

**DRAFT ECONOMIC ANALYSIS OF CRITICAL
HABITAT DESIGNATION FOR NINE BEXAR COUNTY,
TEXAS INVERTEBRATE SPECIES**

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PREFACE

The U.S. Fish and Wildlife Service has added this preface to all economic analyses of critical habitat designations:

"The standard best practice in economic analysis is applying an approach that measures costs, benefits, and other impacts arising from a regulatory action against a baseline scenario of the world without the regulation. Guidelines on economic analysis, developed in accordance with the recommendations set forth in Executive Order 12866 ("Regulatory Planning and Review"), for both the Office of Management and Budget and the Department of the Interior, note the appropriateness of the approach:

'The baseline is the state of the world that would exist without the proposed action. All costs and benefits that are included in the analysis should be incremental with respect to this baseline.'

"When viewed in this way the economic impacts of critical habitat designation involve evaluating the 'without critical habitat' baseline versus the 'with critical habitat' scenario. Impacts of a designation equal the difference, or the increment, between these two scenarios. Measured differences between the baseline and the scenario in which critical habitat is designated may include (but are not limited to) changes in land use, environmental quality, property values, or time and effort expended on consultations and other activities by Federal landowners, Federal action agencies, and in some instances, State and local governments and/or private third parties. Incremental changes may be either positive (benefits) or negative (costs).

"In *New Mexico Cattle Growers Ass'n v. U.S.F.W.S.*, 248 F.3d 1277 (10th Cir. 2001), however, the 10th Circuit recently held that the baseline approach to economic analysis of critical habitat designations that was used by the Service for the southwestern willow flycatcher designation was 'not in accord with the language or intent of the ESA.' In particular, the court was concerned that the Service had failed to analyze any economic impact that would result from the designation, because it took the position in the economic analysis that there was no economic impact from critical habitat that was incremental to, rather than merely co-extensive with, the economic impact of listing the species. The Service had therefore assigned all of the possible impacts of designation to the listing of the species, without acknowledging any uncertainty in this conclusion or considering such potential impacts as transaction costs, reinitiations, or indirect costs. The court rejected the baseline approach incorporated in that designation, concluding that, by obviating the need to perform any analysis of economic impacts, such an approach rendered the economic analysis requirement meaningless: 'The statutory language is plain in requiring some kind of consideration of economic impact in the CHD phase.'

"In this analysis, the Service addresses the 10th Circuit's concern that we give meaning to the ESA's requirement of considering the economic impacts of designation by acknowledging the uncertainty of assigning certain post-designation economic impacts (particularly section 7 consultations) as having resulted from either the listing or the designation. The Service believes that

for many species the designation of critical habitat has a relatively small economic impact, particularly in areas where consultations have been ongoing with respect to the species. This is because the majority of the consultations and associated project modifications, if any, already consider habitat impacts and as a result, the process is not likely to change due to the designation of critical habitat. Nevertheless, we recognize that the nationwide history of consultations on critical habitat is not broad, and, in any particular case, there may be considerable uncertainty whether an impact is due to the critical habitat designation or the listing alone. We also understand that the public wants to know more about the kinds of costs consultations impose and frequently believe that designation could require additional project modifications.

"Therefore, this analysis incorporates two baselines. One addresses the impacts of critical habitat designation that may be 'attributable co-extensively' to the listing of the species. Because of the potential uncertainty about the benefits and economic costs resulting from critical habitat designations, we believe it is reasonable to estimate the upper-bounds of the cost of project modifications based on the benefits and economic costs of project modifications that would be required due to consultation under the jeopardy standard. It is important to note that the inclusion of impacts attributable co-extensively to the listing does not convert the economic analysis into a tool to be considered in the context of a listing decision. As the court reaffirmed in the southwestern willow flycatcher decision, 'the ESA clearly bars economic considerations from having a seat at the table when the listing determination is being made.'

"The other baseline, the lower boundary baseline, will be a more traditional rulemaking baseline. It will attempt to provide the Service's best analysis of which of the effects of future consultations actually result from the regulatory action under review - i.e. the critical habitat designation. These costs will in most cases be the costs of additional consultations, reinitiated consultations, and additional project modifications that would not have been required under the jeopardy standard alone as well as costs resulting from uncertainty and perceptual impacts on markets."

DATED: March 20, 2002

EXECUTIVE SUMMARY

1. The purpose of this report is to identify and analyze the potential economic impacts that may result from the proposed critical habitat designation for the nine Bexar County karst invertebrates. This report was prepared by Industrial Economics, Incorporated, for the U.S. Fish and Wildlife Service's Division of Economics.
2. Section 4(b)(2) of the Endangered Species Act (Act) requires the Service to designate critical habitat on the basis of the best scientific data available, after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas within critical habitat, provided the exclusion will not result in extinction of the species.
3. The focus of this economic analysis is on section 7 of the Act, which requires Federal agencies to insure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat. Federal agencies are required to consult with the Service whenever they propose an action that may affect a listed species or its designated critical habitat. Aside from the protection that is provided under section 7, the Act does not provide other forms of protection to lands designated as critical habitat. Because consultation under section 7 only applies to activities that are carried out, permitted, or funded by a Federal agency, the designation of critical habitat will not afford any additional protections for species with respect to such strictly private activities.

Proposed Critical Habitat

4. The nine invertebrates were listed as endangered on December 26, 2000 (65 FR 81421). In August 2002, the U.S. Fish and Wildlife Service (the Service) proposed to designate approximately 9,516 acres of land in Bexar County, Texas as critical habitat for these nine karst invertebrates. The Service proposed to designate 21 critical habitat units scattered throughout the cities of San Antonio, Grey Forest and Alamo Heights in Bexar County, Texas; one of them is further divided into five units. Thus, the total number of units is 25. The lands within these units are under private, City, State and Federal ownership.

Framework and Economic Impacts Considered

5. This analysis first identifies land use activities within or in the vicinity of those areas being proposed for critical habitat that are likely to be affected by section 7 of the Act. To do this, the analysis evaluates a "without section 7" scenario and compares it to a "with section 7" scenario. The "without section 7" scenario constitutes the baseline of this analysis. It represents the level of protection currently afforded the species under the Act, absent section 7 protective measures, which includes other Federal, State, and local laws. The "with section 7" scenario identifies land-use activities likely to involve a Federal nexus that may affect the species or its designated critical habitat, which accordingly have the potential to be subject to future consultations under section 7 of the Act.

6. Economic activities identified as likely to be affected under section 7 and the resulting impacts that section 7 can have on such activities constitute the upper-bound estimate of the proposed critical habitat economic analysis. By defining the upper-bound estimate to include both jeopardy and critical habitat impacts, the analysis recognizes the difficulty in differentiating between the two in evaluating only the critical habitat effects associated with the proposed rule. This step is adopted in order to ensure that any critical habitat impacts that may occur co-extensively with the listing of the species (i.e., jeopardy) are not overlooked in the analysis.
7. Upon identifying section 7 impacts, the analysis proceeds to consider the subset of impacts that can be attributed exclusively to the critical habitat designation. To do this, the analysis adopts a “with and without critical habitat approach.” This approach is used to determine those effects found in the upper-bound estimate that may be attributed solely to the proposed designation of critical habitat. Specifically, the “with and without critical habitat” approach considers section 7 impacts that will likely be associated with the implementation of the *jeopardy* provision of section 7 and those that will likely be associated with the implementation of the *adverse modification* provision of section 7. In many cases, impacts associated with the jeopardy standard remain unaffected by the designation of critical habitat and thus would not normally be considered an effect of a critical habitat rulemaking. The subset of section 7 impacts likely to be affected solely by the designation of critical habitat represents the lower-bound estimate of this analysis.
8. Two primary categories of potential costs are considered in the analysis. These are:
 - Costs associated with identifying the effect of the designation on a particular parcel or land use activity (e.g., technical assistance, section 7 consultations).
 - Costs associated with any modifications to projects, activities, or land uses resulting from the outcome of section 7 consultations with the Service.

