habitat for both Government Canyon Bat Cave spider and meshweaver (77 FR 8450). None of these species or their habitats receives direct protection under Texas state law, since invertebrates are not included on the TPWD's list of threatened and endangered species.

Based on the geologic restrictions on the distribution of cave fauna and the location of known caves, Veni (1994) delineated five karst zones that reflect the relative likelihood of finding any of the Bexar County listed troglobites (and other rare or endemic karst species). These five zones are defined as:

Zone 1: Areas known to contain one or more of the listed karst invertebrates
Zone 2: Areas having high probability of suitable habitat for the listed karst invertebrates
Zone 3: Areas that probably do not contain listed karst invertebrates
Zone 4: Areas that require further research, but are generally equivalent to Zone 3, although they may include sections that could be classified as Zone 2 or Zone 5
Zone 5: Areas that do not contain listed karst invertebrates

Under contract with the Service, Veni (2002) re-evaluated and, where applicable, redrew the boundaries of each karst zone originally delineated in Veni (1994). Revisions were based on current geologic mapping, further studies of cave and karst development, and the most current information available on the distribution of listed and non-listed troglobites (Veni 2002).

Additionally, Veni (1994) established six geographic areas called Karst Faunal Regions (KFRs) within the Bexar County Karst Zones. These divisions were defined by hydrogeologic barriers and/or other restrictions to the migration of troglobitic species over evolutionary time (Veni 2009).

These six KFRs were used in the Service's final rule designating critical habitat to define the ranges of the listed species and are as follows:

1. Stone Oak
2. UTSA
3. Helotes
4. Government Canyon
5. Culebra Anticline
6. Alamo Heights

Table 4-6 describes the currently known distribution of the Covered Karst Invertebrates in the Plan Area.

Table 4-6: Distribution of the Covered Karst Invertebrates in the Plan Area

Species	KFR	Number of known (possible) localities
Rhadine exilis	Government Canyon	6
	Helotes	5
	Stone Oak	31
	UTSA	9 (2 possible)
Rhadine infernalis	Culebra Anticline	8
	Government Canyon	14
	Helotes	6
	Stone Oak	4
	UTSA	7
Batrisodes venyivi	Government Canyon	3
	Helotes	4
	UTSA	1
Neoleptoneta microps	Government Canyon	1
Cicurina madla	Government Canyon	7
	Helotes	6 (1 possible)
	Stone Oak	1 (1 possible)
	UTSA	8
Cicurina venii	Culebra Anticline	1
Cicurina vespera	Government Canyon	1

Source: Service 2011a.

See **Appendix C – Biology of the Covered Species** of the SEP-HCP and the Service's *Bexar County Karst Invertebrate Recovery Plan* and *Bexar County Karst Invertebrate Distribution* (2011b) for more details about the species, their habitat and distribution, karst zones, and KFRs.

4.6.6 Covered Karst Invertebrates - Environmental Consequences

The Covered Karst Invertebrates will be covered by the ITP requested under the Proposed Action. Indicators of impact significance vary by species and are provided in the appropriate subsection. Definitions of impact intensity, however, are similar for all Covered Karst Invertebrates and are as follows:

Negligible: The Covered Species will not be affected or there will be no measurable change to the population in the area of potential impacts.
Minor: Measurable changes to the Covered Species or their habitat however relatively localized within the area of potential impacts.
Moderate: Noticeable adverse or beneficial impacts to the population or habitat of the Covered Species within the area of potential impacts.
Major: Obvious impacts to the population or habitat of the Covered Species within the area of potential impacts and severe consequences or exceptional benefits.

No Action Alternative
Land development activities over the karst could potentially cause a decline in the numbers and range of one or more of these Covered Karst Invertebrates. However, due to the general sensitivity of karst habitats and the limited known distribution of many of these species, it is unknown how many acres of karst habitat actually support listed species and how many species would actually be impacted by land development activities. Overall, generally there is a lack of sufficient information on the distribution, abundance, life history, and specific habitat requirements of karst species. This factor in combination with the lack of information regarding the precise location of future land development in the Plan Area, and the inability to predict the level of compliance with the ESA, make it difficult to predict the impacts and mitigation likely to occur under the No Action Alternative. Regardless of the overall impacts of land use changes in the Plan Area, individual projects within occupied karst habitat may require incidental take authorization from the Service in order to obtain an ITP and comply with the ESA. Some conservation efforts for the species will take place as individual ESA incidental take authorization will require that any known occupied karst feature that is impacted will be mitigated for by some form of permanent protection per the Service's preserve design guidance. Therefore, the overall benefit to the species resulting from individual ESA incidental take authorizations under the No Action Alternative is likely to be minor.

Proposed SEP-HCP Alternative
As with the No Action Alternative Covered Karst Invertebrates in the Plan Area will likely suffer adverse impacts from habitat loss or degradation resulting from expected increases in developed land uses over the next 30 years; however, the extent or significance of these potential adverse impacts is uncertain due to the scarcity of information pertaining to these species. The SEP-HCP is designed to offset the impacts associated with development activities over Karst Zones 1 through 4. Take of 21,086 acres over these karst zones would only be authorized outside known occupied features, unless and until conservation baselines are met and only after extensive karst feature surface surveys. At full implementation, the Proposed SEP-HCP Alternative preserve system will include at least 1,000 acres of new, high quality, karst preserves with confirmed occupation by one or more of the Covered Karst Invertebrates.

Mitigation measures included in the Proposed SEP-HCP Alternative include avoidance of occupied karst features by establishing a 750-foot no-disturbance radius (Occupied Cave Zone) from feature entrances until the conservation baselines are achieved. The conservation baselines are based on the Service's recovery standards for downlisting each of the Covered Karst Invertebrates (Service 2011b). After conservation baselines are achieved and access to an Occupied Cave Zone is allowed, Plan Participants will be assessed a flat fee for conducting activities within this area. Plan Participants could also provide acceptable preserve land in lieu of fees. For the remainder of the parcel outside of Occupied Cave Zones, Participants will be required to immediately notify the SEP-HCP and stop work within 50 feet of

any discovered features for no more than seven days to allow for SEP-HCP-sponsored investigations of the feature. Participants will not be required to provide any additional mitigation or engage in any additional consultation with the SEP-HCP or the Service if a Covered Karst Invertebrate is found in a previously unknown feature that had no surface expression.

The level of incidental take authorization in the Proposed SEP-HCP Alternative represents 20 percent of the projected impacts to potential habitat for the Covered Karst Invertebrates within Bexar County or the City of San Antonio for the next 30 years. While the proposed SEP-HCP will cover seven listed karst species for incidental take under the ESA, the SEP-HCP's conservation program is likely to incidentally protect habitats for other species within the preserve system. The Proposed SEP-HCP Alternative will also promote the conservation of listed karst species through education and outreach programs and will fund research to increase the body of knowledge regarding their biology and conservation. The Proposed SEP-HCP Alternative is likely to result in a minor to moderate beneficial impact to the Covered Karst Invertebrates, compared to the No Action Alternative, due to the larger and likely more numerous karst preserves.

10% Participation Alternative

As previously stated, the 10% Participation Alternative will not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years. Therefore, the potentially adverse impacts to karst species resulting from anticipated land development will be similar to the impacts described for the No Action Alternative.

The primary difference between the 10% Participation Alternative and the No Action Alternative is the perpetual protection and management of 750 acres of karst preserves distributed across Bexar County. This alternative contemplates an incidental take request of 10,543 acres of potential Covered Karst Invertebrate habitat (i.e., the level of requested incidental take authorization). While some habitat conservation will occur under the No Action Alternative as the result of individual ESA compliance actions, the extent of these individual preserves will likely be less than the assured protection of 750 acres under the 10% Participation Alternative. The likelihood of participation under the SEP-HCP will likely be higher than under the No Action Alternative and, therefore, will provide more preserves for the listed karst invertebrates than without. However, the beneficial impacts of the 10% Participation Alternative on Covered Karst Invertebrates will likely be only minor, since the total area that will be conserved under this alternative will be small compared to the total size of the area of potential effect.

Single-County Alternative

The Single-County Alternative will not significantly influence the amount timing, or location of land development anticipated over the next 30 years. It will restrict purchase of conservation lands to Bexar County, plus a 10-mile radius around Bexar County. The potentially adverse impacts to Covered Karst Invertebrates resulting from anticipated land development will be similar to the impacts described for the No Action Alternative. The Single County Alternative is identical to the Proposed SEP-HCP Alternative for Covered Karst Invertebrates. Therefore, this alternative will also likely result in a minor to moderate beneficial impact to the Covered Karst Invertebrates, compared to the No Action Alternative, due to the likely more numerous karst preserves.

Increased Mitigation Alternative

The Increased Mitigation Alternative, like the other alternatives, is not anticipated to influence land development trends in the Plan Area over the next 30 years. The Increased Mitigation Alternative

would authorize the same amount of incidental take of Covered Karst Invertebrates habitat as the Proposed SEP-HCP and Single-County alternatives and will have similar adverse impacts on Covered Karst Invertebrates.

The Increased Mitigation Alternative proposes preservation of 2,000-acres of new karst preserves for the Covered Karst Invertebrates, which is based generally on the acquisition of six new karst preserves in each of the five KFRs in the Plan Area. This preserve size is double that proposed for the Proposed SEP-HCP and Single-County alternatives and more than double that of the 10% Participation Alternative. As a result, the Increased Mitigation Alternative could have a moderate benefit to the Covered Karst Invertebrates in the Plan Area, compared to the No Action Alternative because protecting this many occupied caves would contribute significantly to meeting the Service's downlisting criteria for the Covered Karst Invertebrates.

4.6.7 Other Threatened and Endangered and Candidate Species - Affected Environment

There are several other federally threatened, endangered, and candidate species that are not addressed as Covered Species or Voluntarily Conserved Species. Concurrent with the preparation of the SEP-HCP the Edwards Aquifer Authority, San Antonio Water Systems, the cities of New Braunfels and San Marcos, and Texas State University prepared and submitted an application for an incidental take permit for several federallylisted species dependent on the springs and river systems associated with the Edwards Aquifer. The notice of availability of the final Environmental Impact Statement and the incidental take permit for the Edwards Aquifer Recovery Implementation Program (EARIP), including the HCP, was published in the February 15 2013, *Federal Register*. The EARIP HCP describes measures to minimize and mitigate the effects of incidental take of the following: the fountain darter (*Etheostoma fonticola*), San Marcos salamander (*Eurycea nana*), Texas wild rice (*Zizania texana*), Texas blind salamander (*Eurycea rathbuni*), Peck's cave amphipod (*Stygobromus pecki*), San Marcos gambusia (*Gambusia georgei*), Comal Springs dryopid beetle (*Stygoparnus comalensis*) and the Comal Springs riffle beetle (*Heterelmis comalensis*). Since the EARIP and its supporting documents address these eight aquatic species they are not addressed in this EIS.

Other threatened, endangered and candidate species include: the whooping crane (*Grus Americana*), piping plover (*Charadrius melodus*), Robber Cave meshweaver (*Cicurina baronia*), Cokendolpher Cave harvestman (*Texella cokendolpheri*), American black bear (*Ursus americanus*), jaguarundi (*Herpailurus yaguarondi*), gray wolf (*Canis lupus*), red wolf (*Canis rufus*), false spike (*Quadrula mitchelli*) and smooth pimpleback (*Quadrula houstonensis*). **Table 4-7** provides a description of these species and their status.

Table 4-7: Other Threatened, Endangered and Candidate Species

Species	Federal/ State Status*	Distribution in Plan Area	Description
whooping crane (*Grus Americana*)	LE/E	7-county Plan Area	Potential migrant via plains throughout most of Texas (including the Plan Area) to the Gulf Coast; winters in coastal marshes. Habitat during migration and winter includes marshes, shallow lakes, lagoons, salt flats, grain and stubble fields and barrier islands (NatureServe 2010, TPWD 2015).

Species	Federal/ State Status*	Distribution in Plan Area	Description
piping plover (*Charadrius melodus*)	LT/T	7-county Plan Area	Occurs as a transient passing through the state (including the Plan Area); wintering migrant along the Texas Gulf Coast. Habitat includes sandy upper beaches, especially where scattered grass tufts are present, and sparsely vegetated shores and islands of shallow lakes, ponds, rivers and impoundments (NatureServe 2010, TPWD 2015).
Robber Cave meshweaver (*Cicurina baronia*)	LE/NL	Bexar County	Habitat includes karst limestone caves and mesocaverns, including suitable substrates, for example, spaces between and underneath rocks and un-compacted soil. Found in karst features in north and northwest Bexar County. The likelihood of recovery is low considering that they are known from so few locations and they occur in an area that is highly urbanized (USFWS 2011, TPWD 2015).
Cokendolpher Cave harvestman (*Texella cokendolpheri*)	LE/NL	Bexar County	Habitat includes karst limestone caves and mesocaverns, including suitable substrates, for example, spaces between and underneath rocks and un-compacted soil. Found in karst features in north and northwest Bexar County. The likelihood of recovery is low considering that they are known from so few locations and they occur in an area that is highly urbanized (USFWS 2011, TPWD 2015).
black bear (*Ursus americanus*)	T/T	7-county Plan Area	Habitat includes bottomland hardwoods and large tracts of inaccessible forested areas (TPWD 2015). According to TPWD (2009), the chance of an established population of black bear in the Hill Country, which includes the Plan Area, is remote.
jaguarundi (*Herpailurus yaguarondi*)	LE/E	Comal County	This species is limited to the lower Rio Grande Valley in dense thorny shrublands and is highly unlikely to regularly occur within the Plan Area (TPWD 2010, 2015).While a natural heritage record exists in Comal County, the species is highly unlikely to regularly occur within the Plan Area.
gray wolf (*Canis lupus*)	LE/E	Extirpated	Formerly known throughout the western two-thirds of the state in forests, brushlands, or grasslands (TPWD 2015).
red wolf (*Canis rufus*)	LE/E	Extirpated	Formerly known throughout eastern half of Texas in brushy and forested areas, as well as coastal prairies (TPWD 2015).
false spike (*Quadrula mitchelli*)	NL/T	Possibly Extirpated	Found in medium to large rivers; substrates varying from mud through mixtures of sand, gravel and cobble; one study indicated water lilies were present at the site; Rio Grande, Brazos, Colorado, and Guadalupe (historic) river basins (TPWD 2015).
smooth pimpleback (*Quadrula houstonensis*)	C/T	Blanco, Kerr, Kendall	Small to moderate streams and rivers as well as moderate size reservoirs; mixed mud, sand, and fine gravel, tolerates very slow to moderate flow rates, appears not to tolerate dramatic water level fluctuations, scoured bedrock substrates, or shifting sand bottoms, lower Trinity (questionable), Brazos, and Colorado River basins (TPWD 2015).

Source: TPWD 2009, 2010 and 2015; NatureServe 2010; Service 2011b.

* C= candidate for federal listing, E = endangered, LE= listed endangered, LT = listed threatened, NL = not listed, T = threatened

4.6.8 Other Threatened and Endangered and Candidate Species – Environmental Consequences

No Action Alternative

Anticipated land development over the next 30 years would convert currently undeveloped open space used by a wide variety of wildlife species to developed land uses. While some wildlife species thrive in urbanized environments, most wildlife communities currently present in the Plan Area would experience a decrease in habitat and likely declines in population sizes.

Action Alternatives

The proposed conservation measures of the Action Alternatives would help to reduce the potential negative impacts to wildlife communities. The primary conservation measure of the Action Alternatives is the acquisition and perpetual management of endangered species habitats within the Plan Area. Protecting contiguous open space is crucial for many wildlife species as they depend on numerous habitats throughout their lives. In addition, contiguous forest habitat supports native wildlife species that require large areas to survive. Such habitat supports natural ecological processes, such as predator/prey interactions and natural disturbance. It also serves to buffer species against the negative consequences of fragmentation.

The preserve system of the Action Alternatives would incidentally benefit a variety of native wildlife species in the Plan Area, particularly those that utilize forest habitats, shrubland habitats, and karst habitats. However, given the mosaic of habitat types across the landscape of the Plan Area, it is likely that the preserve system (while targeting areas of potential habitat for the covered species) would also contain substantial native vegetation communities that would support the sheltering, nesting, and foraging requirements for many other wildlife species.

Incidental take for the Covered Species authorized through the Action Alternatives would not be expected to result in the incidental taking of these unaddressed species. As described above, many of these unaddressed species occur in habitats or portions of the Plan Area that do not generally overlap with the habitats used by the Covered Species. Others are only known to occur in the Plan Area on an accidental or very rare basis and would not typically be encountered by users of the Plan. The ITP will only provide regulatory assurances under the Service's No Surprises Rule for the Covered Species. Participants conducting otherwise lawful activities that might incidentally take a listed species other than the Covered Species must seek incidental take authorization directly from the Service.

4.7 SOCIOECONOMIC RESOURCES

4.7.1 Socioeconomic Resources - Affected Environment

Socioeconomic resources are those social and economic factors that affect the human environment. They include historic and forecasted population, housing and employment growth, changes in land use and development patterns and the effects of these changes on the economic conditions of the communities experiencing these changes including identifying disproportionate negative impacts to minority and low-income populations, as described in Chapter 4.1.1.

Population Trends

The Plan Area is a growing region. From 2000 to 2010 the population has increased 24 percent, which represents a growth rate that outpaced the overall population growth in state of Texas (USCB 2000 and 2010a) (**Table 4-8**).

Table 4-8: Population Growth 2000 to 2010

Area	Census 2000 Population	Census 2010 Population	Percent Change
State of Texas	20,851,820	25,145,561	21%
Plan Area	1,603,715	1,983,268	24%
Bandera	17,645	20,485	16%
Bexar	1,392,931	1,714,773	23%
Blanco	8,418	10,497	24%
Comal	78,021	108,472	39%
Kendall	23,743	33,410	41%
Kerr	43,653	49,625	14%
Medina	39,304	46,006	17%

Source: USCB 2000 and 2010ba.

Comal and Kendall counties exhibited the fastest growth rates of the seven counties in the Plan Area, with estimated growth rates of approximately 39 percent and 41 percent between 2000 and 2010, respectively. However, the estimated population growth in these two counties represented only 11 percent of the total population increase in the Plan Area. Bexar County added the most people to the Plan Area (approximately 322,000 people) during that period. Kerr County had the lowest estimated growth rate of the counties in the Plan Area, with only an estimated 14 percent population increase between 2000 and 2010.

The SEP-HCP has a planning horizon of 30 years, extending from 2010 until 2040; although these years were used for planning, the permit would not be issued until at least 2015. Based on available state and county-level data, population projections through 2040 were produced using a least squares formula; a statistical method used to forecast trends while minimizing error. The 2010 population numbers are from the 2010 Census data while the forecasts are based on projections. The numbers have been adjusted and only represent population growth where Covered Activities will occur and where habitat for the Covered Species is generally located. **Table 4-9** shows that the Plan Area is projected to grow 61.6 percent between 2010 and 2040.

Table 4-9: Projected Population Growth 2010 to 2040

Area	2010	2020	2030	2040	2010 to 2040 Percent Change
Plan Area	1,983,268	2,318,780	1,722,881	3,205,229	61.6%
Bandera	20,485	26,406	30,205	34,004	66.0%
Bexar *	1,714,773	1,955,272	2,242,923	2,530,872	47.6%
Blanco	10,497	11,423	12,700	14,028	33.6%
Comal	108,472	168,408	237,164	331,520	205.6%
Kendall	33,410	47,516	60,099	71,442	113.8%
Kerr	49,625	56,374	61,447	80,059	61.3%
Medina	46,006	53,381	78,343	143,303	211.5%

Source: USCB 2010a; ESRI BIS 2009; WDA 2010a.

* The Bexar County numbers have been adjusted and represent the population projections for only the northwest portion of the county. This portion of Bexar County is where Covered Activities are likely to occur and where habitat for the Covered Species is generally located.

Employment and Economic Trends

The Plan Area boasts a diverse economy dominated by the educational and healthcare sectors as well as retail trade, professional, scientific, management, administration, and waste management industries (**Table 4-10**). Bexar County is the major employment center in the Plan Area accounting for 86.8 percent of all jobs in the region. Bexar County is also home to several military installations which employ almost 23,000 people.

The health of the regional economy can also be measured by household income. The median household income in the Plan Area was $47,048 in 2010. Kendall and Comal County households were generally wealthier with a median household income of $66,655 and $64,752 respectively. And, Kerr and Bandera County households earned a lower median household income when compared to the other counties in the Plan Area ($43,072 and $44,352, respectively) (**Table 4-11**). In comparison, the median household income in the state of Texas was $49,646 in 2010 and was $51,914 in the United States overall (USCB 2010c).

The TWC provides employment projections for the state of Texas in regions known as Workforce Development Areas. Statistics for the Alamo Workforce Development Areas cover Atascosa, Bandera, Bexar, Comal, Frio, Gillespie, Guadalupe, Karnes, Kendall, Kerr, Medina and Wilson counties. For this analysis it is assumed that the trends forecasted for the Alamo Workforce Development Areas represent the likely trends in employment growth within the Plan Area. Between 2008 and 2018 employment in the Alamo Workforce Development Areas is forecast to grow 20 percent overall, adding over 620,000 new jobs. The industries currently driving the economy within the Plan Area, particularly education and healthcare, are forecasted to lead the regional economy, in terms of employment growth, into the future. Assuming that these trends continue more than 1.4 million employees could be working in the Plan Area by 2040. The TWC projections also provide forecasted 10-year growth rates (2008 to 2018) by industry. The data provided in **Table 4-12** assume that the industry trends forecasted by TWC between 2008 and 2018 will continue to 2040.

Table 4-10: Employment by Industry - 2010

County	Total Labor Force	Agriculture, Forestry, Fishing, Hunting and Mining	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation & Warehousing, and Utilities	Information	Finance, Insurance, and Real Estate, Rental & Leasing	Professional, Scientific, & Management, and Administrative & Waste Management	Educational Services and Healthcare & Social Assistance	Arts, Entertainment & Recreation And Accommodation & Food Services	Other Services (Except Public Administration)	Public Administration	Armed Forces	Unemployed
SEP-HCP Plan Area	940,468	8,484	73,233	52,334	24,886	102,162	40,542	20,310	80,552	91,386	188,689	82,527	43,286	46,495	23,391	62,191
Bandera	9,334	435	1,151	442	133	1,019	434	40	639	886	1,649	793	633	624	0	456
Bexar*	816,333	4,864	60,387	44,307	21,801	87,948	35,297	18,424	71,493	79,856	163,102	73,044	37,264	40,777	22,975	54,794
Blanco	5,147	180	881	120	68	651	216	54	343	581	775	468	224	293	0	293
Comal	51,633	663	5,387	3,833	1,684	6,441	2,353	1,013	3,574	5,281	9,816	4,059	2,274	2,061	287	2,907
Kendall	15,800	678	1,706	1,145	312	1,400	495	202	1,611	1,743	3,079	1,096	861	706	78	688
Kerr	22,031	657	1,803	1,095	369	2,839	673	339	1,374	1,732	5,843	1,898	1,264	819	6	1,320
Medina	20,190	1,007	1,918	1,392	519	1,864	1,074	238	1,518	1,307	4,425	1,169	766	1,215	45	1,733

Source: USCB 2010d.

* Includes all of Bexar County. In 2010, 6.6 percent of the labor force in the Plan Area was unemployed. While more than 62,000 people were without work in 2010 in the Plan Area, the economy of the Plan Area outperformed the state of Texas (8.2 percent unemployed) and the Nation (9.9 percent unemployed) (US Bureau of Labor Statistics, January 2010).

Table 4-11: Household Income - 2010

County	Total Households	Less than $24,999		$25,000 to $49,999		$50,000 to $74,999		$75,000 to $99,999		$100,000 or More		Median HH Income ($)
		Households	Percentage of Total	Households	Percentage of Total	Households	Percentage of Total	Households	Percentage of Total	Households	Percentage of Total	
Plan Area	679,008	172,682	25.4%	178,089	26.2%	125,299	18.5%	80,940	11.9%	121,998	18.0%	47,048
Bandera	8,419	2,480	29.5%	2,297	27.3%	1,454	17.3%	1,028	12.2%	1,160	13.8%	44,352
Bexar*	580,224	151,691	26.1%	153,572	26.5%	107,781	18.6%	67,656	11.7%	99,524	17.2%	47,048
Blanco	3,935	866	22.0%	1,247	31.7%	471	12.0%	536	13.6%	815	20.7%	46,128
Comal	38,984	6,322	16.2%	8,508	21.8%	7,175	18.4%	6,116	15.7%	10,863	27.9%	64,752
Kendall	12,055	2,076	17.2%	2,540	21.1%	1,878	15.6%	1,556	12.9%	4,005	33.2%	66,655
Kerr	20,285	5,492	27.1%	6,026	29.7%	3,614	17.8%	2,025	10.0%	3,128	15.4%	43,072
Medina	15,106	3,755	24.9%	3,899	25.8%	2,926	19.4%	2,023	13.4%	2,503	16.6%	49,138

Source: USCB 2010b and 2010c.

Notes: * Includes all of Bexar County, total households may differ from other tables in this chapter.

Table 4-12: Projected Employment by Industry in the Plan Area – 2010 to 2040

Year	Agriculture, Forestry, Fishing, Hunting and Mining	Construction	Manufacturing	Wholesale Trade	Retail Trade	Transportation & Warehousing, and Utilities	Information	Finance, Insurance, and Real Estate, Rental & Leasing	Professional, Scientific, & Management, and Administrative & Waste Management	Educational Services and Health Care & Social Assistance	Arts, Entertainment & Recreation And Accommodation & Food Services	Other Services (Except Public Administration)	Public Administration	Total
10-Year Growth Rate*	9.8%	24.8%	0.1%	13.6%	17.4%	14.6%	15.5%	16.2%	20.0%	32.2%	20.8%	16.4%	16.3%	N/A
2010	7,476	71,024	50,718	26,498	96,853	38,454	20,131	77,104	85,682	178,191	79,422	41,782	41,743	815,078
2020	8,209	88,638	50,769	30,102	113,705	44,068	23,251	89,595	102,818	235,569	95,942	48,634	48,547	979,847
2030	9,013	110,620	50,819	34,196	133,490	50,502	26,855	104,109	123,382	311,422	115,898	56,610	56,460	1,183,377
2040	9,896	138,054	50,870	38,846	156,717	57,876	31,018	120,975	148,058	411,699	140,004	65,894	65,663	1,435,572
2010 to 2040 Change	2,420	67,030	152	12,348	59,864	19,422	10,887	43,871	62,376	233,508	60,582	24,112	23,920	620,494

Source: TWC 2008; USCB 2010d.

* Assumes that the 10-year growth rates forecasted for 2008 to 2018 by TWC will continue until 2040.

Housing Trends

In 2009 there were approximately 440,000 housing units in the Plan Area of which 67.4 percent were single-family homes (**Table 4-13**). This general housing pattern is similar throughout the counties in the Plan Area.

Table 4-13: Estimated Households and Housing Units (2009)

County	Number of Housing Units	Single-Family Housing Units	% Single-Family Housing Units	Non-Single-Family Housing Units	% Non-Single Family Housing Units
Plan Area	439,565	296,361	67.4%	143,204	32.6%
Bandera	11,500	7,753	67.4%	3,747	32.6%
Bexar*	320,404	212,013	66.2%	108,391	33.8%
Blanco	4,617	3,488	75.5%	1,129	24.5%
Comal	49,007	37,139	75.8%	11,868	24.2%
Kendall	14,173	9,310	65.7%	4,863	34.3%
Kerr	22,758	15,794	69.4%	6,964	30.6%
Medina	17,106	10,864	63.5%	6,242	36.5%

Source: ESRI BIS 2009 and WDA 2010a.

* Only includes the portions of Bexar County where habitat for the Covered Species occurs, excluding Camp Bullis.

Household characteristics, county appraisal district land use data, and the projected population growth were used to establish the overall demand for new housing in the Plan Area between 2010 and 2040 (**Table 4-14**).

Table 4-14: Projected Housing Units (2010, 2020, 2030 & 2040)

County	Projected Total Housing Units					Projected Single-Family Housing Units				
	2010	2020	2030	2040	2010-2040 % Change	2010	2020	2030	2040	2010-2040 Percent Change
Plan Area	437,595	558,890	690,406	779,150	78%	303,460	392,244	492,708	562,350	85%
Bandera	11,722	13,668	15,639	17,610	50%	7,902	9,393	10,884	12,375	57%
Bexar*	315,201	405,841	490,917	502,891	60%	216,738	281,781	344,991	353,654	63%
Blanco	4,682	5,290	5,890	6,514	39%	3,537	4,029	4,511	5,012	42%
Comal	50,931	69,772	96,751	133,413	162%	38,665	53,920	76,795	107,896	179%
Kendall	14,680	18,987	24,129	28,662	95%	9,649	13,044	16,917	20,410	112%
Kerr	23,019	25,825	28,314	36,946	61%	15,946	17,462	19,239	25,949	63%
Medina	17,359	19,507	28,766	53,113	206%	11,023	12,615	19,370	37,053	236%

Source: WDA 2010a.

* Only includes the portions of Bexar County where habitat for the Covered Species occurs, excluding Camp Bullis.

Based on these projects there could be almost 880,000 new housing units built in the Plan Area by 2040 of which 72.2 percent are likely to be single-family homes. Based on these calculations, Medina County is anticipated to see the largest percent change in housing units overall with a 206 percent growth in housing units overall and a 236 percent increase in the number of single-family homes built in the county; however, Bexar County will experience the most development with 187,690 new housing units being built in the northern portion of the county.

Land Use

The Plan Area covered approximately 4.1 million acres with land uses that vary from densely urban to remote and rural. Within the Plan Area there are 42 cities including San Antonio, New Braunfels, Schertz, Leon Valley, Live Oak, Hondo, Boerne, Helotes, Kerrville, Bandera, and Blanco. The population of these 42 cities ranges from just over 100 to over 1 million people (USCB 2010a). Approximately 470,600 acres or 11 percent of the Plan Area are within a city limit (SAM, Inc. 2006). The remainder of the Plan Area is relatively rural and is either unincorporated or included in the ETJ of a city.

Land Use Distribution

Land use information was collected for parcels within the Plan Area from county appraisal districts in 2009 (**Table 4-15**).

Table 4-15: Land Use Categories and Descriptions

General Land Use Category	Description
Single-family Residential	Includes properties developed with stand-alone single-family residences or manufactured homes on single-family lots.
Non-single-family Residential	Includes properties developed with apartment buildings, mobile home parks, multiplex structures, and similar public and private dwelling units.
Commercial and Industrial	Includes properties developed as retail and other shopping center uses, office, wholesale, industrial, and other commercial uses.
Exempt	Includes exempt properties such as public-owned lands, lands owned by non-profit or religious and charitable organizations, schools, railroad property, and others. Also known to include some park or preserve land.
Transportation and Utility Rights-of-way	Estimation was necessary for this land use class because county appraisal districts do not typically track lands used as rights-of-way for transportation networks or utilities. It is assumed that 15 percent of the total developed acres are used for transportation and utilities rights-of-way in the rural areas of the Plan Area and that 30 percent of the total developed acres in more urban areas are used for transportation and utilities.
Available Lands	Includes vacant platted lots, unoccupied residential lots in builder inventory, agricultural lands, and lands with farm and ranch-related improvements. These lands are assumed to be available for future development or occupancy.
Other and Unclassified	Includes lands with other miscellaneous that are not classified in county appraisal district records (including public lands that are not recorded on county tax rolls). Known to include some areas of parkland or preserves (such as Government Canyon State Natural Area) and large water bodies (such as Canyon Lake). The acres assigned to this category were also adjusted to account for the remaining geographic area not included in other land use categories due to incomplete appraisal district parcel records. Land in this category is generally assumed to be unavailable for future development.