Section 7 Costs

9. This analysis estimates that, over ten years, seven formal consultations and 21 informal consultations will occur on projects with the potential to affect the proposed critical habitat area. Most of the future section 7 consultations associated with the area proposed as critical habitat are likely to address private landowner Habitat Conservation Plans, and participation in Partners for Fish and Wildlife. In addition, it is expected that the Service will provide technical assistance to parties on 312 occasions. Results of the economic analysis of section 7 activity for these invertebrate species are summarized in Exhibit ES-2. The affected parties include:
 - **Federal Agencies:** Review of the redraft of Department of Defense, Camp Bullis' Karst Management Plan is anticipated to result in one informal consultation.

- **State Agencies:** Road maintenance activities are expected to prompt Texas Department of Transportation to engage in two formal Section 7 consultations and seek technical assistance from the service approximately three times. In addition, review of Government State Canyon Natural Area's Master Plan is expected to result in one technical assistance effort.
 - **Private Landowners:** Activities on private land with no Federal nexus are anticipated to result in five formal consultations due to voluntary development of Habitat Conservation Plans, and 308 technical assistance efforts due to inquiries regarding lands within critical habitat area. In addition, the Service hopes to engage up to 20 private landowners in the critical habitat area in the Partners for Fish and Wildlife Program, resulting in 20 informal consultations.
10. Based on the past consultation history regarding other listed species inhabiting the proposed units of critical habitat, the expected formal and informal Section 7 consultations with Federal and State agencies are likely to occur over the next ten years even if critical habitat is not designated for these invertebrate species. However, Texas Department of Transportation and private landowners are expected to behave differently in a "with critical habitat" compared to a "without critical habitat" scenario. Three TxDOT road maintenance technical assistance requests, along with five formal consultations and 158 instances of technical assistance for private landowners are attributed directly to critical habitat designation. Most of these costs solely attributable to critical habitat designation are expected to arise from new information and awareness that would result from the designation, particularly due to the Service's effort to send out notification letters to all landowners of parcels in the critical habitat area.
11. In addition to the impacts described above, no broader regional impacts are expected to flow from the designation of critical habitat in Bexar County, Texas largely because of the secluded nature of the species preferred dwellings (i.e., subsurface caves). The development projects described in Section 3.2 of this analysis are the only activities expected to generate Section 7 impacts. Smaller development and land management projects on individual properties within the area are not expected to result in Section 7 consultations.
12. Exhibit ES-1 provides an overview of the total Section 7 costs associated with the listing and designation of critical habitat for the karst invertebrates over a ten year period. Approximately 83 percent of the total Section 7 costs are determined to be attributable to the critical habitat designation as described in detail in Section 4.4. Exhibit ES-2 provides a more detailed per unit summary of the consultation and technical assistance costs associated with activities within or affecting the proposed critical habitat designation for these invertebrate species over a ten-year period.

Exhibit ES-1			
TOTAL SECTION 7 COSTS ASSOCIATED WITH THE LISTING AND DESIGNATION OF CRITICAL HABITAT IN BEXAR COUNTY, TEXAS			
10 Year Time Horizon			
	Range	Total Section 7 Costs	Attributed Solely to Critical Habitat Designation
Present Value (7% discount rate)	<i>Low</i>	\$15,100,000	\$12,500,000
	<i>High</i>	\$15,600,000	\$12,600,000
Annualized	<i>Low</i>	\$2,150,000	\$1,780,000
	<i>High</i>	\$2,210,000	\$1,800,000
Present value (3% discount rate)	<i>Low</i>	\$18,400,000	\$15,200,000
	<i>High</i>	\$18,900,000	\$15,400,000
Annualized	<i>Low</i>	\$2,150,000	\$1,780,000
	<i>High</i>	\$2,210,000	\$1,800,000
Management Costs for Mitigation Lands for Years 11 and Beyond (Units 1e, 2, 12, 16, and 21)			
Present value (7% discount rate)		\$1,550,000	\$1,550,000
Present value (3% discount rate)		\$5,490,000	\$5,490,000

Section 7 Benefits

13. Potential benefits of section 7 implementation to protect these invertebrate species and their proposed habitat include:
- species existence value;
 - species use values;
 - improved ecosystem health;
 - enhanced real estate values; and
 - recreational benefits.
14. The benefits identified above arise primarily from the protection afforded these invertebrate species under the Federal listing of these species as endangered. This analysis does not quantify total economic benefits attributable to the designation of critical habitat

because of the difficulty in differentiating benefits attributable solely to the listing of the species, and the dearth of relevant quantitative data.

Exhibit ES-2							
SUMMARY OF SECTION 7 COSTS ASSOCIATED WITH THE LISTING AND DESIGNATION OF CRITICAL HABITAT FOR THE NINE KARST INVERTEBRATES IN BEXAR COUNTY, TEXAS OVER A TEN YEAR TIME HORIZON							
Unit	Critical Habitat Impacts	Range	Costs				Attributed Solely to Critical Habitat Designation
			Service	Action Agency	Third Parties	Total Section 7 Costs	
1a-1e	Technical Assistance, Formal Consultation, Project Modifications	Low	\$3,620	n/a	\$3,520,000	\$3,530,000	\$3,530,000
		High	\$7,460	n/a	\$3,530,000	\$3,540,000	\$3,530,000
2	Technical Assistance, Formal Consultation, Project Modifications	Low	\$4,140	n/a	\$3,520,000	\$3,530,000	\$3,530,000
		High	\$8,820	n/a	\$3,530,000	\$3,540,000	\$3,540,000
3	Technical Assistance	Low	\$2,340	n/a	\$5,400	\$7,740	\$4,300
		High	\$6,120	n/a	\$13,500	\$19,600	\$10,900
4	Technical Assistance	Low	\$3,120	n/a	\$7,200	\$10,300	\$5,160
		High	\$8,160	n/a	\$18,000	\$26,200	\$13,000
5	Technical Assistance	Low	\$1,040	n/a	\$2,400	\$3,440	\$1,720
		High	\$2,720	n/a	\$6,000	\$8,720	\$4,360
6	Technical Assistance	Low	\$520	n/a	\$1,200	\$1,720	\$860
		High	\$1,360	n/a	\$3,000	\$4,360	\$2,180
7	Technical Assistance	Low	\$1,300	n/a	\$3,000	\$4,300	\$2,580
		High	\$3,400	n/a	\$7,500	\$10,900	\$6,540
8	Technical Assistance	Low	\$3,380	n/a	\$7,800	\$11,200	\$6,020
		High	\$8,840	n/a	\$19,500	\$28,300	\$15,300
9	Technical Assistance	Low	\$260	n/a	\$600	\$860	\$0