Source: Bandera, Bexar, Blanco, Comal, Kendall, Kerr and Medina County Appraisal Districts 2009.

Table 4-16 includes a summary of general 2009 land uses estimated for each county in the Plan Area. Some portions of Bexar County were not included if they did not contain habitat for the species covered by the SEP-HCP (i.e., parts of central and southeastern Bexar County) or were primarily federal lands (i.e., Camp Bullis) which will not be eligible to participate in the SEP-HCP.

Table 4-16: General Land Uses within the Plan Area in 2009 (acres)

County	Single-Family Residential	Non-Single-Family Residential	Commercial & Industrial	Exempt	Transportation & Utility ROW	Available Lands	Other Unclassified Land Uses
Plan Area	252,802	29,483	49,996	35,169	62,046	2,253,782	955,439
Bandera	20,546	3,436	3,377	5,479	4,473	266,750	206,254
Bexar*	74,740	5,937	28,050	1,329	23,936	108,933	57,174
Blanco	3,231	266	335	732	579	303,880	57,174
Comal	50,318	6,451	12,553	11,570	13,188	142,192	148,435
Kendall	20,910	5,246	2,160	2,894	4,284	353,760	35,034
Kerr	14,742	3,353	2,087	10,883	4,441	499,289	174,042
Medina	68,314	4,794	1,434	2,281	11,146	578,979	186,936

Source: WDA 2010b.
* Only includes the portions of Bexar County where habitat for the Covered Species occurs, excluding Camp Bullis.

Land Use Projections

Projected land use and development changes within the Plan Area through 2040 are based on population projections, housing characteristics and trends, land use data, and other market factors (**Table 4-17**) (WDA 2010b). Changes in single-family residential development were projected using population projections, household sizes, and target densities and historic trends to predict the extent of new single-family development. As the dominant developed land use, single-family residential uses were also used as a benchmark for projecting new development for multi-family residential, commercial/industrial, and exempt uses.

Revenue Analysis

An analysis was conducted to evaluate the potential impact of preserving habitat within the Plan Area on property tax revenues. Taxing jurisdictions in the Plan Area establish tax values based on the current and best use of the land, including the value of land, improvements on the land, and the economic use of the property including tax exemptions. Preserving habitat in the Plan Area in perpetuity will have the effect of fixing the current and best use of the land as conservation. Land preserved for the purposes of conservation are taxed in the Plan Area at a similar rate as undeveloped land or land taxed with an agricultural exemption. In general, conservation and agricultural land generates less tax revenue for a taxing jurisdiction than developed properties; however, since conservation land is in an undeveloped state, there would be no net loss of tax revenue.

Table 4-17: Projected Distribution of Land Uses in the Plan Area in 2040 (acres)

County	Single-Family Residential	2009-2040 Percent Change	Non-Single-Family Residential	2009-2040 Percent Change	Commercial & Industrial	2009-2040 Percent Change	Exempt	2009-2040 Percent Change	Transportation & Utility ROW	2009-2040 Percent Change	Available Lands	2009-2040 Percent Change	Other Unclassified Land Uses	2009-2040 Percent Change
Plan Area	387,824	53.4%	40,049	35.8%	78,009	56.0%	55,571	58.0%	131,445	111.9%	2,012,629	-10.7%	933,190	-2.3%
Bandera	24,836	20.9%	4,276	24.4%	4,168	23.4%	7,371	34.5%	5,687	27.1%	257,795	-3.4%	206,184	0.0%
Bexar*	124,014	65.9%	7,873	3.26%	40,646	44.9%	2,124	59.8%	54,219	126.5%	23,672	-78.3%	47,551	-16.8%
Blanco	4,173	29.2%	313	17.7%	481	43.6%	742	1.4%	1,080	86.5%	302,486	-0.5%	147,312	157.7%
Comal	94,469	87.7%	7,521	16.6%	20,641	64.4%	18,604	60.8%	35,846	171.8%	68,945	-51.5%	138,681	-6.6%
Kendall	30,827	47.4%	6,127	16.8%	4,236	96.1%	6,202	114.3%	6,787	58.4%	335,180	-5.3%	34,929	-0.3%
Kerr	20,781	41.0%	3,968	18.3%	2,947	41.2%	12,747	17.1%	8,778	97.7%	487,215	-2.4%	172,401	-0.9%
Medina	88,725	29.2%	9,970	108.0%	4,891	241.1%	7,781	241.1%	19,049	70.9%	537,337	-7.2%	186,131	-0.4%

Source: WDA 2010b.
* Only includes the portions of Bexar County where habitat for the Covered Species occurs, excluding Camp Bullis.

Table 4-18 summarizes the projected level of new development for the Plan Area by 2040, based on the Alamo WDA land use analysis.

Table 4-18: Acres of New Development Projected in the Plan Area (2009-2040)

County	Acres of New Development (2009-2040)	Average Annual Increase in New Development (2009–2040)
Plan Area	241,152	7,779
Bandera	8,955	289
Bexar*	85,260	2,750
Blanco	1,395	45
Comal	73,247	2,363
Kendall	18,580	599
Kerr	12,074	389
Medina	41,642	1,343

Source: WDA 2010b.
* Only includes the portions of Bexar County where habitat for the Covered Species occurs, excluding Camp Bullis.

4.7.2 Socioeconomic Resources - Environmental Consequences

Methodology

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

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

Minor: Changes in economic activities will be measurable but will be localized, will not influence the structure, composition, or function of the socioeconomic environment in the Plan Area and will be limited in context.

Moderate: Changes in economic activities will be noticeable, although localized, and may somewhat influence the structure, composition, or function of the socioeconomic environment of localities in the Plan Area, but will be limited in context.

Major: Changes in the economic activities will be measurable, will alter the structure, composition, or function of the socioeconomic environment in the Plan Area and may be extensive in context.

No Action Alternative

Under the No Action Alternative the Service will not issue an ESA section 10(a)(1)(B) permit, and the Applicants will not implement the SEP-HCP. Land development projects in the Plan Area will follow the standard procedures for complying with the ESA on a project-by-project basis. The No Action Alternative represents the status quo whereby land development projects will also be subject to the existing federal and state regulations concerning impacts to the natural and human environment.

As described above, more than 240,000 acres of land in the Plan Area are anticipated to be developed through 2040. This development could potentially contribute to the overall tax base throughout all Plan Area counties by increasing the value of land. Development would also serve the housing and employment needs of the future; however, the type, timing and location of development are influenced most by market conditions. Therefore, it is unknown what type, when or where future development will occur and what the impact of development will be. The socioeconomic conditions of the Plan Area are linked to its place within the local, national, and global economy and the demands of growth. The No Action Alternative is expected to have only negligible adverse impacts on the socioeconomic conditions of the Plan Area because there will be no measurable change in economic activities resulting from not issuing the permit.

Proposed SEP-HCP Alternative

The Proposed SEP-HCP Alternative contemplates an alternate means to comply with the ESA by applying for an ITP for the duration of 30 years and developing a preserve system to serve as mitigation, all of which will be administered by Bexar County and the City of San Antonio. By implementing the Proposed SEP-HCP Alternative, the time needed for ESA compliance could be significantly reduced when compared to the No Action Alternative (months compared to years). The ESA compliance process under the Proposed SEP-HCP Alternative will not require an enrolled project to draft a HCP, draft a NEPA document, identify mitigation lands, or coordinate with the Service. Because there are fewer steps involved in the process, the costs of ESA compliance could be significantly less for enrolled projects—both in terms of time savings and decreased costs associated with hiring consultant staff—and could also be less for Service staff as they will not be required to review and process each application.

Despite these time and costs savings, the Proposed SEP-HCP Alternative is not expected to substantially affect the amount, timing, or location of land development over the next 30 years. Some projects may be able to accelerate their timeline; however, the overall economic effect will be negligible. Developed property in the Enrollment Area could generate a higher tax base when compared to vacant land and could be added to the tax roll sooner if a project is completed at an accelerated pace; however, the beneficial effect to the tax base of San Antonio and Bexar County (the Enrollment Area) will be negligible (if any) as other aspects of land development play a larger role in the timing of projects.

The Proposed SEP-HCP Alternative assumes the conservation of 31,030 acres of habitat, the majority of which would occur in the rural counties of the Plan Area for GCWA and BCVI and in Bexar County for the Covered Karst Invertebrates. Preservation of these acres in perpetuity would fix the current and best use of these acres as conservation; this means that the potential tax revenue generated from the preserves would only change if the appraisal districts adjusted the tax rate for conservation land. It is overly speculative to predict if potential preserve land would develop in the future, the type of development that would occur and the tax value generated by that future development.

Studies have suggested that the conservation of open space could have the effect of increasing property values of the surrounding land (McConnell and Walls 2005). These increases could result in beneficial impacts to the tax base, however, "the appreciated land value induced by open space conservation bears a spatial pattern," which "is attributed to the spatial characteristics of conserved open space, such as size, shape, and spatial location" (Jiang and Swallow 2007). As the size, location and shape of the preserve land has not been identified, the potential increase in property values around the proposed preserve lands is not known. Overall, adverse impacts to employment, income, and tax base as a result of the Proposed SEP-HCP Alternative will be negligible because there will be no measurable economic change resulting from this alternative.

10% Participation Alternative

The 10% Participation Alternative is comparable to the Proposed SEP-HCP Alternative in terms of establishing the proposed means for expediting the ESA compliance process. The potential beneficial and adverse impacts discussed for the Proposed SEP-HCP Alternative will be the same for the 10% Participation Alternative. The major differences between the Proposed SEP-HCP Alternative and the 10% Participation Alternative are the requested acres included in the incidental take of endangered species and the proposed acreage of preserve lands. The 10% Participation Alternative calls for less take and less conservation than the Proposed SEP-HCP Alternative. This means that less land would be subject to expedited development in the Enrollment Area and less land would be preserved in the Plan Area which would remain taxed as conservation use. As with the Proposed SEP-HCP Alternative, predicting if and when development would occur, as well as the type and the value of future development are overly speculative; therefore, implications to the tax base in the Enrollment Area and the Plan Area cannot be determined.

It is likely that projects enrolled in the SEP-HCP under the 10% Participation Alternative could be completed faster than will be possible under the No Action Alternative; however, as with the Proposed SEP-HCP Alternative, the overall economic impacts will likely be negligible. The 10% Participation Alternative contemplates covering only 10 percent of the projected loss of habitat in the Enrollment Area and it is possible that the amount of incidental take allocated to this alternative could be exhausted before the 30-year expiration of the requested permit. If the permit were to be exhausted prior to the 30-

year expiration, projects that impact listed species will be required to comply with the ESA using the existing process. The 10% Participation Alternative will result in negligible impacts to employment, income, and tax base because there will be no measurable change in economic activities.

Single-County Alternative

The Single-County Alternative, like the other Action Alternatives, will establish an expedited process for complying with the ESA and will establish a system of preserve land to serve as mitigation for impacts to Covered Species. The potential beneficial and adverse impacts discussed for the Proposed SEP-HCP Alternative will be the same for the Single-County Alternative. Projects enrolled in the SEP-HCP under the Single-County Alternative could be completed faster than will be possible under the No Action Alternative. Although the average appraisal value of property in Bexar County is greater than property in the rural counties in the Plan Area. the amount, timing, or location of land development over the next 30 years is unknown so estimating the potential beneficial and adverse impacts to the tax base is overly speculative.

The major difference between the Single-County Alternative and the Proposed SEP-HCP Alternative is the size and location of conservation actions. The Single-County Alternative proposes the same amount of take in the Enrollment Area as the Proposed SEP-HCP Alternative for all of the Covered Species; however, it offers one-half of the preserve size and higher Preservation Credit costs for GCWA and BCVI. The other main difference is that all activities associated with the Single-County Alternative would be limited to Bexar County or within 10 miles of the Bexar County line, as opposed to throughout the 7-county Plan Area. It is possible that the land available to serve a preserve in and around Bexar County might not meet the anticipated need for incidental take authorization before the 30-year expiration of the requested permit. If the permit were to be exhausted prior to the 30-year expiration, projects that impact listed species will be required to comply with the ESA using the existing process. The Single-County Alternative will not substantially affect the amount, timing, or location of land development and does not replace the existing means to comply with the ESA, so despite the limited preserve lands and higher costs associated with this alternative, it will only result in negligible adverse impacts to employment, income, and tax base because there will be no measurable change in economic activities.

Increased Mitigation Alternative

The Increased Mitigation Alternative, like the other Action Alternatives will establish an expedited process for complying with the ESA and will establish a system of preserve land to serve as mitigation for impacts to Covered Species. The potential beneficial and adverse impacts of the Proposed SEP-HCP Alternative will be the same for the Increased Mitigation Alternative. Like the other Action Alternatives, it is likely that projects enrolled in the SEP-HCP under the Increased Mitigation Alternative could be completed faster than will be possible under the No Action Alternative.

The major difference between the Increased Mitigation Alternative and the Proposed SEP-HCP Alternative is larger preserve requirements for GCWA and the Covered Karst Invertebrates. This alternative also requires that 60 percent of the conservation land for GCWA be located in Bexar County or within 5 miles. Because of these stipulations, the cost per acre of direct effect to GCWA and BCVI is higher than the other Action Alternatives; greater costs could discourage participation in the Plan.

As with the other Action Alternatives, there is a potential loss in tax base because conservation land will no longer be available for development. Because the mitigation requirements are greater in terms of acreage and because there is a requirement for most GCWA to occur in an area with greater land values, it is possible that the potential loss in tax revenues could be greater than the other Action Alternatives. And, the beneficial effect to the tax base could be more significant for this alternative since the size of the preserve system will be greater and will lead to more opportunities for adjacent properties to experience value increases due to the proximate principle. However, as with the other Action Alternatives, the Increased Mitigation Alternative is not expected to substantially affect the amount, timing, or location of land development over the next 30 years so speculating the adverse and beneficial effects is not possible; the overall economic impacts will likely be negligible.

Overall, the Increased Mitigation Alternative has the potential to result in minor adverse impacts to the socioeconomic environment because changes in economic activities could be measurable but localized; would not influence the structure, composition, or function of the socioeconomic environment in the Plan Area; and would be limited in context.

4.8 CLIMATE CHANGE

4.8.1 Affected Environment

The term climate refers to a “complex, interactive system consisting of the atmosphere, land surface, snow and ice, oceans and other bodies of water, and living things” (Le Treut *et al*. 2007). Different factors can act to change the climate. There are natural factors, such as volcanic eruptions and solar variations, as well as human factors, such as changes in atmospheric composition (Le Treut *et al.*2007). Climate change refers to a major shift in weather patterns over a number of years due to these factors. Recently, climate change has erroneously become synonymous with global warming, which is merely a subset of climate change. Global warming is defined as a temperature increase near the surface of the earth due to greenhouse gasses. Climate change is the incremental impact of past and present factors that when added together have the capacity to make major long-term changes in global weather patterns. Greenhouse gasses, such as carbon dioxide and water vapor, create a protective layer around Earth’s surface, trapping heat inside. This trapping of heat is referred to as the natural greenhouse effect. “Without the natural greenhouse effect, the average temperature at Earth’s surface will be below the freezing point of water” (Le Treut *et al.* 2007). However in recent years, excess carbon dioxide in the atmosphere has led to a spike in global temperatures. Atmospheric carbon dioxide levels have increased by about 35 percent since 1830 and grew by 80 percent between 1970 and 2004. Ice cores taken from polar ice caps show that pre-industrial levels of carbon dioxide were around 280 parts per million (ppm) whereas in 2005, they were measured at 379 ppm. "This exceeds by far the natural range over the last 650,000 years (180 to 300 ppm)" (Schmandt *et al.* 2009). Carbon dioxide is emitted whenever fossil fuels, including oil and coal, are burned. Texas ranks the highest among the states in carbon dioxide emissions, largely due to coal consumption (Schmandt *et al.* 2009). Additionally, "Texas leads the nation in energy consumption, accounting for more than one tenth of total U.S. energy use" (Schmandt *et al.* 2009).