Exhibit ES-2							
SUMMARY OF SECTION 7 COSTS ASSOCIATED WITH THE LISTING AND DESIGNATION OF CRITICAL HABITAT FOR THE NINE KARST INVERTEBRATES IN BEXAR COUNTY, TEXAS OVER A TEN YEAR TIME HORIZON							
Unit	Critical Habitat Impacts	Range	Costs				
			Service	Action Agency	Third Parties	Total Section 7 Costs	Attributed Solely to Critical Habitat Designation
		<i>High</i>	\$680	n/a	\$1,500	\$2,180	\$0
10-11	Informal Consultation	<i>Low</i>	\$1,000	\$1,300	n/a	\$2,300	\$0
		<i>High</i>	\$3,100	\$7,900	n/a	\$11,000	\$0
12	Technical Assistance, Formal Consultation, Project Modifications	<i>Low</i>	\$13,500	n/a	\$3,550,000	\$3,560,000	\$3,450,000
		<i>High</i>	\$33,300	n/a	\$3,620,000	\$3,620,000	\$3,570,000
13	Technical Assistance	<i>Low</i>	\$1,820	n/a	\$4,200	\$6,020	\$3,440
		<i>High</i>	\$4,760	n/a	\$10,500	\$15,300	\$8,720
14	Technical Assistance	<i>Low</i>	\$260	n/a	\$600	\$860	\$860
		<i>High</i>	\$680	n/a	\$1,500	\$2,180	\$2,180
15	Technical Assistance	<i>Low</i>	\$7,800	n/a	\$18,000	\$25,800	\$12,900
		<i>High</i>	\$20,400	n/a	\$45,000	\$65,400	\$32,700
16	Technical Assistance, Formal Consultation, Project Modifications	<i>Low</i>	\$10,600	\$7,800	\$7,100,000	\$7,120,000	\$3,530,000
		<i>High</i>	\$21,700	\$13,000	\$7,110,000	\$7,150,000	\$3,540,000
17	Technical Assistance	<i>Low</i>	\$260	n/a	\$600	\$860	\$860
		<i>High</i>	\$680	n/a	\$1,500	\$2,180	\$2,180
18	Technical Assistance	<i>Low</i>	\$2,340	n/a	\$5,400	\$7,740	\$4,300
		<i>High</i>	\$6,120	n/a	\$13,500	\$19,600	\$10,900
19	Technical Assistance	<i>Low</i>	\$520	n/a	\$1,200	\$1,720	\$860

Exhibit ES-2							
SUMMARY OF SECTION 7 COSTS ASSOCIATED WITH THE LISTING AND DESIGNATION OF CRITICAL HABITAT FOR THE NINE KARST INVERTEBRATES IN BEXAR COUNTY, TEXAS OVER A TEN YEAR TIME HORIZON							
Unit	Critical Habitat Impacts	Range	Costs				
			Service	Action Agency	Third Parties	Total Section 7 Costs	Attributed Solely to Critical Habitat Designation
		<i>High</i>	\$1,360	n/a	\$3,000	\$4,360	\$2,180
20	Technical Assistance	<i>Low</i>	\$39,800	n/a	\$91,800	\$132,000	\$66,200
		<i>High</i>	\$104,000	n/a	\$230,000	\$334,000	\$168,000
21	Technical Assistance, Formal Consultation, Project Modifications	<i>Low</i>	\$6,220	n/a	\$3,530,000	\$3,540,000	\$3,530,000
		<i>High</i>	\$14,300	n/a	\$3,540,000	\$3,560,000	\$3,540,000
Multiple	Informal Consultations	<i>Low</i>	\$20,000	n/a	\$24,000	\$44,000	\$0
		<i>High</i>	\$62,000	n/a	\$138,000	\$200,000	\$0
All	Total Costs	<i>Low</i>	\$124,000	\$9,100	\$21,400,000	\$21,500,000	\$17,800,000
		<i>High</i>	\$320,000	\$20,900	\$21,800,000	\$22,100,000	\$18,000,000

Source: Based on past consultation records and conversations with Federal agencies potentially affected by the proposed critical habitat designation.

Notes: Estimates are rounded to three signification digits and therefore may not add up due to rounding. Estimates are reported in 2002 dollars. In the case of internal consultations, the Service bears the cost of the Action Agency.

INTRODUCTION AND BACKGROUND

SECTION 1

15. In August 2002, the U.S. Fish and Wildlife Service (the Service) proposed designating critical habitat for nine endangered karst-dwelling invertebrate species in Bexar County, Texas. The purpose of this report is to identify and analyze the potential economic impacts that may result from the proposed critical habitat designation. This report was prepared by Industrial Economics, Incorporated (IEc), under contract to the Service's Division of Economics.
16. Section 4(b)(2) of the Endangered Species Act (the Act) requires that the Service base the designation of critical habitat upon the best scientific and commercial data available, after taking into consideration the economic impact, and any other relevant impact, of specifying any particular area as critical habitat. The Service may exclude areas from critical habitat designation when the benefits of exclusion outweigh the benefits of including the areas as critical habitat, provided the exclusion will not result in extinction of the species.
17. Under the listing of a species, section 7(a)(2) of the Act requires Federal agencies to consult with the Service in order to ensure that activities they fund, authorize, permit, or carry out are not likely to jeopardize the continued existence of the species. The Service defines jeopardy as any action that would appreciably reduce the likelihood of both the survival and recovery of the species. For designated critical habitat, section 7(a)(2) also requires Federal agencies to consult with the Service to ensure that activities they fund, authorize, permit, or carry out do not result in destruction or adverse modification of critical habitat. Adverse modification of critical habitat is currently construed as any direct or indirect alteration that appreciably diminishes the value of critical habitat for conservation of a listed species.

1.1 Description of Species and Habitat¹

18. The nine invertebrates are obligate troglobites, cave-dwelling species, of local distribution in karst terrain in north and northwest Bexar County, Texas. “Karst” is a terrain that is formed by the slow dissolution of calcium carbonate from limestone bedrock by mildly acidic groundwater. These invertebrates are small in size, ranging from one millimeter to one centimeter in length, eyeless, or essentially eyeless, and most lack pigment. Some of their characteristic traits such as slow metabolism, long legs and loss of eyes indicate their adaptation to cave life. Leaf litter, cave crickets, small mammals and other vertebrates that rest or die in the cave serve as primary nutrients for these invertebrate species and their karst ecosystem. The primary constituent elements required by these species include: 1) karst-forming rock containing subterranean spaces with stable temperatures, extremely high humidity and suitable substrates; and 2) healthy native vegetative community and animals on the surface surrounding the karst features to provide nutrients and protect the karst ecosystem from adverse effects.

19. Factors that threaten the survival of the invertebrate species include water contamination, alteration of habitat through construction, eradication or alteration of surface flora and fauna, and presence of non-native fire ants. In addition, the invertebrates are vulnerable to water contamination, as water may directly enter caves after rain allowing for little or no purification. The majority of the caves known to contain the endangered karst invertebrate species are in the greater San Antonio metropolitan area where development pressure is high. Therefore, protecting and preserving these caves, and the surface habitat that supports the karst ecosystem, are expected to be major conservation challenges.

20. Currently, the Service is aware of 69 caves in Bexar County that contain one or more of the nine karst invertebrate species. The Service proposes to designate lands surrounding 57 caves known to contain one or more of the nine invertebrates. In addition to the caves, the estimated surface and subsurface drainage areas around each cave, at least 90 acres of the native plant and animal community and a buffer protecting the surface community from the effects of fragmentation and isolation, are necessary to support the karst ecosystem. The following are brief descriptions of the distribution of the nine invertebrates.

- ground beetle (*Rhadine exilis*): This species is currently known to inhabit 44 caves in the Government Canyon karst fauna region, Helotes, University of Texas San Antonio (UTSA), and Stone Oak karst fauna regions.
- ground beetle (*Rhadine infernalis*): This species is currently known to inhabit 31 caves in Government Canyon karst fauna region, Culebra Anticline, Stone Oak, Helotes and UTSA karst fauna regions.

¹ Information on these invertebrate species and their habitat is taken from the U.S. Fish and Wildlife Service, *Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Nine Bexar County, Texas Invertebrate Species*, 67 FR 166 (2002).

- Helotes mold beetle (*Batrisodes venyivi*): This species is currently known to inhabit six caves in Helotes, Government Canyon karst fauna region, and UTSA karst fauna regions.
- Cokendolpher cave harvestman (*Texella cokendolpheri*): This species is currently only known to inhabit Robber Baron Cave in the Alamo Heights karst fauna region.
- Robber Baron Cave meshweaver (*Cicurina baronia*): This species is currently only known to inhabit Robber Baron Cave in the Alamo Heights karst fauna region.
- Madla Cave meshweaver (*Cicurina madla*): This species is currently known to inhabit eight caves in the Stone Oak, Government Canyon karst fauna region, UTSA, and Helotes karst fauna regions.
- Braken Bat Cave meshweaver (*Cicurina venii*): This species is currently only known to inhabit Braken Bat Cave in the Culebra Anticline karst fauna region.
- Government Canyon Bat Cave meshweaver (*Cicurina vespera*): This species is currently known to inhabit two caves in the Government Canyon karst fauna region, and Helotes karst fauna regions.
- Government Canyon Bat Cave spider (*Neoleptoneta microps*): This species is currently known to inhabit two caves in the Government Canyon karst fauna region.

1.2 **Proposed Critical Habitat**²

21. The Service proposes 25 units as critical habitat for the nine karst invertebrates, encompassing a total of 9,516 acres in Bexar County, Texas. Each of the units contain one or more caves known to host one or more of the nine invertebrate species. However, caves and surrounding lands owned by one developer, La Cantera Development Company, are excluded from critical habitat designation because of special management provided to the species and caves through their Habitat Conservation Plan (HCP). La Cantera owns approximately 1,000 acres of commercial and residential development property in and around the proposed critical habitat area, including within Units 1e, 3, 6, 8, and 17. In order to undertake development activities on the properties, La Cantera Development Company

² Information on each unit is taken from the U.S. Fish and Wildlife Service, *Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Nine Bexar County, Texas, Invertebrate Species*, 67 FR 166 (2002).

created the HCP in order to receive incidental take permits under Section 10(a)(1)(B) of the Act for three of the nine invertebrate species.³

22. Descriptions of each proposed critical habitat unit are provided.

Unit 1(1a to 1e): This unit is divided into five units scattered within or adjacent to Government Canyon State Natural Area (GCSNA) in northwest Bexar County. Units 1a through 1e total approximately 1,378 acres. Four of the five units—Units 1a, 1b, 1c and 1d—fall entirely within GCSNA, which is owned and managed by the Texas Park and Wildlife Department. Unit 1e extends through a portion of GCSNA, La Cantera's Canyon Ranch preserve, and City of San Antonio's Iron Horse Canyon property. Unit 1 contains eight caves known to be inhabited by one or more of the nine invertebrates.

Unit 2: This unit encompasses approximately 245 acres of private, mostly undeveloped land in northwest Bexar County. Two caves known to be inhabited by one or more of the nine invertebrates occur in this unit.

Unit 3: This unit encompasses approximately 154 acres of private land in northwest Bexar County. Some residential development exists in the northern portion of the unit.

Unit 4: This unit encompasses approximately 154 acres of private land in northwest Bexar County that is subdivided for residential development, but as of yet, largely undeveloped. One cave known to be inhabited by one or more of the nine invertebrates occurs in this unit.

Unit 5: This unit encompasses approximately 116 acres of private land in northwest Bexar County composed of one large undeveloped tract of land and several smaller tracts marked by residential development. One cave known to be inhabited by one or more of the nine invertebrates occurs in this unit.

Unit 6: This unit encompasses approximately 111 acres of private land in northwest Bexar County characterized primarily by large tracts of undeveloped land with smaller tracts of residential development.

³ U.S. Fish and Wildlife Service, *Environmental Assessment/Habitat Conservation Plan for Issuance of an Endangered Species Act Section 10(a)(1)(B) Permit for the Incidental Take of Two Troglobitic Ground Beetles (Rhadine exilis and Rhadine infernalis) and Madra Cave Meshweaver (Cicurina madra) During the Construction and Operation of Commercial Development on the Approximately 1,000 -Acre La Cantera Property, San Antonio, Bexar County, Texas, October 11, 2001*; Memorandum to Regional Director, Region 2, U.S. Fish and Wildlife Service, from Field Supervisor, U.S. Fish and Wildlife Service, Austin office, October 22, 2001.

Unit 7: This unit encompasses approximately 123 acres of private land in northwest Bexar County containing large tracts of land, several of which have residential development. One cave known to be inhabited by one or more of the nine invertebrates occurs in this unit.

Unit 8: This unit encompasses approximately 428 acres of private land in northwest Bexar County. While mostly undeveloped, the southeastern portion of the unit is subdivided and developed with homes. Two caves known to be inhabited by one or more of the nine invertebrates occur in this unit.

Unit 9: This unit encompasses approximately 175 acres of State land in northwest Bexar County owned by the University of Texas, San Antonio. The unit is undeveloped but bordered on the north by Loop 1604, a major roadway. One cave known to be inhabited by one or more of the nine invertebrates occurs in this unit.

Unit 10: This unit encompasses approximately 906 mostly undeveloped acres in northern Bexar County. The northern half of the unit overlaps with land owned and operated by the Department of Defense's (DOD) Camp Bullis. The southern half of the unit overlaps with a park owned by the City of San Antonio, and some private lands. Three caves known to be inhabited by one or more of the nine invertebrates occur in this unit.

Unit 11: This unit encompasses approximately 3,143 acres of Federal land in north Bexar County. The entire unit is contained within DOD's Camp Bullis boundaries. Although largely undeveloped, the unit contains some structures and clear-cut land for use in military training maneuvers. Twenty caves are known to be inhabited by one or more of the nine invertebrates in this unit.

Unit 12: This unit encompasses approximately 258 acres of private land in north Bexar County subdivided for residential development. Approximately half of the lots have been developed. Two caves known to be inhabited by one or more of the nine invertebrates occur in this unit.

Unit 13: This unit encompasses approximately 125 acres of private land in north Bexar County that are largely undeveloped. Some small tracts of land have residential development. One cave known to be inhabited by one or more of the nine invertebrates occurs in this unit.