A warming trend in both the atmosphere and the oceans has been observed at a time when historical models predict a cooling period. “It is extremely unlikely (<5 percent) that the global pattern of warming during the past half century can be explained without [human involvement]” (Hegerl *et al.* 2007). This temperature increase is therefore attributed to human activities, “primarily the combustion of fossil fuels and removal of forests” (Le Treut *et al.* 2007).

Many people incorrectly cite a cold winter or a cooling spot on the globe as evidence against global warming when in fact these cool patches are part of a natural cycle. Indeed, there are always extremes, but as the climate begins to change, the frequency and intensity of these extremes will begin to increase. In fact, these extremes are indicative of climate change, of which global warming is merely one aspect. Despite the extreme winter weather events that have occurred around the globe in recent memory, "the fact that the globe is warming emerges clearly" from average weather temperatures (Le Treut *et al.* 2007). In this century, the 9 warmest years have all occurred in the past 14 years (EPA 1997). An increase in global surface temperature will lead to significant negative impacts on economies, wildlife, and overall quality of life (Claxton 2009).

The southwestern United States, including Texas, can expect hotter summers and less annual precipitation if the lifestyle and growth trends continue without significant changes. The Intergovernmental Panel on Climate Change predicted that by 2100, temperatures in Texas will increase by "about 3°F in the spring (with a range of 1 to 6°F) and about 4°F in other seasons (with a range of 1 to 9°F)" (EPA 1997). On the southern Edwards Plateau, rainfall is predicted to drop by twenty percent and droughts to become commonplace (Claxton 2009). This will cause a downward spiral: an increase in temperatures will lead more people using their air conditioning, which will lead to higher energy consumption, resulting in more air pollution, which will lead to an increase in emissions, which in turn will further heat up the atmosphere. Additionally, the mean annual temperature in cities worldwide can be 1.8 to 5.4°F warmer than surrounding rural areas leading to a further need for cooling. This is due to the urban heat island effect. The heat island effect is caused by the sun warming dry, exposed, urban surfaces, such as roofs and pavement. This effect is important to consider as it places many of the same demands on the local environment that climate change does on the global scale: increased energy consumption, elevated emissions of air pollutants and greenhouse gases resulting in compromised human health and comfort (EPA 2009).

This cumulative temperature increase will be detrimental to humans, plants, and animals. One study projects, that by 2050, instances of human heat-related deaths will triple to over 100 deaths per summer (EPA 1997). Warming may expand the habitat of insects known to carry diseases thus increasing the possibility of outbreaks of diseases such as malaria (EPA 1997). As hotter weather could increase the frequency of wildfires, we can also expect forests to recede and be replaced by grasslands (EPA 1997). The destruction of forests, as well as the increase in temperature and decrease in rain, will adversely affect Texas ecosystems. As a direct result of current elevated temperatures, the migration patterns and the growing season of birds and butterflies have changed. Trees that are already stressed by drought may be too weak to resist the increase in pests and fires (Schmant *et al.* 2009). Trees absorb carbon dioxide in the atmosphere, absorb and defuse sunlight, and provide shade, so fewer trees means higher concentrations of carbon dioxide and more sunlight reaches the ground.

Studies suggest that a reduction in spring-flow, combined with an increase in temperature, could be devastating to endangered species in outflow locations. "Genetic aspects of biodiversity are illustrated by the global hotspot of endemism found in the isolated springs and cave systems of the Edward Plateau, a natural legacy unique to Texas" (Schmant *et al.* 2009). To protect the diversity of species in the region, flow restrictions may be placed on pumping, a cost of 0.5-2 million dollars per year (Chen *et al.* 2001). Many cities, including San Antonio, use aquifers as their primary water source, and the aquifers depend on rainfall for recharge. Most climate change studies indicate a decrease in rainfall in the coming

century. Even if rainfall remains constant, the increase in temperature will accelerate evaporation and enhance dryness in the region (Schmandt *et al.* 2009). This warmer climate will result in “as much as a 35 percent decrease in stream flow, and less water for recharging groundwater aquifers (EPA 1997).” Considering only population growth in Texas and the resulting water demand, Texas water flows will decrease by 25 percent by 2050 under normal conditions and by 42 percent under drought conditions.

When climate change (estimated by a 3.5 degree Fahrenheit increase and a 5 percent precipitation decrease) is factored into the water balance, "2050 projected flows to the coast are 70 percent of the 2000 values under normal conditions and 15 percent under drought conditions" (Schmandt et al 2009). According to Mace and Wade (2008), “the Edwards Aquifer is one of the area’s most vulnerable to climate change impacts in the United States.” Other studies show that by 2090, climate change will increase municipal water demand by 1.5 to 3.5 percent and that, although crop yield will decrease, irrigation water demand will increase by over 30 percent (Chen *et al.* 2001). Mace and Wade (2008) also predict that as a result, Comal Springs will go dry as recharge falls.

There will also be a significant economic burden associated with climate change around the Edwards Aquifer. Agriculture in Texas is a $12.6 billion annual industry, two-thirds of which is livestock (EPA 1997). A decrease in rainfall will lead to an increase in livestock, crop, and municipal water demand, which in turn will lower the profitability of farming (Chen *et al.* 2001). Chen *et al.* (2001) also predict a regional economic loss of 2.2 to 6.8 million dollars per year and a 30-45 percent reduction in farm income by 2090 (Chen *et al.* 2001). However, if the state took initiative to reduce the impacts that currently affect Texas, such as sea level rise, coastal erosion, air and water quality, and over-reliance on fossil fuels, they would "go a long way towards mitigating the impact of climate change on the State" (Schmandt *et al.* 2009). There is no formal policy in Texas to address climate change; however, indirect means to mitigate climate change are occurring at the municipal level in communities throughout the state. Programs that incentivize energy efficiency, conservation of water and natural resources, and changes in land use and transportation/transit use patterns result in reduced resource consumption and emissions.

Efforts to mitigate climate change are also being made on the national scale. The federal Clean Air Act dictates that the EPA will set air quality standards for six pollutants determined to be detrimental to the humans or wildlife, the most well-known of which is ozone (Claxton 2009). Children and seniors are particularly susceptible to ozone; high levels of ozone can cause irritation to the throat and lungs. High ozone levels can also adversely affect trees and vegetation (Claxton 2009). For each of the pollutants, the Clean Air Act mandates that the EPA set standards at a level at which they will have no known or anticipated impacts on the environment (Claxton 2009).

San Antonio and the surrounding counties had previously met these standard, but when the standard was updated, this area was in danger of being declared in nonattainment, or having ozone emissions above the standard. The area committed to take action to cut back on ozone emissions by signing an Early Action Compact (EAC). The standards are currently being re-examined (San Antonio-Bexar County Metropolitan Planning Organization 2010).

Global climate change has the potential to alter the regional distribution of plant and animal communities by large-scale changes in average temperature, level and frequency of precipitation, groundwater regimes, and fire regimes. Climate change could cause areas currently containing suitable

habitat for the Covered Species to increase or decrease in extent and quality. For the GCWA and the BCVI climate change could also cause areas not currently considered to be suitable habitat, including areas currently outside of the known range of the species, to become suitable habitat and it is possible that the species could adapt to use such habitat.

While it is generally agreed that insufficient knowledge currently exists to generate a reliable projection of the potential impacts of global climate change on GCWA species, the US Committee on the North American Bird Conservation Initiative has begun to assess the sensitivity of birds to climate change. In its report, *2010 State of the Birds*, the GCWA was noted as a conservation species of concern with a medium climate change vulnerability risk (North American Bird Conservation Initiative 2010). Natural disasters, such as wildfire, prolonged and severe droughts, and floods are normal events that occur in Central Texas. However, climate change has been linked to an increase in frequency and intensity of these events (Natural Resources Defense Council 2013). Natural disasters have the potential to destroy or damage large expanses of suitable habitat – including preserve lands.

4.8.2 Environmental Consequences

Methodology

The implementation of any of the Action Alternatives will have very little effect on overall weather patterns over a number of years, and since climate change is due to incremental effects of natural and man-influenced events no one program is likely to significantly impact climate change. However, land use changes that reduce the extent or composition of carbon absorbing native communities within the Plan Area while increasing the urban heat island effect over time will be less beneficial or more adverse, and alternatives that have the potential to positively influence air quality by creating more vegetated open space will be considered to be beneficial. Therefore, qualitative differences in the alternatives are determined based on which alternative will be more likely to contribute to climate change.

The intensity of impacts to climate change are measured based on the definition of the following terms:

- **Negligible:** Changes to land use, plant community size, integrity or continuity or urban development will not be likely to occur.
- **Minor:** Relative impacts to natural habitat will occur, and land development will be concentrated into urban islands; also, development will be localized to a small percentage land use.
- **Moderate:** A relatively large percentage of land use will experience measureable change in terms of an increase or reduction in open space, vegetation communities and heat islands.
- **Major:** Substantial changes to large portions of open space, vegetation communities and large heat islands will be apparent.

No Action Alternative

As previously described, a total of 241,152 acres in the Plan Area will experience construction activities concentrated in northern Bexar County, southwestern Comal County and eastern Medina County with or without the SEP-HCP over the next 30 years. New development will include clearing and altering of vegetation prior to construction. Increased urbanization will result soil compaction, and a reduction of the soil's ability to hold and conduct water, nutrients, and air necessary for plant root activity, and increased runoff. Devegetation and fragmentation of open space along with an increase in development

and urbanization will result in production and concentration of greenhouse gasses and result in relatively minor adverse impacts on climate change.

Under the No Action Alternative, the impacts on climate via changes in land use or the creation of urban heat islands will not be mitigated, unless regional and national policies are changed to address the issue. Any necessary ESA incidental take authorizations related to land development projects will also occur under the No Action Alternative (i.e. individual ESA section 10(a)(1)(B) permits or section 7 consultations), and other open space could also be protected through compliance with other local, state, and federal regulations. As a result, some parcels containing natural vegetation communities will be conserved on a case-by-case basis and result in negligible beneficial impacts that could influence climate change in the Plan Area. Overall, however, minor adverse impacts to climate change will result from the No Action Alternative because relative impacts to natural habitat could occur, land development could be concentrated into urban islands, and ESA compliance for land development could be localized to a small percentage land use.

Proposed SEP-HCP Alternative

The Proposed SEP-HCP Alternative will not be expected to substantially affect the amount, timing, or location of land development over the next 30 years, with the exception of preventing future development from occurring in areas that are designated as preserve. Therefore, the adverse impacts to climate change associated with urban development and deforestation under the Proposed SEP-HCP Alternative will be similar to those described for the No Action Alternative.

Compared to the No Action Alternative, the Proposed SEP-HCP Alternative will be expected to result in a greater level of land conservation due to increased compliance with the ESA. It is anticipated that as much as approximately 31,000 acres of undeveloped land containing habitat for the Covered Species will be permanently protected under this alternative. Preserve land will be primarily forest and shrubland vegetation communities used by the GCWA and BCVI. It is likely that this level of open space conservation will not occur under the No Action Alternative. Moreover, preserve size balances open space with urban and residential development, minimizing adverse effects. The Proposed SEP-HCP Alternative would have a minor beneficial impact on climate change because of the larger preserves, which would be expected to buffer against localized climate change impacts.

10% Participation Alternative

The 10% Participation Alternative will not have a significant influence on the amount, timing, or location of land development anticipated over the next 30 years. Therefore, the potentially adverse impacts to climate change resulting from anticipated land development will be similar to the impacts described for the No Action Alternative.

The primary difference between the 10% Participation Alternative and the No Action Alternative is the establishment and long-term management of a 7,390-acre preserve system. While some habitat conservation will occur under the No Action Alternative as the result of individual ESA compliance actions, the extent of these individual preserves will likely be less than the assured protection of 7,390 acres under the 10% Participation Alternative and the distribution of preserve lands under the No Action Alternative will likely be more scattered. The concentration of preserve land with more assured protection and guided management is likely to create a more effective protection for open space containing natural vegetation communities contained within the 7,390-acre preserve system than will be

achieved with fewer, smaller, and more scattered protected areas under the No Action Alternative. Thus, these larger blocks of conserved open space protected from development by the SEP-HCP will be more likely to yield benefits to regional air quality than the mitigation measures that will result from project-by-project incidental take authorizations with the Service. However, the beneficial impacts of the 10% Participation Alternative on climate would likely be only negligible as the total area that will be conserved under this alternative will be small compared to the total size of the area of potential effect.

Single-County Alternative

The Single-County Alternative will not have a significant influence on the amount, timing or location of land development anticipated over the next 30 years. It will restrict purchase of preserve lands to Bexar County, plus 10-miles around the county. The potentially adverse impacts to native vegetation resulting from anticipated land development will be similar to the impacts described for the No Action Alternative.

The primary difference between the Single-County Alternative and the No Action Alternative is the establishment and long-term management of a preserve system of up to 16,014 acres. While some habitat conservation will occur under the No Action Alternative as the result of individual ESA compliance actions and other park and open space initiatives, the extent of these individual preserves will likely be less than the assured protection of 16,014 acres under the Single County Alternative, furthermore the distribution of preserve lands will likely be more scattered. Larger blocks of conserved native vegetation protected from development by the SEP-HCP will be more likely to yield benefits to the ecosystem than the mitigation measures that will result from project-by-project incidental take authorizations with the Service under the No Action Alternative. Overall, the beneficial impacts of the Single County Alternative on climate will likely be minor, compared to the No Action Alternative, because all of the preserve lands proposed for the Single-County Alternative will be concentrated closer to the urbanized City of San Antonio and therefore may ameliorate the effects of the urban heat-island.

Increased Mitigation Alternative

The Increased Mitigation Alternative will not have a large influence on the amount, timing of land development anticipated over the next 30 years. Land development under the Increased Mitigation Alternative will have similar adverse effect as the No Action Alternative. The protection and management of relatively large blocks of native vegetation will help moderate temperatures, since large preserve blocks would have a greater effect on temperature than smaller parcels.

The establishment and long-term management of up to 43,741-acre preserve system, as proposed under this alternative, will reduce fragmentation of native vegetation communities by land developments which would moderate temperatures, and promote carbon absorption. Like the Single-County Alternative, the Increased Mitigation Alternative includes a requirement that some of the preserve land be located within or adjacent to Bexar County. The more urbanized land uses found in Bexar County increases the heat island phenomenon. However, this alternative will likely contain larger areas of contiguous, undeveloped land throughout the Plan Area than the No Action Alternative. Therefore, the potential beneficial impacts of the Increased Mitigation Alternative will be greater than those expected under the No Action Alternative, due to the protection of large, contiguous areas; and management of vegetation to maintain habitat characteristics and encourage native vegetation.

4.9 CUMULATIVE IMPACTS

Cumulative impacts are defined in CEQ regulations (40 CFR § 1508.7) as:

> "…the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant actions taking place over a period of time."

According to the Service's consultations tracking database, 63 formal section 7 consultations on the GCWA authorized impacts to almost 98,000 acres of GCWA habitat Several large consultations make up the majority of this acreage: 1) over 37,900 acres were associated with Fort Hood activities; 2) over 52,000 acres were associated with brush control projects throughout the GCWAs 35 county range; and 3) 5,000 acres were for activities on Camp Bullis, less than 15 percent of which was considered occupied. The conservation resulting from these consultations is over 61,300 acres of GCWA habitat maintained on Department of Defense (DOD) land and over 22,000 acres of private land preserved and/or maintained for the benefit of the GCWA. Additionally, the Service has issued a total of 134 individual 10(a)(1)(B) incidental take permits, which have their own formal intra-Service section 7 consultations. Over 48,000 acres of GCWA habitat were authorized to be impacted. Of this total over 21,000 were authorized as part of the Travis County and City of Austin HCP, 6,000 of which were authorized under Williamson County's Regional HCP, 3,000 of which were authorized as part of Oncor's programmatic HCP, 9,000 of which were authorized as part of Hays County's Regional HCP, 1,100 of which were part of LCRA's CREZ HCP, and 5,200 of which were authorized as part of Comal County's Regional HCP. The conservation result of all HCPs if fully implemented would be over 59,000 acres and almost $1.3 million for the preservation and/or maintenance of land for the benefit of the GCWAs.

According to the Service's consultations tracking database, there have been at least 31 formal section 7 consultations on BCVIs authorizing impacts to over 272,000 acres of BCVI habitat. Of this acreage 256,196 acres were associated with brush management and prescribed fire consultations. An additional 15,612 acres were associated with activities on Fort Hood. In total these consultations resulted in over 27,000 acres of habitat managed and maintained specifically for the BCVI with an expectation of an additional net benefit in BCVI habitat creation from the brush management and prescribed fire consultations. Additionally, the Service has issued 9 individual 10(a)(1)(B) incidental take permits with their associated formal intra-Service section 7 consultations. These 9 permits authorized over 16,700 acres of effects to BCVI habitat and if all take occurs, would result in over 11,600 acres of habitat preserved and over $1,500,000 given to the Texas Parks and Wildlife Foundation to perpetually manage BCVI habitat on the 4,500 acre Pairrie Haynes Ranch.

Potential karst habitat, which is mapped within Bexar County and a small portion of Medina and Bandera counties, covers 285,966 acres of Karst Zones 1 through 4 (Bexar County 2015). According to the Service's consultations database there has been one formal section 7 consultation on an endangered Bexar County karst invertebrate, *C. venii*. This consultation was with the U.S. Federal Highway Administration on the discovery of *C. venii* during the construction of State Highway 151 in San Antonio. This project resulted in the filling in of one cave, 121 acres of direct surface impacts, and the funding of biota and genetics studies of *Cicurina* species. Additionally, the Service has issued one section 10(a)(1)(B) incidental take permit including the associated intra-Service section 7 consultation. This permit covered impacts to three caves containing three listed species (*R. infernalis, R. exilis,* and *C.*

madla) and the additional potential incidental take of the species on 1,000 impacted acres in the event a feature with a listed species was discovered during construction. Two of the impacted caves are contained in one-acre setbacks and one cave was filled. Mitigation for the take authorized in this permit consisted of the purchase of se ven karst preserves totaling 181 acres. Any unknown features destroyed during construction were covered under the incidental take authorization and required no additional mitigation.

The Proposed Action is issuance of an incidental take permit under section 10(a) of the ESA that will authorize take associated with the clearing of up to up to 9,371 acres of GCW habitat, 2,440 acres of BCV habitat and 10,234 acres of Karst Zones 1 and 2 and 10,825 acres of karst zones 3 and 4 within the Plan Area over a period of 30 years. The Proposed Action would mitigate the loss with up to 23,430 acres of GCW habitat, 6,600 acres of BCV habitat and 1,000 acres of karst invertebrate habitat depending on the alternative (see Table 3-6 for a comparison of mitigation by alternatives). As discussed in Chapter 1.2, between 2010 and 2040, 341,551 new residential buildings (multi-family and single family) are projected to be built in the Plan Area, mostly in Bexar County (WDA 2010b) covering approximately 241,152 acres within the Plan Area. Table 4-19 provides a list of proposed development projects within the Plan Area. Also, within the Plan Area, anticipated GCWA habitat loss is 51,150 acres, with 10,084 acres of anticipated BCV habitat loss, and 51.171 acres of Karst Zones 1 and 2, and 54.259 acres of Karst Zones 3 and 4 lost.

Table 4-9: Ongoing and Future Projects in the Plan Area

Project Name	Planning Entity	Project Description	Timeframe	Location
Land Development Projects				
Private Sector Land Development Projects				
Bulverde Oaks	Various	Master Plan with > 19,000 SF lots total	Ongoing	Bulverde Road, Northern Bexar County
Coronado	Robert Tips	111 acre Master Plan	2014+	West of US 281, north of St. Croix, San Antonio
Four S Ranch	Various	780 acre Master Plan with 1,800 platted lots	2010+	Smithson Valley Road, Comal County
James Avery Expansion	James Avery Craftsman Inc. (Jewelry-maker)	New 47,000 square-foot factory	2015+	Texas 27, Kerrville
Johnson Ranch	Various	Master Plan, approx. 500 acres with 1,025 platted lots with retail center	2010+	East of US 281, north of FM 1863, Comal County
Highland Estates	Borgfeld Partners	182 acres residential subdivision	2010+	South of Borgfeld Drive, west of Bulverde Road
Kinder Ranch	SA Kinder Ranch	Master Plan, approx. 1,000 acres	2012+	North of Borgfeld Drive, west of Bulverde Road, south of Bexar/Comal County line
McCarty Ranch	Various	Approx. 400 acres	TBD	West of US 281, north of FM 1863, Comal County
Mooney Aviation Company Expansion	Mooney International (Aircraft Manufacturer)	Expand manufacturing facility	2015+	Al Mooney Rd, Kerrville
Moretti Subdivision	Michael Moretti	13.7 acre commercial development	2008+	US 281 north of Wilderness Oaks

Project Name	Planning Entity	Project Description	Timeframe	Location
Unnamed Subdivision	Various	Approx. 3,000 acres	Partially Built/ Ongoing	Northwest of Ammann Road at FM 1863
River Crossing	Various	Major Commercial	Partially Built/ Ongoing	Spring Branch
The Crossing at 46	Various	Commercial	Partially Built/ Ongoing	SH 46 at US 281
Public Sector Land Development Projects				
Smithson Valley High School	Comal ISD	Extensive renovation and expansion; capacity 2,575 students	2009 – 2011+	SH 46, west of FM 3159
Smithson Valley Middle School	Comal ISD	Expansion; capacity 1,150 students	2010	FM 311, north of SH 46
Spring Branch Middle School	Comal ISD	Expansion; capacity 1,150 students	2010	SH 46, west of US 281
Rahe Bulverde Elementary	Comal ISD	New school facilities for additional space and to combine 2 existing schools; capacity 824 students	2010	East Ammann Road
New Elementary at Indian Springs	Comal ISD	New school; capacity 824 students	2011	Southeast of Smithson Valley Road at Bulverde Road
New High School, new Middle School & new Elementary School at Kinder Tract	Comal ISD	Up to 3 new schools	2011+	Borgfeld Drive at Bulverde Road
Possible New Elementary	Northeast ISD	New school to be developed on 21-acre tract in Bulverde Oaks; (Per Feb 2009 article in SA Bus Journal NEISD purchased 21-acre tract for new school);	2010+	Near Bulverde Road
Boerne Schools: Samuel V. Champion High, New Elementary, Land Acquisition	Boerne ISD	No current expansion projects; New schools developed 2008-2009; Last bond measure including $2 million to acquire land for future campuses	TBD	Various
Republic Services Tessman Road Landfill	Republic Services	Expansion in capacity for 50 years	2002-2022	East IH-10, San Antonio
Covel Gardens Landfill	Waste Management	Expansion in capacity for 10 years	2002-2022	8611 Covel Road, San Antonio
Kerrville Landfill	Republic Services	Expansion in capacity for 10 years	2002-2022	TX-534 Loop, Kerrville
Castroville Wastewater Treatment Plant	City of Castroville	Expansion of wastewater treatment plant	2015+	City of Castroville
Kerrville Municipal/Louis Schreiner Airport	City of Kerrville	Taxi ways, taxi lanes, water line new hangars and taxiways, runway rehab, site prep for future hangar development	2010-2014	City of Kerrville
Butt-Holdsworth Memorial Library	City of Kerrville	Renovation and expansion	2012	City of Kerrville

Project Name	Planning Entity	Project Description	Timeframe	Location
Natural Resources Management Programs				
Hays County Regional HCP	Hays County	Protection of habitat for BCVI and GCWA	Ongoing	Hays County
Comal County Regional HCP	Comal County	Protection of habitat for BCVI and GCWA	Ongoing	Comal County
Edwards Aquifer Recovery Implementation Plan	EAA, SAWS, City of New Braunfels, City of San Marcos, Texas State University	Protection of habitat for fountain darter, San Marcos gambusia, Comal Springs riffle beetle, Comal Springs dryopid beetle, Peck's Cave amphipod, Texas blind salamander, Texas wild-rice, San Marcos salamander, Comal Springs salamander, Edwards Aquifer diving beetle and Texas troglobitic water slater	Ongoing	EAA's jurisdiction boundary
Project-specific HCPs, Management and Recovery Plans (Camp Bullis Karst Species Recovery Plan; GCSNA Karst Management and Recovery Plan)	Various entities	Conservation and management of sensitive species and habitats including habitat for threatened and endangered species	Ongoing	Plan Area
Species-specific Recovery Plans	USFWS	Recovery goals established in GCWA, BCVI and Karst Invertebrate Recovery Plans	Ongoing	
Biological Opinion for Bexar County Military Installations	US Department of Defense	Protection of endangered species	Ongoing	Bexar County
Edwards Aquifer Rules and Protect Program	TCEQ	Includes permitting and requires BMPs; Rules apply to Edwards Aquifer Contributing, Recharge and Transition Zones	Ongoing	Edwards Aquifer
Edwards Aquifer Protection	City of San Antonio	An initiative currently implemented by the City of San Antonio to protect the Aquifer by acquiring sensitive and irreplaceable land located over its recharge and contributing zones. Funding is provided by Proposition 3 (2000) and Proposition 1 (2005). Over 54,000 acres (21,853 hectares) have been acquired and protected.	Ongoing	San Antonio
Edwards Aquifer Protection	SAWS	Development review and regulation over the Edwards Aquifer Recharge and Contributing Zones; well head protection program, abandoned well program	Ongoing	SAWS jurisdiction
Recreation Management on Comal River	WORD	Organization to protect river and promote more environmentally sensitive behavior among	Ongoing	Comal River

Project Name	Planning Entity	Project Description	Timeframe	Location
		recreational users		
Sensitive Land Acquisition	SAWS in partnership with Nature Conservancy, Trust for Public Land, Bexar Land Trust, Texas Cave Management Association	Water supply fee-funded program for protection of geologically sensitive areas, point recharge features, using Conservation Easements and Fee Simple land acquisitions; 9,140 acres (3,699 hectares) preserved at GCSNA, Davis Ranch, Stone Oak Park, Annandale Ranch	Ongoing	Bexar County
Programs to Acquire Sensitive or Threatened Landscapes	Conservancy, Trust for Public Lands, Bexar Land Trust, Green Spaces Alliance of South Texas, Other NGO and Private Land Trusts	Program based on use of inheritance tax rules or other financial incentives	Ongoing	Plan Area
Landscape Conservation Cooperatives	USDI	LCCs are conservation efforts at the landscape level to use management-science partnerships to address climate change and other stressors within and across landscapes	To be determined	Plan Area
Property Tax Incentives (Ag and Wildlife Exemptions)	County Appraisal Districts – often in Conjunction with TPWD Biologists	Programs which lower taxes on lands managed for agriculture or wildlife production	Ongoing	Plan Area
Landowner Conservation Assistance and Safe Harbor Programs	Environmental Defense Fund	GCWA habitat protection based in counties primarily in Edwards Plateau; program addresses private land, seeks to steadily improve relationships with landowners. Has enrolled 80 Central Texas landowners (120,000 acres of ranch)	Ongoing	Edwards Plateau
Transportation Infrastructure Projects				
IH-10 W, Loop 1604 to S of Huebner Rd	TxDOT FY 2011-2014 STIP	Expand six to eight lane Expressway and operational improvements	2011	IH-10, south of Huebner Road to Loop 410
US 281, 0.2 mi N of Loop 1604 to Bexar / Comal Co. Line	Alamo RMA FY 2011-2014 STIP	Expand to six lane Expressway, with six new main lanes, outer lanes	2013	US 281, 0.2 mi north of Loop 1604 to Bexar / Comal County Line
Loop 1604, NW Military Hwy to Redland Road	Alamo RMA FY 2011-2014 STIP	Expand from four to eight lane Expressway, with four new main lanes and outer lanes	2014	Loop 1604, NW Military Hwy to Redland Road
Loop 1604, SH 16 to NW Military Hwy	Alamo RMA FY 2011-2014 STIP	Expand from four to eight lane Expressway, with four new main lanes and outer lanes, including connectors at IH-10	2013	Loop 1604, SH 16 to NW Military Hwy
Wurzbach Parkway	TxDOT	New location four lane divided	2011	Wurzbach Parkway,

Project Name	Planning Entity	Project Description	Timeframe	Location
Extension	FY 2011-2014 STIP	roadway construction.		segments from FM 2696 to Wetmore; inside Loop 1604
Austin-San Antonio Passenger Rail	Lone Star Rail District FY 2011-2014 STIP	Passenger rail service between Austin and San Antonio metropolitan areas.	Ongoing	Austin-San Antonio Rail Corridor
Salado Creek Bike Path	City of San Antonio FY 2011-2014 STIP	Construct bike path	2013	Salado Creek, Blanco Road to Wetmore Road
US 281 Transit Facility (Park-n-Ride)	VIA Metro Transit FY 2011-2014 STIP	Site Acquisition & Construction of Park & Ride Facility	2014	Stone Oak Parkway
Northeast Transfer Center –Naco Pass	VIA Metro Transit FY 2011-2014 STIP	Site Acquisition (Future Construction of Transit Center)	2011	Naco Pass
Loop 1604 at US 281 Interchange	Alamo RMA	Construct interchange with non-toll direct connectors	Constructed 2013	Bexar County Loop 1604 at US 281
US 281 Superstreet Project	Alamo RMA	Superstreet Concept Operational improvements	Constructed 2010	Various
Bulverde Road Added Capacity	Mobility 2035	Widened and added lanes	2015 (expected operational)	Bulverde Road from Evans to Marshall
Bulverde Road Bicycle Lanes	Mobility 2035	Addition of bike lanes		Along Bulverde from Evans to Marshall
US 281	Comal County Major Thoroughfare Plan	Controlled Access Freeway		Bexar County line to Guadalupe River
SH 46, from FM 2722 to Comal/Kendall Co. Line	Comal County Major Thoroughfare Plan	Upgrade to Secondary and Primary Arterial		SH 46, from FM 2722 to Comal/Kendall Co. line except in incorporated areas
FM 306, FM 2793, FM 2722, FM 3159, FM 1863 (East of US 281), and FM 3351	Comal County Major Thoroughfare Plan	Upgrades to Primary Arterials		Various locations
FM 32, FM 311, and FM 484	Comal County Major Thoroughfare Plan	Upgrades to Secondary Arterials		Various locations
FM 1863 (West of US 281), FM 2696, Ammann Road, Smithson Valley Road, Rebecca Creek Road, Demi John Bend, and N Cranes Mill Road	Comal County Major Thoroughfare Plan	Upgrades to Collector Roads		Various locations
The Medina Line	Southwest Gulf Railroad	Construct 9-mile common carrier railroad to connect to Vulcan Materials Company limestone quarry/other econ development	2015+	Hondo Medina County
IH 10 West Kendall County	Mobility 2040	Replace IH 10 bridges and reconstruction and widen Scenic Loop to 4 lanes between frontage roads; intersection improvements	2015	Kendall County IH 10 West at Scenic Loop Road