Unit 14: This unit encompasses approximately 426 acres of undeveloped private land in northwest Bexar County. Three caves known to be inhabited by one or more of the nine invertebrates occur in this unit.

Unit 15: This unit encompasses approximately 481 acres of private land in northwest Bexar County. The majority of the land is within a subdivision

bordered by undeveloped tracts of land. Four caves known to be inhabited by one or more of the nine invertebrates occur in this unit.

Unit 16: This unit encompasses approximately 152 primarily undeveloped acres of private land in northwest Bexar County. Loop 1604 bisects the eastern portion of the unit. One cave known to be inhabited by one or more of the nine invertebrates occurs in this unit.

Unit 17: This unit encompasses approximately 118 acres of private land in northwest Bexar County. The unit is characterized by large undeveloped tracts, and small roadways.

Unit 18: This unit encompasses approximately 100 acres of private land in northwest Bexar County. Though largely undeveloped, the northern portion of the unit is subdivided for residential development. The southern portion is lined with developed residential lots. Two caves known to be inhabited by one or more of the nine invertebrates occur in this unit.

Unit 19: This unit encompasses approximately 146 acres of private land in northern Bexar County. The majority of the land contains residential development with patches of undeveloped areas, and is bordered by two major roadways. Lands within this unit do not meet the primary constituent element requirements of a healthy native plant and animal surface community. Therefore, only the subsurface portion of the unit is being proposed as critical habitat area. One cave known to be inhabited by one or more of the nine invertebrates occurs in this unit.

Unit 20: This unit encompasses approximately 395 acres of private land in northwest Bexar County characterized by dense urban development. Lands within this unit do not meet the primary constituent element requirements of a healthy native plant and animal surface community. Therefore, only the subsurface portion of the unit is being proposed as critical habitat area. One cave known to be inhabited by one or more of the nine invertebrates occurs in this unit.

Unit 21: This unit encompasses approximately 382 acres of private land in north Bexar County. The unit is primarily undeveloped tracts of land with some small lots of residential development. Three caves known to be inhabited by one or more of the nine invertebrates occur in this unit.

1.3 Framework for Analysis

23. The focus of this economic analysis is on section 7 of the Act, which requires Federal agencies to insure that any action authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction

or adverse modification of critical habitat. Federal agencies are required to consult with the Service whenever they propose an action that may affect a listed species or its designated critical habitat. Aside from the protection that is provided under section 7, the Act does not provide other forms of protection to lands designated as critical habitat except where activities and habitat modification would result in take under the Act. Because consultation under section 7 only applies to activities that are carried out, permitted, or funded by Federal agencies, the requirements of Section 7 as they apply to the designation of critical habitat will not afford any additional protections for species with respect to strictly private activities (i.e., activities with no Federal “nexus”) beyond those already provided by the Section 9 take prohibitions.

24. This analysis first identifies land use activities within or in the vicinity of those areas being proposed for critical habitat that are likely to be affected by section 7 of the Act. To do this, the analysis evaluates a “without section 7” scenario and compares it to a “with section 7” scenario. The “without section 7” scenario constitutes the baseline of this analysis. It represents the level of protection that would be afforded the species under the Act if section 7 protective measures were absent. This level of protection would include Federal, State, and local laws. The “with section 7” scenario identifies land-use activities likely to involve a Federal nexus that may affect the species or its designated critical habitat, which accordingly have the potential to be subject to future consultations under section 7 of the Act.
25. Economic activities identified as likely to be affected under section 7 and the resulting impacts that section 7 can have on such activities constitute the upper-bound estimate of the proposed critical habitat economic analysis. By defining the upper-bound estimate to include both jeopardy and critical habitat impacts, the analysis recognizes the difficulty that can exist in differentiating between these two categories of effects, (i.e., in evaluating only the critical habitat effects associated with the proposed rulemaking). This approach is taken in order to ensure that any critical habitat impacts that may occur co-extensively with the listing of the species (i.e., jeopardy) are not overlooked in the analysis.
26. Upon identifying section 7 impacts, the analysis proceeds to consider the subset of impacts that can be attributed exclusively to the critical habitat designation. To do this, the analysis adopts a “with and without critical habitat approach.” This approach is used to determine those effects found in the upper-bound estimate that may be attributed solely to the proposed designation of critical habitat. Specifically, the “with and without critical habitat” approach considers section 7 impacts that will likely be associated with the implementation of the *jeopardy* provision of section 7 and those that will likely be associated with the implementation of the *adverse modification* provision of section 7. In many cases, impacts associated with the jeopardy standard remain unaffected by the designation of critical habitat and thus would not normally be considered an effect of a critical habitat rulemaking. The subset of section 7 impacts likely to be affected solely by the designation of critical habitat represents the lower-bound estimate of this analysis.
27. The proposed critical habitat designation for these invertebrate species encompasses land under Federal, State, City and private ownership. For State, City and private lands

subject to critical habitat designation, section 7 consultations and modifications to land uses and activities can only be required when a Federal nexus, or connection, exists. A Federal nexus arises if the activity or land use of concern involves Federal permits, Federal funding, or another form of Federal involvement. While Section 7 consultations are not required for activities on non-Federal lands, non-Federal Section 10 applications will require an intra-Service Section 7 analysis prior to the issuance of a Section 10 Incidental Take Permit.

28. In addition to the lands contained within the proposed critical habitat designation, this report examines activities on adjacent property sponsored or permitted by Federal agencies that may affect the invertebrate species and/or adversely modify the proposed critical habitat area.

29. This report estimates impacts of listing and critical habitat designation on activities that are "reasonably foreseeable," including, but not limited to, activities that are currently authorized, permitted, or funded, or for which proposed plans are currently available to the public. Accordingly, the analysis bases estimates on activities that are likely to occur within a ten-year time horizon.

1.4 Methodological Approach

30. This report relies on a sequential methodology and focuses on distilling the salient and relevant aspects of potential economic impacts of designation. The methodology consists of:

- Determining the current and projected economic activity within and around the proposed critical habitat area;
- Considering how current and future activities that take place or will likely take place on the Federal and private land could adversely affect proposed critical habitat;
- Identifying whether such activities taking place on privately owned property within the proposed critical habitat boundaries are likely to involve a Federal nexus;
- Evaluating the likelihood that identified Federal actions and non-Federal actions having a Federal nexus will require consultations under section 7 of the Act and, in turn, that such consultations will result in modifications to projects;
- Estimating per-unit costs of expected section 7 consultations, project modifications and other economic impacts associated with activities in or adjacent to areas proposed as critical habitat;
- Estimating the upper-bound of total costs associated with the area proposed for the designation (including costs that may be attributed co-extensively

with the listing of the species) and the lower bound of costs (i.e., costs attributable solely to critical habitat);

- Assessing the extent to which critical habitat designation will create costs for small businesses and/or affect property values as a result of modifications or delays to projects.
- Determining the benefits that may be associated with the designation of critical habitat; and

Assessing the extent to which critical habitat designation will create costs for small businesses and/or affect property values as a result of modifications or delays to projects.

1.5 Information Sources

31. The primary sources of information for this report were communications with personnel from the Service and affected Federal, State and City agencies, the past consultation history in Texas, and government documents. Publicly available data (i.e., information available on the Internet) were also used to augment the analysis. Estimates of the cost of an individual consultation were developed from a review and analysis of historical section 7 files from a number of Service field offices around the country.