Project Name	Planning Entity	Project Description	Timeframe	Location
		and bike & pedestrian accommodations.		
IH 10 West Bexar County	Mobility 2040	Construct grade separation at Old Fredericksburg, reconfigure ramps and widen frontage road to convert to one way operation.	2015	From FM 3351 to Fair Oaks
IH 410 Bexar County	Mobility 2040	Expand from 6 to 8 lanes to Ingram Road and construct prior direct connectors at SH 151	2015	From SH 151 to Ingram Road
UTSA Boulevard San Antonio	Mobility 2040	Expand 2 to 4 lanes with median, left turn lanes, sidewalks, bike lanes and drainage.	2015	From Babcock Road to Edwards Ximenes Drive
Water Infrastructure Projects				
Bulverde Regional Water Master Plan	Canyon Lake Water Service Company	Plan to provide domestic water service to numerous parcels in southern Comal County.	On-going	Bexar County line in south; Kendall County line in west; FM 3009 in east; and areas north of SH 46.
Storage above Canyon Reservoir	Guadalupe-Blanco River Authority	An aquifer storage and recovery system or off-channel reservoir.	Prior to 2020	Canyon Reservoir
Western Canyon Water Treatment Plant Expansion	Guadalupe-Blanco River Authority	Future expansion of the Western Canyon Water Treatment Plant.	Prior to 2050	Western Canyon Water Treatment Plant
Lower Guadalupe Water Supply Project for Upstream GBRA Needs	Guadalupe-Blanco River Authority	Water management strategy to supply Water Treatment Plans by diversion of underutilized water supply from the Lower Guadalupe Basin	2011 SCTRW Plan	Lower Guadalupe Basin
Edwards Aquifer – Carrizo/Wilcox Aquifer Transfers (Twin Oaks ASR)	SAWS	An operational Aquifer Storage and Recovery (ASR) program involving transfers between the two aquifers	Operational ongoing	SAWS Service Area
Edwards Aquifer Recharge Initiative -Type 1 and Type 2 Projects	SAWS, with GBRA, SARA, EAA, USACE	Edwards Aquifer recharge enhancement from upstream runoff detention (Type 1) and temporary channel impoundments (Type 2)	Cibolo: 2010+	Cibolo Watershed
	Nueces RA, City of Corpus Christi also for Nueces Basin		Nueces: 2012+	Nueces River Basin
Western Canyon WS for SAWS	SAWS, GBRA, Cities of Boerne, Fair Oaks, Bulverde, and Johnson Ranch, Cordillera Ranch, Tapatio Springs/ Kendall County Utility Co., and Comal Trace Subdiv.	Utilization of water supply from Canyon Lake; includes Winwood Tank and Oliver Ranch water storage facilities	Ongoing	Participating cities and developments in Bexar, Comal, and Kendall Counties
Trinity Aquifer WS for SAWS	SAWS, Oliver Ranch, Bulverde Sneckner Ranch	Provides water supply to SAWS from Trinity Aquifer withdrawals; augments water supply	Contract terms through 2024	Serves large area north of Loop 1604 and west of US 281

Project Name	Planning Entity	Project Description	Timeframe	Location
Brackish Ground Water Desalination	SAWS	Treatment of water from the brackish zone of the Wilcox Aquifer	Potential operations 2011+	SAWS Service Area
Regional Carrizo Water Supply	SAWS	Development of a pipeline to transfer water supply from Gonzales and Wilson counties	2015	SAWS Service Area
Ocean Desalination	SAWS	Long term strategy is under study	2035 – 2060	SAWS Service Area

Source: Planning Entity Web Sites accessed November 2015.

The following analysis considers the magnitude of the cumulative impact on the resource health. Health refers to the general overall condition, stability, or vitality of the resource and the trend of that condition. Therefore, the resource health and trend are key components of the cumulative impacts analysis. Laws, regulations, policies, or other factors that may change or sustain the resource trend will be considered to determine if more or less stress on the resource is likely in the foreseeable future. Opportunities to mitigate adverse cumulative impacts will be described in each resource area for water resources; vegetation, general wildlife; threatened and endangered species; and socio-economic resources. This is followed by a discussion of the potential impacts on climate change.

Water Resources

Chapter 307.1 of the Texas Administrative Code addresses surface water quality standards for the State and states that it is the policy of the State "to maintain the quality of water in the state consistent with public health and enjoyment, propagation and protection of terrestrial and aquatic life, operation of existing industries, and economic development of the state." The TCEQ monitors and assesses the extent to which the State's waters provide for healthy aquatic communities, water-based recreation, and safe public water supplies as part of its Texas Water Quality Inventory. The State's surface water quality standards define the goals for a body of water with respect to five general use categories for which the water body should be suitable. The TCEQ reports that its pace and progress in addressing water quality impairments documented on the State's 303(d) list has risen sharply since 2000 (TCEQ 2013).

Section 26.401 of the Texas Water Code establishes the State's groundwater protection policy, which sets a goal of non-degradation of groundwater resources for all State groundwater quality programs. This policy provides that groundwater quality should be restored if feasible. Overall, the approach strives to protect groundwater resources for their highest quality use related to human health and the environment. Several state agencies are responsible for regulating groundwater, including the TCEQ and the Texas Water Development Board, among others.

Cumulative impacts on water resources within the Plan Area will result from the rapidly increasing human population, increased development, and changes in land use over the next 30 years. New development will likely encroach onto aquifer recharge zones and could increase the potential for contamination of water. In addition, development activities in other Texas counties outside of the Plan Area could also impact water resources within the Plan Area. For the No Action Alternative, the continuation of land development trends has the potential of reducing or degrading available water supplies in the Plan Area and contributing to adverse cumulative impacts on the available water supply for humans, wildlife, and vegetation.

The implementation of the SEP-HCP will have the potential to create an overall cumulative, beneficial effect on water quality and quantity in the Plan Area and elsewhere across the region. The implementation of the SEP-HCP is expected to increase compliance with the ESA and result in more conservation actions for the Covered Species, primarily via the protection of large patches of native vegetation. In addition, these conservation actions will be more systematic than will individual, project-specific mitigation efforts for the Covered Species under the No Action Alternative. Water quality and aquifer recharge can be adversely affected by pavement and impervious cover associated with development. The systematic conservation of large patches of habitat for the Covered Species will better protect recharge features and vegetation that provide water filtration (such as riparian vegetation) when compared to smaller and more fragmented preserves associated with individual permits. The scale of these beneficial cumulative impacts will vary between negligible (10% Alternative) to minor (for the Proposed Alternative, Single County Alternative, or Increased Mitigation Alternative).

Vegetation

Over the last 10 years, conversion to grassland or shrubland vegetation was the most common fate of lost forest cover across the Plan Area, particularly outside of Bexar County. Conversion of forest cover to other, non-urban, land cover types accounted for approximately 87 percent of the forest cover loss across the Plan Area, and as much as 97 percent of the loss occurred in Blanco, Bandera, Kerr, Kendall and Medina counties. In the next 30 years a total of 241,152 acres in the Plan Area are projected to undergo construction activities with or without the SEP-HCP. Most of this land will be impacted by construction associated with ongoing residential construction in currently platted subdivisions, new projects that are currently undergoing the subdivision approval process, and a number of road improvement projects are reasonably certain to occur in the coming years. This development will be expected to increase the amount of urban land cover in the Plan Area and decrease the amount of vegetation communities (particularly forest cover and grassland or shrub cover); however, a detailed projection of any such land cover change is not possible.

Cumulative impacts to vegetation communities within the area of potential effect will result from the rapidly increasing human population, increased development, and changes in land use. The current composition, distribution, and extent of the various vegetation communities in the Plan Area are the result of past and present land development patterns, recreational and agricultural land uses, water availability, and climatic events (such as droughts and floods). As described in previous sections, all four Action Alternatives evaluated in this EIS will result in moderate adverse impacts on vegetation (compared to current conditions) as land development trends will continue as described for the No Action Alternative. However, compared to the No Action Alternative, each of the Action Alternatives will have a somewhat positive impact on regional vegetation patterns as large blocks of mitigation lands within the Plan Area will be acquired and managed in perpetuity as habitat for the Covered Species. Thus, the incremental impacts of each of these Action Alternatives will slightly offset the adverse cumulative impacts on vegetation from other regional impacts.

General Wildlife

Wildlife populations in the Plan Area are anticipated to be moderately adversely impacted as a result of the loss of vegetation communities. The 2005 *Texas Wildlife Action Plan* (formerly known as the Texas Comprehensive Wildlife Conservation Strategy) developed by TPWD identifies threats to the State's wildlife resources associated with changing demands on land resources (such as land development and fragmentation that threaten the viability of natural habitats and the sustainability of wildlife populations),

introduced species (non-native plants and animals that displace native species and threaten habitat integrity for native wildlife), noxious brush and invasive plants (excessive quantities of even native plants can reduce the quality of wildlife habitat), overgrazing and fire suppression (improper application of these management tools or uses have contributed to a drastic alteration of the historic landscape), and limited understanding of complex natural systems (lack of reliable knowledge about the function of natural systems can lead to inappropriate conservation or management decisions) (TPWD 2005). The 2005 Texas Wildlife Action Plan considers the ecoregions occurring in Bexar County to be relatively high priorities for management and conservation efforts and identified species with low or declining populations that are important to the health and diversity of the State's wildlife resources.

Cumulative impacts to wildlife depend on whether a particular wildlife species thrives or deteriorates as a result of human encroachment. Urban-adapted or tolerant wildlife species (such as raccoons, squirrels, grackles, and blue jays) could benefit from an increase in human activity, while other species (such as cave-dependent bats, bobcats, forest dwelling birds, and many reptiles) will decrease as humans convert or encroach upon natural landscapes. As discussed above for vegetation, the Action Alternatives will have a slight benefit to general wildlife populations compared to the cumulative impacts of the No Action Alternative as consolidated tracts of mitigation lands will be acquired and managed in perpetuity. These consolidated tracts of land will provide wildlife populations with the necessities required for species survival. Thus, the incremental impacts of each of the SEP-HCP Action Alternatives will slightly offset adverse cumulative impacts on general wildlife populations from other regional impacts.

Threatened and Endangered Species

Human activities within Enrolled Properties could cause a change in the local population of predator (cats, dogs, raccoons, etc.) species or competitor species (changes in vegetation/habitat) and thereby degrade the adjacent habitat and harm adjacent threatened and endangered species individuals. As previously described, a total of 241,152 acres in the Plan Area is projected to experience construction activities with or without the SEP-HCP over the next 30 years. Interrelated or interdependent construction or other land use activities that occur within Enrolled Properties after the authorized take has occurred could cause noise or other disturbances that could harass neighboring threatened and endangered species.

Migratory species, such as the GCWA and BCVI, could return to an Enrolled Property that had previously been habitat but has since been removed or degraded. Species may be harmed by having to move to alternative habitat areas for breeding, feeding or sheltering. The authorized habitat loss will be a reasonably certain cause of this effect on returning individuals, but will typically occur after the habitat removal was complete.

Indirect impacts to karst invertebrate species may occur as a result of changes to the surface plant and animal communities outside of Occupied Cave Zones. Land use changes that reduce the extent or composition of native communities within a preserve could diminish the long-term viability of such communities over time, and could affect the quality and quantity of water and nutrients feeding subterranean karst environments.

All of the Action Alternatives will have the same cumulative impact on threatened and endangered species. The SEP-HCP is not an essential cause of habitat loss because habitat loss will occur with or

without the SEP-HCP, and does not constitute a new federal program authorizing new activities within potential impacts to the human environment because participation is voluntary.

Socioeconomic Resources

Recent socioeconomic trends in the Plan Area are a reflection of the social and economic impacts of population growth and land development in recent years. Generally these socioeconomic indicators (population growth, employment trends, and housing trends) are increasing or improving, resulting in a larger tax base for the Plan Area. None of the Action Alternatives will be expected to have long-term cumulative socioeconomic impacts on the local or regional population, economic trends, employment rates, per capita income, or real estate transactions. Participants in the SEP-HCP will enjoy cost and time savings as a result of simplified ESA compliance, but these savings will not be expected to rise to a level that will significantly impact local or regional economies. The Service will experience a long-term beneficial impact under the Action Alternatives, since each of the SEP-HCP alternatives will reduce the amount of time and effort the Service will spend on individual ESA consultations. The time savings for individually permitting incidental take through the permitting process will likely result in a portion of the anticipated land development occurring one to two years sooner than will be expected with an individual ESA consultation, and could accelerate the growth of Bexar County's and any other participant's tax base. In addition, creation of large preserves under the Action Alternatives will likely increase the value of adjacent property, further increasing the local tax base by an undetermined amount. Each of the Action Alternatives require the dedication of revenues from the Bexar County's general maintenance and operations fund, which could negatively affect the County's ability to support services currently funded with these revenues; however, this effect will be mitigated by participation fees. For the Action Alternatives, the amount of general fund revenues that could be dedicated to the implementation of the SEP-HCP will be approximately $1.31 million to over $1.12 billion over 30 years.

Climate Change

Regional climate results from processes that can be regional, continental, and even global in scale. Therefore, it is not appropriate to limit the examination of cumulative impacts to the specific geographic Plan Area as was done in the section above. The EPA (1997) predicts that over the next century, climate in Texas is likely to become warmer, with wider extremes in both temperature and precipitation. Weather in Texas is already highly variable and it is expected to become more so.

Over the next 30 years, the U.S. and world populations are each expected to increase by roughly 30 percent, with the U.S. population expected to increase by nearly 100 million people and the world population expected to increase by about 2 billion people (USCB 2010a). As the human population increases, so will demand for fossil fuels, renewable forms of energy, and other natural resources. Also expected to increase are the number of vehicles on roads; the number of motorized boats on the water; the number of planes in the air; the number of homes, businesses, and industries whose operations result in the emission of greenhouse gases; the number of people burning firewood for cooking and heating; and all other activities associated with an expanding human population.

As discussed in Section 4.8, implementation of all five alternatives is expected to result in minor negative or beneficial impacts. The potential contributions, however, would be imperceptible when compared against regional, national, and global outputs of greenhouse gases.

4.10 UNAVOIDABLE IMPACTS

Unavoidable impacts are defined as those that meet the following two criteria: 1) there are no reasonably practicable mitigation measures to eliminate the impacts and 2) there are no reasonable alternatives to the proposed project that will meet the purpose and need of the action, eliminate the impact, and not cause other or similar significant impacts (40 CFR 1500.2(e)).

It is expected that development in the Plan Area will continue as trends predict under the No Action Alternative, regardless of whether the SEP-HCP is implemented or not (see **Section 4.1**). Since impacts associated with anticipated land development will be the same for the No Action Alternative and each of the Proposed Action Alternatives, the differences in the impacts of the Proposed Action Alternatives will be limited to the impacts associated with the implementation of their conservation programs. Therefore, all alternatives discussed in this EIS will result in unavoidable impacts that will include loss of vegetation, native wildlife, and endangered species habitat, as well as some impacts to water resources.

4.11 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Under 40 CFR 1502.16, an irreversible commitment of resources is defined as the loss of future options and primarily applies to non-renewable resources, such as minerals or cultural resources, and to those resources that are renewable only over long time spans, such as soil productivity. Irretrievable commitments represent the loss of production, harvest, or use of renewable resources. These opportunities are foregone for the period of the proposed action, during which other allocations of these resources cannot be realized. These decisions are reversible, but the utilization opportunities foregone are irretrievable.

Under all of the Action Alternatives, the loss of habitat for the threatened and endangered species in the Enrollment Area will result in irreversible habitat loss. However, the proposed preserves described for each Proposed Action Alternative will help ensure that habitat for these species will be protected and managed in perpetuity. Under all Proposed Action Alternatives, the commitment and funding by Bexar County and the City of San Antonio for acquisition and permanent management of mitigation properties will be irreversible. The commitment and funding of mitigation and monitoring activities for the duration of the Permit will also be irretrievable.

4.12 SHORT-TERM USE OF THE ENVIRONMENT VS. LONG-TERM PRODUCTIVITY

Pursuant to NEPA regulations (CFR 1502.16), an EIS must consider the relationship between short-term uses of the environment and the maintenance and enhancement of long-term productivity. Short-term uses are those that determine the present quality of life for the public. The quality of life for future generations depends on long-term productivity; the capability of the environment to provide on a sustainable basis.

All Alternatives, including the No Action Alternative will result in a short-term loss of habitat for the Covered Species in the Plan Area due to human population growth and the associated increase in land development. However, all Proposed Action Alternatives will be expected to protect more suitable habitat for these species in the long term through the acquisition and management of their preferred habitat in perpetuity.