**CRITICAL HABITAT AREA SOCIOECONOMIC PROFILE
AND BASELINE ELEMENTS**

SECTION 2

32. This section summarizes key economic and demographic information, and highlights existing relevant regulations for Bexar County. County level data are presented to provide context for the discussion of potential economic impacts due to critical habitat designation, and to illuminate trends that may influence these impacts.

2.1 Bexar County, Texas⁴

33. The proposed critical habitat units are located in north and northwest Bexar County, Texas. Bexar County lies within the San Antonio Metropolitan Area. In 2000, the County supported a population of approximately 1.4 million residents (the fourth most populous county in Texas at the time), or 6.7 percent of the total state population. Bexar County experienced a population growth of 17.5 percent between 1990 and 2000, compared to a State average of 22.8 percent. This population is projected to increase an additional 11.7 percent by 2010 and by 25.3 percent by 2030. Spread over 1,247 square miles, the County has an average density of 1,117 people per square mile.

34. In 2000, Bexar County estimated total personal income of residents at \$36.2 billion, with a per capita personal income (PCPI) of \$25,881. Bexar's PCPI was seven percent lower than the State average (\$27,752) and 12 percent lower than the national average (\$29,469). The 2000 PCPI indicated an increase of 4.7 percent from 1999, which was less than the State PCPI growth (5.8 percent) and that of the nation (5.8 percent).

35. Total earnings of persons employed within the Bexar County area increased from \$27.7 billion in 1999 to \$29.6 billion in 2000, an increase of 6.7 percent. In 2000, services,

⁴ Population summaries are derived primarily from: U.S. Census Bureau State and County Quick Facts. Accessed at: <http://quickfacts.census.gov/qfd/states/48/48029.html>, June 28, 2002; Texas County Population Projections, 2000 to 2030. Accessed at: <http://www.window.state.tx.us/ecodata/popdata/popfiles.html>, June 28, 2002; Bureau of Economic Analysis Regional Accounts Data. Accessed at: <http://www.bea.doc.gov/bea/regional/reis/>, June 28, 2002; Personal communication with personnel from San Antonio Planning Office, Texas, June 20, 2002.

transportation and public utilities and State and local government were the largest industries in the County (i.e., industries with the highest earnings).

36. The proposed designation of critical habitat for the invertebrate species lies in northern part of the County with majority of the units lying right outside of a major City highway—Loop 1604—that circles the heart of the City of San Antonio. North Bexar County is generally a high middle-income area subject to rapid residential development—single family homes and apartment complexes. However, because of its proximity to San Antonio metropolitan area, some of the units are on already well-developed lands.⁵ The economic impact of proposing critical habitat against the backdrop of substantial development pressure in this rapidly expanding suburban county is detailed throughout this analysis.

2.2 Relevant Baseline Elements: Regulations

37. Existing regulations and programs currently affect the proposed critical habitat units. These regulations provide protection to the karst invertebrate species in the absence of the protection afforded by the listing, and anticipated additional protection of the proposed critical habitat designation. Therefore, any protections or costs engendered by the listing or critical habitat designation are incremental to these baseline protections. This section provides an overview of existing regulations and programs that affect the proposed critical habitat units, including: (1) Edwards Aquifer (the Aquifer) protections, (2) Government Canyon State Natural Area (GCSNA) policies, (3) Proposition 3 Program, (4) Texas Cave Management Association (TCMA) protections, (5) Texas Transportation Code, and (6) State-level endangered species protections.

2.2.1 Edwards Aquifer Protections

38. The proposed critical habitat area lies in the karst fauna areas above the Edwards Aquifer. The Aquifer is composed of a layer of porous, honeycombed, water-bearing limestone and is the primary source of drinking water for the City of San Antonio and surrounding towns. Proposed critical habitat Units 1a-1e, 12, 13, 19, and 21 and a portion of Units 8, 9, 10, 11, and 18 lie on the recharge zone of the Aquifer. A recharge area occurs where highly faulted and fractured outcrop is present, thereby facilitating flow of water into the Aquifer. The remaining proposed units fall in contributing, transition, and artesian zones of the Aquifer, where limestone is faulted and fractured, containing caves and sinkholes.⁶ This section describes Federal, State, and City regulations that provide protection to the Aquifer in terms of maintaining sufficient levels and quality of groundwater.

⁵ Personal communication with personnel from San Antonio Planning Office, July 20, 2002.

⁶ The Edwards Aquifer Homepage, "Introduction to the Edwards Aquifer." From <http://www.edwardsaquifer.net/intro.html>, June 27, 2002.

2.2.1.(a) Sole Source Aquifer Protection Program

39. The Sole Source Aquifer (SSA) Protection Program is authorized by Section 1424(e) of the Safe Drinking Water Act of 1974 (SDWA).

"EPA defines a sole or principal source aquifer as one which supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer. These areas can have no alternative drinking water source(s) which could physically, legally, and economically supply all those who depend upon the aquifer for drinking water."⁷

40. The Edwards Aquifer was designated as a SSA in December, 1975 (40 FR 58344).⁸ It was the first Aquifer to be designated under this program. The benefit of SAA designation is an EPA review of any proposed project that lies in the recharge zone, the surface area connected to the recharge zone, or the watershed area which contributes to the surface water flowing across the Aquifer. The EPA only reviews projects that have applied for Federal funding and constitute a potential threat to the Aquifer. If the EPA determines a project potentially will result in groundwater pollution, it will recommend project modifications to avoid pollution.⁹ Each of the proposed critical habitat units lie in the Edwards Aquifer recharge, transition, or contributing zone, and therefore meet the criteria for project review under the Aquifer's sole source designation.

41. Although the SSA Protection Program does not offer provisions that specifically target endangered species, by minimizing the flow of contaminants through the caves and into the Aquifer, the program may offer some marginal protection to the endangered karst invertebrates. Karst ecosystems are sensitive to water quality because of the ease with which water enters the caves with little to no filtration. Although toxicological studies of water-borne contaminants have not been done on the invertebrates, studies on similar species suggest that exposure to such contaminants may have adverse effects on these nine endangered species.¹⁰ EPA review of a proposed project in the surface area above Edwards Aquifer would occur absent critical habitat designation. As such, this analysis assumes that the EPA review of development plans to protect the Aquifer offers a similar level of protection to the Aquifer that the Service review of development plans under Section 7 offers

⁷ U.S. Environmental Protection Agency, "Sole Source Aquifer Protection Program." From <http://www.epa.gov/safewater/swp/ssa.html>, July 1, 2002.

⁸ U.S. Environmental Protection Agency, "Sole Source Aquifer Designation Citations." From <http://www.epa.gov/earth1r6/6wq/swp/ssa/descit.htm>, July 31, 2002.

⁹ U.S. Environmental Protection Agency, "The Effects of Sole Source Aquifer Designation." From <http://www.epa.gov/earth1r6/6wq/swp/ssa/effects.htm>, July 31, 2002.

¹⁰ George Veni & Associates. Management Plan for the Conservation of Rare Karst Species and Karst Species Proposed for Endangered Listing, Camp Bullis, Bexar and Comal Counties, Texas. Prepared for: Garrison Public Works, Environmental Division, September 30, 1999.

to the critical habitat area. Therefore the SSA status of the Aquifer provides baseline protection to the endangered karst invertebrates.

2.2.1.(b) Edwards Aquifer Protection Program

42. Texas Natural Resources Conservation Commission (TNRCC) must approve any plans (i.e., construction of buildings, utility stations, or roads; clearing or excavation; or any other activities that pose a potential threat to the water quality of the Aquifer) to build on the recharge, transition, or contributing zones of the Edwards Aquifer. To be approved, an applicant must meet statutory requirements for the following plans:

Water pollution abatement plan;

Organized sewage collection system;

Underground storage tank facility for static hydrocarbon and hazardous substance storage; and

Aboveground storage tank facility plan for static hydrocarbon and hazardous substance storage¹¹

Once plans are approved, TNRCC monitors the site for compliance.

43. Although the Edwards Aquifer Protection Program does not offer provisions that specifically target endangered species, by attempting to prevent the flow of contaminants through the caves and into the Aquifer, the program may offer some marginal protection to the endangered karst invertebrates. Review of a proposed project by the TNRCC would occur absent critical habitat designation. Therefore, the Edwards Aquifer Protection Program provides additional baseline protection to the endangered karst invertebrates.

2.2.1.(c) Code of Ordinances, City of San Antonio, Texas

44. San Antonio Code of Ordinances Part II, Chapter 34, Water and Sewer Articles IV and VI offer some measure of protection to the City's groundwater supply by regulating water conservation and reuse, and water quality control and pollution prevention, respectively.¹² Because the Edwards Aquifer is the primary source of groundwater for the City, these protections regulate use of its water resources.

45. San Antonio Code of Ordinances Part II, Chapter 34, Article VI regulates water quality control and pollution prevention of the City's groundwater. This article intends to prevent the contamination of the Aquifer resource by regulating construction and

¹¹ Texas Natural Resource Conservation Commission Rules, Chapter 213, Subchapter A, 213.5(a).

¹² City of San Antonio Code of Ordinances, Part II, Chapters 34 and 35.

maintenance of wells. Although the City Code of Ordinances does not offer provisions that specifically target endangered species, by regulating the water quality of the Aquifer, the rules may offer some protection to the endangered karst invertebrates. Such regulation would occur absent critical habitat designation and therefore provides additional baseline protection to the endangered karst invertebrates.

2.2.1.(d) The Edwards Aquifer Authority Rules

46. The Edwards Aquifer Authority (the Authority) was created by the Texas Legislature in 1993 as a regulatory agency for preservation and protection of the Edwards Aquifer. The goals of the Authority are to:

Fully implement the requirements of the Edwards Aquifer Authority Act;

Develop an effective, comprehensive management plan based on sound, consensus-based scientific research and technical data;

Maintain continuous springflow;

Protect and ensure the quality of ground to surface water in the Authority's jurisdiction;

Forge solutions that ensure public trust;

Promote healthy economies in all parts of the region;

Research and develop additional sources of water; and

Provide strong, professional management for the Authority¹³

47. The Authority is currently drafting a set of Proposed Rules pertaining to water quality.¹⁴ Edwards Aquifer Authority Proposed Rules, Chapter 713, Subchapter G, Recharge Zone Protection, intend to regulate activities with the potential to pollute the Aquifer and connected surface streams. These proposed rules will not offer provisions that specifically target endangered karst invertebrates. However, by regulating the water quality of the Aquifer, such rules may offer marginal protection to the species. If passed, these regulations would occur absent critical habitat designation and would therefore provide additional baseline protection to the endangered karst invertebrates.

¹³ The Edwards Aquifer Authority, "Edwards Aquifer Authority Goals." From <http://www.edwardsaquifer.org/Pages/theauthority.html>, July 18, 2002.

¹⁴ Personal communication with Aquifer Scientist, Edwards Aquifer Authority, July 19, 2002.

2.2.2 Government Canyon State Natural Area Policies

48. Units 1a through 1d of the proposed critical habitat area are contained entirely within Texas Park and Wildlife Department's (TPWD) Government Canyon State Natural Area (GCSNA). In addition, a portion of Unit 1e lies on this State property. GCSNA was purchased by TPWD in cooperation with Edwards Underground Water District (now Edward's Aquifer Authority), San Antonio Water System, the Trust for Public Lands, and the Federal government Land and Water Conservation Fund.¹⁵
49. Five caves lie within Units 1a through 1d in the GCSNA. TPWD intends to develop a management plan to preserve the listed species within the caves and the associated surface plant and animal community and subject them to management practices, including biannual treatment for non-native fireants, restricted human access, and maintenance of vegetation around cave entrances. In addition, caves under this plan within the view of proposed trail areas will have gated entrances or will be obscured.¹⁶ Such practices restrict human access, decreasing chances of disturbance to the cave and surrounding areas. This management protocol would occur absent critical habitat designation and therefore provides additional baseline protection to the endangered karst invertebrates.

2.2.3 Proposition 3

50. The "Proposition 3" sales tax incentive program was approved in May 2000 as a joint effort of the Bexar Land Trust, the City of San Antonio, the Trust for Public Lands, the Nature Conservancy of Texas, and the San Antonio River Authority.¹⁷ Once acquired, Proposition 3 lands are preserved as open space.¹⁸
51. The City of San Antonio purchased part of Iron Horse Canyon, which is contained within Unit 1e, under the Proposition 3 Program, therefore securing this land against commercial and residential development. However, this property may still be subject to recreational development. This protection would occur absent critical habitat designation and therefore provides additional baseline protection to the endangered karst invertebrates in Unit 1e.

¹⁵ Texas Parks and Wildlife: State Parks and Historic Sites, "Government Canyon State Natural Area." From <http://www.tpwd.state.tx.us/park/govcan/govcan.htm>, June 27, 2002.

¹⁶ Personal communication with Manager, Government Canyon State Natural Area, June 23, 2002.

¹⁷ Bexar Land Trust, "Exciting Things are Happening in San Antonio!" From <http://www.bexarlandtrust.org>, June 27, 2002.

¹⁸ Personal communication with Proposition 3 Office, City of San Antonio, June 20, 2002.

2.2.4 Texas Cave Management Association Protections

52. The TCMA is a nonprofit Texas corporation chartered to preserve the caves and caverns of Texas; to promote the conservation and study of caves within the State of Texas; and when possible to acquire property for conservation, scientific and educational purposes and not for profit.¹⁹ TCMA currently manages Robber Baron Cave in Unit 20, and about 0.5 acres surrounding the opening. TCMA plans to redesign the existing cave gate and restore native vegetation around the entrance of the cave. The redesigned gate will facilitate the exchange of air and nutrients into the cave as well as restrict human access. The new gate will also allow greater access for small mammals and cave crickets to enter and exit the cave, providing nutrients to the endangered invertebrates inhabiting the cave. This maintenance and protection would occur absent critical habitat designation and therefore provides additional baseline protection to the endangered invertebrates within this cave.