CHAPTER 5

LIST OF PREPARERS

Name	Role	Contribution to EIS Preparation	Education	Years of Experience
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Jennifer Zankowski	NEPA Assistant Project Manager	Preparation of EIS Public Meeting	B.A. Human Ecology, M.S. Community and Regional Planning	8
Bowman Consulting, Inc. (previously Loomis Partners, Inc.) – SEP-HCP Lead				
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Name	Role	Contribution to EIS Preparation	Education	Years of Experience
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CHAPTER 6

GLOSSARY OF TERMS AND ABBREVIATIONS

6.1 GLOSSARY OF TERMS

Agency Oversight Group (AOG)	SEP-HCP advisory committee composed of representatives from Bexar County, the City of San Antonio, Texas Parks and Wildlife Department, and the U.S. Fish and Wildlife Service. The AOG was created to facilitate coordination among the Applicants and the regulatory agencies.
Alternatives	Under NEPA, the Service must, "objectively evaluate all reasonable alternatives, and for alternatives which were eliminated from detailed study, briefly discuss the reasons for their having been eliminated." Reasonable alternatives are those that substantially meet the purpose and need. A "no action alternative" must also be described and analyzed. This alternative is simply what will happen if the action was not taken.
Applicants	The County of Bexar, Texas and the City of San Antonio are jointly applying to the Service for an Incidental Take Permit under section 10(a)(1)(B) of the ESA. As the Applicants of the Incidental Take Permit, Bexar County and the City of San Antonio will be responsible to the Service for complying with the terms and conditions of the Incidental Take Permit and overseeing the implementation of the SEP-HCP. The specific responsibilities and duties of each Applicant will be specified in an Interlocal Agreement, which will require Service approval.
Aquifer	Rocks or sediments, such as cavernous limestone and unconsolidated sand, that store, conduct, and yield water in significant quantities.
Biological Advisory Team (BAT)	SEP-HCP advisory committee appointed by Bexar County and the Texas Parks and Wildlife Department to advise the Applicants on technical matters relating to the biology and conservation of the species and habitats addressed in the SEP-HCP, including calculating the degree of harm to the species covered by the plan and calculating the size and configuration of the needed habitat preserves. The BAT included eight members and met the requirements of Chapter 83 of the Texas Parks and Wildlife Code.
CFR	Code of Federal Regulations (the codification of the general and permanent rules and regulations published in the Federal Register by the executive departments and agencies of the federal government).
Citizens' Advisory Committee (CAC)	SEP-HCP advisory committee appointed by Bexar County to assist with development of the SEP-HCP, including reviewing the work of the Biological Advisory Team and the form and level of mitigation proposed in the plan, identifying appropriate funding mechanisms to implement the plan, and determining the method of participation in the plan. The CAC included 21 members representing a variety of community stakeholder interests and met the requirements of Chapter 83 of the Texas Parks and Wildlife Code.

Covered Activities	Otherwise lawful activities that may cause the permanent or temporary loss or degradation of habitat for one or more of the Covered Species. Temporary losses are only expected from management activities on preserves.
Covered Karst Invertebrates	A group of seven invertebrates, including four spiders and three beetles, that was federally listed as endangered on December 26, 2000 (*Neoleptoneta microps, Cicurina madla, Cicurina venii, Cicurina vespera, Rhadine exilis, Rhadine infernalis, and Batrisodes venyivi*). These species live entirely underground in the limestone caves and passages of the karst geologic formations that underlie the northern portion of Bexar County and adjacent areas. These karst invertebrates are Covered Species.
Covered Species	The species for which incidental take will be authorized and which are the focus of the SEP-HCP conservation program. Includes the GCWA, BCVI, and the Covered Karst Invertebrates (*Neoleptoneta microps, Cicurina madla, Cicurina venii, Cicurina vespera, Rhadine exilis, Rhadine infernalis, and Batrisodes venyivi*).
Designated Critical Habitat	A specific geographic area(s) that is essential for the conservation of a threatened or endangered species and that may require special management and protection. Designated critical habitat may include an area that is not currently occupied by the species but that will be needed for its recovery. An area is designated as critical habitat after the Service publishes a proposed federal regulation in the Federal Register, receives and addresses public comments on the proposal, and publishes a final rule in the Federal Registers announcing the final boundaries of the designated critical habitat areas.
Cumulative Impact	An impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes such other actions.
Direct Impacts	The immediate impacts of an action that is not dependent on the occurrence of any additional intervening actions for the impacts to species or effects to designated critical habitat to occur.
Endangered Species Act (ESA)	Endangered Species Act of 1973, as amended (16 USC §1531 et seq.) is federal legislation intended to provide a means to conserve the ecosystems upon which endangered and threatened species depend and provide programs for the conservation of those species, thus preventing extinction of plants and animals.
Environmental Impact Statement (EIS)	A document required by the National Environmental Policy Act for certain actions “significantly affecting the quality of the human environment.” An EIS is a tool for decision making that describes the positive and negative environmental impacts of a proposed action.
Geographic Information System (GIS)	Computer software that processes geographic data and is commonly used to map and analyze landscape features.

Habitat Conservation Plan (HCP)	A plan prepared under the ESA by non- federal parties wishing a obtain permit for the incidental taking of threatened and endangered species. A Habitat Conservation Plan is required to obtain an Incidental Take Permit under section 10(a)(1)(B) of the ESA.
Harass	An intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering (50 CFR § 17.3).
Harm	An act which actually kills or injures wildlife and may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns including breeding, feeding or sheltering (50 CFR § 17.3).
Incidental Take	Taking of a threatened or endangered species that result from carrying out an otherwise lawful activity. See “take” below.
Incidental Take Permit	A permit issued by the Service under section 10(a)(1)(B) of the ESA to non- federal entities authorizing the incidental taking of a threatened or endangered species.
Indirect Impacts	Impacts that are caused by the action but occur later in time or farther in distance, but still are reasonably certain to occur.
Interlocal Agreement	An interlocal agreement is a contract between government agencies.
Jeopardize	Defined by the ESA as “to engage in an action that reasonably will be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, number, or distribution of that species” (50 CFR § 402.02).
JLUS	Camp Bullis “Joint Land Use Study” prepared by the City of San Antonio and the U.S. Army with the input of local stakeholders to help ensure that economic growth is managed in a manner that allows the installation to achieve its mission and remain a vital contributor to the region’s economy.
Karst	A terrain characterized by landforms and subsurface features, such as sinkholes and caves, which are produced by solution of bedrock. Karst areas commonly have few surface streams and most water moves through cavities underground.
Karst Fauna Region (KFR)	KFRs are geographic areas delineated based on discontinuity of karst habitat that may reduce or limit interaction between populations of karst species.
Karst Zones	Geographic areas delineated based on geologic and topographic features that facilitate assessment of the probability of the presence of rare or endemic karst species. Potential karst habitat occurs in Karst Zones 1 through 4.
KFR Groups	Groups of SEP-HCP sectors that generally correspond to the region of one or more of the KFRs described in the Bexar County Listed Karst Invertebrates Recovery Plan.
Mitigation	Actions that compensate for the impacts of incidental take on a species.

National Environmental Policy Act (NEPA)	A United States environmental law that established a national policy promoting the enhancement of the environment. Establishes procedural requirements for all federal government agencies to prepare documentation evaluating the environmental impacts of proposed federal agency actions.
Occupied Cave Zone A	Includes the area within 345 feet of the entrance to a karst feature that is occupied by one or more of the Covered Karst Invertebrates. The extent of this zone encompasses approximately 8.5 acres around a feature.
Occupied Cave Zone B	Includes the area between 345 feet and 750 feet of the entrance to a karst feature occupied by one or more of the Covered Karst Invertebrates. This zone (in combination with Zone A) is intended to encompass all or most of the surface and subsurface resources needed to maintain the environmental integrity of an occupied karst feature.
Participant	Any non-federal entity, including private citizens, businesses, organizations, or state or local governments or agencies, that voluntarily obtains incidental take authorization for the Covered Species through the SEP-HCP.
Plan Area	The geographic extent of the SEP-HCP's operational conservation program. Includes 7 Texas counties: Bexar County, Bandera County, Blanco County, Comal County, Kendall County, Kerr County, and Medina County.
Preservation Credits	A Preservation Credit is generally equivalent to an acre of GCWA or BCVI habitat that is permanently protected and managed for the benefit of the respective species.
Preserve	Tracts of land used as mitigation for the taking of the Covered Species. Together the preserves form the "preserve system" or "preserve lands."
Southern Edwards Plateau Habitat Conservation Plan (SEP-HCP)	An effort by Bexar County, Texas and the City of San Antonio (the Applicants) to address endangered species issues that are threatening the economic growth of the region and promote the conservation of these species and related natural resources. The SEP-HCP supports an Endangered Species Act section 10(a)(1)(B) Incidental Take Permit from the U.S. Fish and Wildlife Service.
SEP-HCP Participants	Any non- federal entity, including private citizens, businesses, organizations, or state or local governments or agencies, that voluntarily participates in the SEP-HCP.
Take	As defined by the Endangered Species Act, "take" means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 USC § 1532(19)).
Voluntarily Conserved Species	Species for which incidental take coverage will not be authorized, but for which targeted conservation measures will be voluntarily implemented as part of the SEP-HCP.

6.2 LIST OF ABBREVIATIONS

-A-	
ACHP	Adivsory Council on Historic Resources
AOG	Agency Oversight Group
-B-	
BAT	Biological Advisory Team
BCVI	Black-capped vireo (*Vireo atricapilla*); a Covered Species
BFZ	Balcones Fault Zone
-C-	
CAA	Clean Air Act of 1970
CAC	Citizens Advisory Committee
CAMPO	Capital Area Council of Governments
CEMP	Construction Emissions Mitigation Plan
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
Corps	U.S. Army Corps of Engineers
-D-	
dB	decibels
dBA	A-weighted decibels
-E-	
EAA	Edwards Aquifer Authority
EAC	Early Action Compact
EIS	Environmental Impact Statement
EPA	US Environmental Protection Agency
ESA	Endangered Species Act of 1973
ESRI BIZ	ESRI Business Solutions
ETJ	extraterritorial jurisdiction
-F-	
FEMA	Federal Emergency Management Agency
FPPA	Farmland Protection Policy Act
FR	Federal Regulation
-G-	
GCWA	Golden-cheeked warbler (*Dendroica chrysoparia*); a Covered Species
-H-	
HCP	Habitat Conservation Plan
-I-	
ITP	incidental take permit
-J-	
JLUS	Camp Bullis Joint Land Use Study
-K-	
KFR	Karst Faunal Region
-L-	
-M-	
MSATs	mobile source air toxics

-N-	
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act (42 USC § 4321 et seq.)
NFIP	National Flood Insurance Program
NHD	National Hydrography Dataset
NHPA	1966 National Historic Preservation Act
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOI	Notice of Intent
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	National Rivers Inventory
-O-	
O_3	ozone
-P-	
Pb	lead
PM_{10} and $PM_{2.5}$	particulate matter 10 microns and particulate matter 2.5 microns
ppm	parts per million
-Q-	
-R-	
ROD	Record of Decision
-S-	
SAL	State Antiquities Landmark
SEP-HCP	Southern Edwards Plateau Habitat Conservation Plan
Service	United States Fish and Wildlife Service
SFHA	special flood hazard areas
SH	State Highway
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SO_2	sulfur dioxide
-T-	
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TGPC	Texas Groundwater Protection Committee
THC	Texas Historical Commission
THPO	Tribal Historic Preservation Officers
TIFs	tax increment finance zones
TNRIS	Texas Natural Resources Information Service
TPWD	Texas Parks and Wildlife Department
TSHA	Texas State Historical Association
TWC	Texas Workforce Commission
TWDB	Texas Water Development Board
-U-	
USC	United Stated Code

USDA	United States Department of Agriculture
-V-	
VOCs	volatile organic compounds
-W-	
WDA	Wendell Davis & Associates

CHAPTER 7

REFERENCES CITED

Bexar Appraisal District. 2009. Property Search. www.bcad.org

Bexar County. 2015. Southern Edwards Plateau Habitat Conservation Plan. (SEP-HCP).

Blanco County Appraisal District. Property Search Options. 2009. https://propaccess.trueautomation.com/clientdb/?cid=10

Bolger, D. T., T. A. Scott, and J. T. Rotenberry. 1997. Breeding bird abundance in an urbanizing landscape in coastal southern California. Conservation Biology 11(2): 406 – 421.

Bradley, G. 1995. Urban forest landscapes: integrating multidisciplinary perspectives. In: Urban forest landscapes: integrating multidisciplinary perspectives. G. Bradley (ed.). University of Washington Press, Seattle, Washington. Pages 3-12.

Bush, P. W., Ardis, A. F., Fahlquist, Lynne, Ging, P. B., Hornig, C. E., and Lanning-Rush, Jennifer. 2000. Water quality in south-central Texas, 1996-98: U.S. Geological Survey Circular 1212, 32 p. http://pubs.usgs.gov/circ/circ1212/.

Cannizzo, James V. 2011. Letter to the Service, 17 August.

Central Appraisal District of Bandera County. 2009. Property Search. http://propaccess.banderaproptax.org/clientdb/?cid=1

Chen, C.-C., D. Gillig, & B. A. McCarl. 2001. Impacts of Climatic Change on a Water Dependent Regional Economy—A Study of the Texas Edwards Aquifer: Climatic Change, v. 49, p. 397-409.

City of San Antonio and United States Department of Defense, Office of Economic Adjustment. 2009. Camp Bullis Joint Land Use Study. 18 Jun 2009. http://www.sanantonio.gov/Portals/0/Files/OMA/CampBullisFINAL2009_08_03_RRR.pdf. Accessed July 22, 2015.

Claxton, Greg. (11 December 2009). Community Inventory: Natural Environment. In Imagine Austin. Retrieved from http://www.imagineaustin.net/

Coder, Dr. Kim D., “Identified Benefits of Community Trees and Forests", University of Georgia, October, 1996.

Collins, E.W., and S. D. Hovorka. 1997. Structure map of the San Antonio Segment of the Edwards Aquifer and Balcones Fault Zone, South-central Texas: Structural framework of a major limestone aquifer: Kinney, Uvalde, Medina, Bexar, Comal, and Hays Counties, Texas. The University of Texas, Bureau of Economic Geology. Miscellaneous Map No. 38, 14 pp. + 1 sheet.

Comal County Appraisal District. 2009. Property Search Options. http://taxweb.co.comal.tx.us/clientdb/?cid=1

CEQ (Council of Environmental Quality). 1981. Forty Most Asked Questions Concerning CEQ’s National Environmental Policy Act Regulations. 23 Mar 1981. http://energy.gov/sites/prod/files/G-CEQ-40Questions.pdf. Accessed July 22, 2015.

DeJong-Hughes, J., Moncrief, J. F., Voorhees, W. B., and J.B. Swan. 2001. Soil compaction: causes, effects and controls. University of Minnesota – Extension. http://www.extension.umn.edu/agriculture/tillage/soil-compaction/.

Diamond, D. D., L. F. Elliott, and R. Lea. 2010. Golden-cheeked warbler habitat up-date – final report. Missouri Resource Assessment Partnership, University of Missouri, Columbia, MO. 8 pp.

Dixon, James. 2000. Amphibians and Reptiles of Texas, Second Edition. College Station: Texas A&M University Press.

EPA (United States Environmental Protection Agency). 1997. Climate change in Texas. EPA 230-F-97-008qq. Washington, D.C.

EPA (United States Environmental Protection Agency). 2009. Heat Island Effect. Accessed at http://www.epa.gov/heatisld/.

ESRI BIS (ESRI Business Solutions). 2009. 2009 and 2014 demographics. http://www.esri.com/software/bao/index.html (see http://www.esri.com/data/esri_data/methodology-statements.html for methodology; Accessed November 8, 2010). ESRI, Redlands, CA.

Federal Register, Vol 59, No. 32, 1994. Retrieved from www.archives.gov/Federal-register/executive-orders/pdf/12898.pdf

Ferrill, D. A., D. W. Sims, D. J. Waiting, A. P. Morris, N. M. Franklin, and A. L. Schultz. 2004. Structural framework of the Edwards Aquifer recharge zone in south-central Texas. Geological Society of America Bulletin. 116(3/4): 407-418.

Ging, P. 1999. Water-quality assessment of south-central Texas: Comparison of water quality in surface-water samples collected manually and by automated samplers. USGS Fact Sheet FS-172-99. Washington D. C.: USGS.

Griffith, G. E., S. A. Bryce, J. M. Omernik, J. A. Comstock, A. C. Rogers, B. Harrison, S. L. Hatch, and D. Bezanson. 2004. Ecoregions of Texas (color poster with map, descriptive text, and photographs) (map scale 1:2,500,000). U.S. Geological Survey, Reston, Virginia.

Groce, J. E., H. A. Mattewson, M. L. Morrison, and N. Wilkins. 2010. Scientific evaluation of the 5-year status review of the Golden-cheeked Warbler. Prepared for U.S. Fish and Wildlife Service. Texas A&M Institute of Renewable Resources, College Station, Texas, USA. 194 pp.

Hegerl, G.C., F. W. Zwiers, P. Braconnot, N.P. Gillett, Y. Luo, J.A. Marengo Orsini, N. Nicholls, J.E. Penner and P.A. Stott, 2007: Understanding and Attributing Climate Change. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Jiang, Yong; Swallow, Stephen K. 2007. Open space preservation, property value, and optimal spatial configuration. In: Burns, R.; Robinson, K., comps. Proceedings of the 2006 Northeastern Recreation Research Symposium; 2006 April 9-11; Bolton Landing, NY. Gen. Tech. Rep. NRS-P-14. Newtown Square, PA: US Department of Agriculture, Forest Service, Northern Research Station: 128-134. http://www.treesearch.fs.fed.us/pubs/12667. Accessed December 12, 2011.

Johnson, S., G. M. Schindel, and G. Veni. 2009. Tracing groundwater flowpaths in the Edwards Aquifer Recharge Zone, Panther Springs Creek Basin, northern Bexar County, Texas. Proceedings of the 15th International Congress of Speleology. p. 1538.

Kendall County Appraisal District. 2009. eSearch. http://esearch.kendallad.org/

Kerr Central Appraisal District. 2009. Property Search Options. http://propaccess.kerrcad.org/clientdb/?cid=0

Kuniansky, E.L., L. Fahlquist, and A. F. Ardis. 2001. Travel times along selected flowpaths of the Edwards Aquifer, central Texas. U. S. Geological Survey. Water-Resources Investigation Report 01-4011. p. 69-77.

Le Treut, H., R. Somerville, U. Cubasch, Y. Ding, C. Mauritzen, A. Mokssit, T. Peterson and M. Prather, 2007: Historical Overview of Climate Change. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt,

M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.

Lingren, R. J., A. R. Dutton, S. D. Hovorka, S. R. H. Worthington, and S. Painter. 2004. Conceptualization and simulation of the Edwards Aquifer, San Antonio Region, Texas. U. S. Geological Survey Scientific Investigations Report 2004-5277. 143 pp.

Lockwood, Mark W. and Brush Freeman. 2004. The Texas Ornithological Society Handbook of Texas Birds. Texas A&M University Press: College Station. 261 pp.

Mace, Robert E., and Shirley C Wade. 2008. In hot water? How climate change may (or may not) affect the groundwater resources of Texas: Gulf coast Association of Geological Societies Transactions, v. 58, p. 655-668. Retrieved from http://www.twdb.state.tx.us/gwrd/pdfdocs/2008_Mace_Wade-climate_change.pdf Majestic Ranch Arts Foundation and U.S. Fish and Wildlife Service (Service). 2010. Majestic Ranch Conservation Banking Agreement, executed November 17, 2010. 93pp.

Medina County Appraisal District. 2009. eSearch. http://esearch.medinacad.org/

McConnell, V. Walls, M. 2005. The Value of Open Space: Evidence from studies of nonmarket benefits. Washington DC: Resource for Future.

McMahan, C. A., R. G. Frye, and K. L. Brown. 1984. The vegetation types of Texas -- including cropland. Texas Parks and Wildlife Department, PWD Bulletin 7000-120. Austin, Texas.

Mills, G. S., J. B. Dunning, Jr., and J. M Bates. 1989 Effects of urbanization on breeding bird community structure in southwestern desert habitats. Condor 91:416-428.

Morrison, M. L., R. N. Wilkins, B. A. Collier, J. E. Groce, H. A. Mathewson, T. M. McFarland, A. G. Snelgrove, R. T. Snelgrove, and K. L. Skow. 2010. Golden-cheeked warbler population distribution and abundance. Texas A&M Institute of Renewable Natural Resources, College Station, Texas, USA. 194 pp.

NPS (National Park Service). 2008. National River Inventory (NRI): Texas Segments. http://www.nps.gov/ncrc/programs/rtca/nri/states/tx.html. Accessed June 14, 2010.

National Wild & Scenic Rivers System. 2011. Designated Rivers - Rio Grande, Texas. http://www.rivers.gov/rio-grande-tx.php

NRCS (Natural Resources Conservation Service). 2011. National Soil Survey Handbook Online. Part 622 Section 622.04, U.S. Department of Agriculture. http://soils.usda.gov/technical/handbook/contents/part622.html

NatureServe. 2010. NatureServe Explorer. An online encylopedia of life [web application]. Version 7.1. NatureServe, Arlington, Virginia. http://www.natureserve.org/explorer. Accessed May 13, 2010.

North American Bird Conservation Initiative. 2010. The state of the birds 2010: Report on climate change. U.S. Department of the Interior, Washington, DC. www.stateofthebirds.org; accessed May 25, 2010.

Owens, M. Keith, and Robert K. Lyons. 2004. Evaporation and interception water loss from juniper communities on the Edwards Aquifer Recharge Area. Texas A&M University System. 3 Feb 2004. http://www.ugra.org/pdfs/BrushManagement.pdf. Accessed July 22, 2015.

SAM, Inc. 2006. StratMap city boundary – Phase 2. Digital geospatial data layer. Prepared for Texas Water Development Board, Texas Natural Resources Information System. StratMap program. Austin, Texas.

San Antonio-Bexar County Metropolitan Planning Organization. Air Quality. Retrieved from http://www.sametroplan.org/Air_Quality/2010_ozone.html

Schmandt, Jurgen, Clarkson, Judith & North, Gerald R. The Impact of Global Warming on Texas. 2nd Edition, University of Texas Press, Austin. 2009

Schmidly, David J. 1994. The Mammals of Texas Revised Edition. University of Texas Press: Austin. 501 pp.

Seaber, P. R., F. P. Kapinos, and G. L. Knapp. 1987. Hydrologic Unit Maps. U.S. Geological Survey. Water-Supply Paper 2294. 63pp.

Service (United States Fish and Wildlife Service). 1991. Black-capped vireo (*Vireo atricapillus*) Recovery Plan. Albuquerque, New Mexico. 74 pp.

Service (United States Fish and Wildlife Service). 1992. Golden-cheeked warbler (*Dendroica chrysoparia*) Recovery Plan. Albuquerque, NM. 88 pp.

Service (United States Fish and Wildlife Service). 2007. Black-capped vireo (*Vireo atricapilla*) 5-year review: summary and evaluation. U.S. Fish and Wildlife Service, Arlington, Texas. 26 pp.

Service (United States Fish and Wildlife Service). 2012. Karst Preserve Design Recommendations. Revised Mar 1 2012. http://www.fws.gov/southwest/es/Documents/R2ES/Bexar_RP_Preserve_mod_rev_20120301.pdf . Accessed July 21, 2015.

Sharp, J. M., Jr., and J. L. Banner. 1997. The Edwards Aquifer: A resource in conflict. GSA Today. 7(8): 2-9.

Sherer, PM. 2003. Parks for people: Why America needs more city parks and open space. San Francisco.

Task Force (Interagency Task Force on Economic Growth and Endangered Species). 2010. Balancing economy with ecology: a report to the Legislature from the Interagency Task Force on Economic Growth and Endangered Species. Texas Comptroller of Public Accounts. November 2010. http://www.texasahead.org/economic_developer/endangered_species/report/2010/96-1430_ESR.pdf

Terborgh, J. 1989. Where have all the birds gone? Essays on the biology and conservation of birds that migrate to the American tropics. Princeton University Press. 224 pp.

TCEQ (Texas Commission on Environmental Quality). 2004. Instructions to Geologists for Geologic Assessments on the Edwards Aquifer Recharge/Transition Zones. TCEQ-0585-Instructions. Rev.10-01-04. http://www.tceq.state.tx.us/assets/public/compliance/field_ops/eapp/F-0585_geologic_assessment_instructions.pdf. Accessed July 22, 2015.

TCEQ (Texas Commission on Environmental Quality). 2009. Edwards Aquifer protection plans website. www.tceq.state.tx.us/compliance/field_ops/eapp/apps.html; accessed April 20, 2010.

TCEQ (Texas Commission on Environmental Quality). 2013. 2012 Texas Integrated Report – Texas 303(d) List (Category 5). http://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/12twqi/2012_303d.pdf; Accessed January 15, 2014.

TGPC (Texas Groundwater Protection Committee). 2008. Joint Groundwater Monitoring and Contamination Report – 2007. SFR-056/07. Jun 2008. https://www.tceq.texas.gov/assets/public/comm_exec/pubs/sfr/056_07.pdf. Accessed January 27, 2014.

TGPC (Texas Groundwater Protection Committee). 2006. Joint Groundwater Monitoring and Contamination Report – 2005. SFR-056/05. Jul 2006. http://www.tceq.state.tx.us/assets/public/comm_exec/pubs/sfr/056_05.pdf. Accessed January 27, 2014.

TGPC (Texas Groundwater Protection Committee). 2013. Joint Groundwater Monitoring and Contamination Report – 2012. SFR-056/12. Jul 2013. www.tceq.texas.gov/assets/public/comm_exec/pubs/.../056-11.pdf. Accessed January 27, 2014.

THC (Texas Historical Commission). 2015. List of Tribal Contacts: http://www.thc.state.tx.us/project-review/tribal-consultation-guidelines/tribal-contacts. Accessed April 7, 2015.

TPWD (Texas Parks and Wildlife Department). 2005. Texas Comprehensive Wildlife Conservation Strategy 2005 – 2010 – Texas Wildlife Action Plan (TWAP) 2005-2010. Texas Parks and Wildlife Department. Austin, Texas. https://tpwd.texas.gov/publications/pwdpubs/pwd_pl_w7000_1187a/.

TPWD (Texas Parks and Wildlife Department). 2009. Wildlife fact sheets [on-line]. http://www.tpwd.state.tx.us/huntwild/wild/species. Accessed May 2010.

TPWD (Texas Parks and Wildlife Department). 2010. Annotated County Lists of Rare Species: Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina counties. Updated March 12, 2010.

TPWD (Texas Parks and Wildlife Department). 2015. Annotated County Lists of Rare Species: Bandera, Bexar, Blanco, Comal, Kendall, Kerr, and Medina counties. Updated March 31, 2015.

TSDC (Texas State Data Center). 2009. Projections of the population of Texas and counties in Texas by age, sex and race/ethnicity for 2000-2040. Population Estimates and Projections Program, Texas State Data Center, Office of the State Demographer, Institute for Demographic and Socioeconomic Research, The University of Texas at San Antonio. http://txsdc.utsa.edu/tpepp/2008projections. Accessed November 2, 2010.

TSHA (Texas State Historical Association). 2010. The Handbook of Texas Online. http://www.tshaonline.org/handbook/online/. Accessed June 11, 2010.

TWC (Texas Workforce Commission). 2008. A Forecast of the Texas Economy and Job Market: 2008-2012. RDA Global.

Texas Water Code. Title 2. Water Administration, Chapter 26. Water Quality Control, Section 401. Legislative Findings. http://www.statutes.legis.state.tx.us/Docs/WA/htm/WA.26.htm.

TWDB (Texas Water Development Board). 2012. Water for Texas 2012 State Water Plan. Jan 2012. http://www.twdb.texas.gov/publications/state_water_plan/2012/2012_SWP.pdf. Accessed July 22, 2015.

TWDB (Texas Water Development Board). 2010. Major and minor aquifers of Texas. Available online at http://www.twdb.state.tx.us/mapping/gisdata.asp; Accessed March 23, 2010.

USCB (United States Census Bureau). 1995. Population of counties by decennial census: 1900 to 1990. Richard L. Forstall (ed.). Population Division, U.S. Census Bureau. Washington D.C. http://www.census.gov/population/www/censusdata/cencounts/files/tx190090.txt. Accessed November 2, 2010.

USCB (United States Census Bureau). 2000. 2000 Census, Table GCT-PH1 - Population, housing units, area, and density. http://factfinder.census.gov. Accessed November 2, 2010.

USCB (United States Census Bureau). 2010a. 2010 Census, Table P5 – Hispanic or Latino Origin by Race, http://factfinder.census.gov. Accessed March 11, 2011.

USCB (United States Census Bureau). 2010b. 2006 to 2010 American Community Survey, Table B19001 – Household Income in the Past 12 Months (in 2010 Inflation-adjusted Dollars), http://factfinder.census.gov. Accessed March 11, 2011.

USCB (United States Census Bureau). 2010c. 2006 to 2010 American Community Survey, Table B19013 – Median Household Income in the Past 12 Months (in 2010 Inflation-adjusted Dollars), http://factfinder.census.gov. Accessed March 11, 2011.

USCB (United States Census Bureau). 2010d. 2006 to 2010 American Community Survey, Table DP03 – Selected Economic Characteristics, http://factfinder.census.gov. Accessed March 11, 2011.

USCB (United States Census Bureau). 2013. 2009 to 2013 American Community Survey, Table B19013 – Median Household Income in the Past 12 Months (in 2013 Inflation-adjusted Dollars), http://factfinder.census.gov. Accessed July 7, 2015.

USDA (United States Department of Agriculture). 2015. National Forests and Grasslands in Texas, http://www.fs.usda.gov/detail/texas/about-forest/?cid=fswdev3_008427.

USDHHS (United States Department of Health and Human Services). 2015. 2015 Poverty Guidelines. http://aspe.hhs.gov/poverty/15poverty.cfm . Accessed July 1, 2015.

USGS (United States Geological Survey). 2003. National Land Cover Database NLCD 1992/2001 Change (edition 1.0). U.S. Geological Survey, Sioux Falls, SD. www.mrlc.gov/multizone.php.

USFWS (United States Fish & Wildlife Service). 2010. Final Environmental Impact Statement for the Hays County Regional Habitat Conservation Plan. May 1, 2010.

Veni, G. 1994. Geologic controls on cave development and the distribution of endemic cave fauna in the San Antonio, Texas, region. Report prepared for Texas Parks and Wildlife Department and U.S. Fish and Wildlife Service, Austin, Texas. 112 pp.

Veni, G. 2002. Delineation of hydrogeologic areas and zones for the management and recovery of endangered karst invertebrate species in Bexar County, Texas. Report prepared for the U.S. Fish and Wildlife Service. 75 pp.

Veni, G. 2009. Karst landscape evolution: impacts of speciation, biogeography, and protection or rare and endangered species. Proceedings of the 15th Annual International Congress of Speleology. (2): 771-776.

WDA (Wendell Davis and Associates). 2010a. Population and housing projections for the Southern Edwards Plateau Habitat Conservation Plan. Version date: December 17, 2010. Prepared for Loomis Partners, Inc. Wendell Davis and Associates, San Antonio, TX.

WDA (Wendell Davis and Associates). 2010b. Preliminary land use projection scenarios for the Southern Edwards Plateau Habitat Conservation Plan. Version date: December 17, 2010. Prepared for Loomis Partners, Inc. Wendell Davis and Associates, San Antonio, TX.

Whitney, G. D., and S. D. Adams. 1980. Man as maker of new plant communities. Journal of Applied Ecology 17:441-448.

Wilkins, N., R. A. Powell, A. A. T. Conkey, and A. G. Snelgrove. 2006. Population status and threat analysis for the black-capped vireo. Department of Wildlife and Fisheries Sciences, Texas A&M University. Prepared for the U.S. Fish and Wildlife Service, Region 2. 146 pp.

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