2.2.5 Texas Transportation Code

53. The majority of the proposed critical habitat units are located just outside Loop 1604, which is a State-managed and maintained roadway. Specifically, Units 9, 16, and 19 are adjacent to, or intersected by this highway. In addition, Unit 13 is intersected by Bulverde Road and Unit 12 lies adjacent to Route 281, both of which are active State-managed and maintained roadways.
54. Title 6 of the Texas Transportation Code mandates that the Texas Department of Transportation (TxDOT) conduct an "environmental review" of all proposed activity on roadways in the State, other than standard maintenance. Furthermore, the code states that, "The department shall coordinate with the Texas Natural Resources Conservation Commission and the Parks and Wildlife Department in preparing an environmental review."²⁰
55. If an environmental review determines that endangered species may be affected by a proposed action, the Parks and Wildlife Department and TxDOT will coordinate their efforts to protect the species' habitat from disturbance. On occasion, the Parks and Wildlife Department may contact FWS for technical assistance on a transportation project in or near designated critical habitat. While such requests for assistance are not required by the Endangered Species Act unless a Federal nexus exists, Texas agencies do sometimes act under State law or their own volition to protect the habitat of known endangered species. These State policies add additional protection to endangered species and their critical habitat.

¹⁹ Texas Cave Management Association, "Who Are We Anyhow?????" From <http://www.cavetexas.org/tcma/whoarewe.htm>, July 25, 2002.

²⁰ The Texas Statutes: Transportation Code, Title 6, Section 201.604, "Environmental Review."

2.2.6 State-Level Endangered Species Protections

56. Texas does not currently list these nine invertebrate species as endangered species at the state level.²¹ Therefore, any section 7 consultations based on the take of a species will be attributed to the Federal Listing of the nine invertebrates.

2.3 Relevant Baseline Elements: Overlap with other Listed Species

57. _____ Two other Federally listed endangered species are found within some of the proposed critical habitat units– golden-cheeked warbler (*Dendroica chrysoparia*), and black-capped vireo (*Vireo atricapillus*). The presence of these species has resulted in a record of past Section 7 consultation with the Service in Texas. In addition, future consultations on these invertebrate species may occur in coordination with consultations regarding other species, and project modifications may be recommended for the benefit of all the species in the given habitat. Exhibit 1-1 lists the endangered species that may inhabit a number of the proposed critical habitat units.

Exhibit 1-1			
OVERLAP WITH OTHER THREATENED AND ENDANGERED SPECIES			
Category	Common Name	Scientific Name	Status
Bird	golden-cheeked warbler	<i>Dendroica chrysoparia</i>	Federally endangered
Bird	black-capped vireo	<i>Vireo atricapillus</i>	Federally endangered

²¹ Texas Parks and Wildlife, “Texas Threatened and Endangered Invertebrates.” From <http://www.tpwd.state.tx.us/nature/endang/animals/invertebrates.htm>, July 25, 2002.

IMPACTS OF CRITICAL HABITAT DESIGNATION ON LAND USE**SECTION 3**

58. The previous two sections introduced the geographic areas the Service is proposing to designate as critical habitat for the nine invertebrates, the socioeconomic profile of these areas, and relevant baseline regulatory protection. This section identifies current land use activities within and/or affecting the land proposed as critical habitat as well as the location, nature, and extent of future activities that may be affected by section 7 implementation within the proposed designation. The section also provides estimates of consultations and other impacts on activities affecting the areas included in the proposed designation. Importantly, these estimates include all section 7-related consultations and technical assistance efforts associated with the proposed critical habitat area. That is, this section includes impacts that may be attributable co-extensively to the listing of these invertebrate species or to other endangered species native to the critical habitat areas, such as the golden-cheeked warbler and black-capped vireo. Therefore, this section provides an upper-bound measure of the impacts likely to be caused by the designation.

59. This section defines the types of Section 7 activities, and describes future projects likely to require section 7 consultations in the proposed critical habitat area over the next ten years.²²

3.1 Categories of Economic Impacts Associated with Section 7 Implementation

60. The following subsection provides an overview of the categories of economic impacts that are likely to arise due to the implementation of section 7 in the area proposed as critical habitat for these invertebrate species.

3.1.1 Technical Assistance

61. Frequently, the Service responds to requests for technical assistance from State agencies, local municipalities, and private landowners and developers who may have questions regarding whether specific activities may affect critical habitat. Technical assistance costs represent the estimated economic costs of informational conversations between these entities and the Service regarding the designation of critical habitat for the

²² In certain instances, the consultation process will require mitigation activities beyond the ten year time horizon. These activities are also discussed here, and related are costs estimated in Section 4.

invertebrates. Most likely, such conversations will occur between municipal or private property owners and the Service regarding lands designated as critical habitat or lands adjacent to critical habitat. The Service's technical assistance activities are voluntary and occur in instances where a Federal nexus does not exist.

3.1.2 Section 7 Consultations

62. Section 7(a)(2) of the Act requires Federal agencies (Action agencies) to consult with the Service whenever activities that they undertake, authorize, permit, or fund may affect a listed species or designated critical habitat. Under certain scenarios, the designation of critical habitat can result in section 7 consultations with the Service beyond those required by the listing. These include:
- New consultations, which can occur when activities involving a Federal nexus are proposed in critical habitat not thought to be currently occupied by the species; and
 - Re-initiations of consultations, which result when consultations that previously occurred under the listing are re-initiated due to new information or circumstances generated by the designation.
63. In some cases, consultations will involve the Service and another Federal agency only, such as the Department of Defense. More often, they will also include a third party involved in projects on non-Federal lands with a Federal nexus, such as state agencies and private landowners.
64. During a consultation, the Service, the Action agency, and the landowner manager applying for Federal funding or permitting (if applicable) communicate in an effort to minimize potential adverse effects to the species and/or to the proposed critical habitat. Communication between these parties may occur via written letters, phone calls, in-person meetings, or any combination of these. The duration and complexity of these interactions depends on a number of variables, including the type of consultation, the species, the activity of concern, and the potential effects to the species and designated critical habitat associated with the activity that has been proposed, the Federal agency, and whether there is a private applicant involved.
65. Section 7 consultations with the Service may be either informal or formal. *Informal consultation*, which consists of informal discussions between the Service, the Action agency, and the applicant concerning an action that may affect a listed species or its designated critical habitat, is designed to identify and resolve potential concerns at an early stage in the planning process. By contrast, a *formal consultation* is required if the Action agency determines that the proposed action is likely to adversely affect the listed species or designated critical habitat in ways that cannot be resolved through informal consultation. Regardless of the type of consultation or proposed project, section 7 consultations can require substantial administrative effort on the part of all participants.

3.1.3 Project Modifications

66. The section 7 consultation process may involve some modifications to a proposed project. These modifications may be agreed upon by the Action agency and the applicant and included in the project description as avoidance and minimization measures, or they may be included in the Service's biological opinion on the proposed action as discretionary conservation measures to assist the Federal agency in meeting their obligations under section 7(a)(1) of the Act.²³ In some cases, the Service may determine that the project is likely to jeopardize the continued existence of the species and/or destroy or adversely modify its designated critical habitat. In these cases the Service will include reasonable and prudent alternatives to the proposed project. The reasonable and prudent alternatives are typically developed by the Service in cooperation with the Action agency and, when applicable, the applicant. Alternatively, the Action agency can develop its own reasonable and prudent alternatives, or seek an exemption for the project. All of these project modifications have the potential to represent some cost to the Action agency and/or the applicant.

3.2 Section 7 Related Impacts

67. This section outlines the expected Section 7 related impacts in each unit by activity. Each subsection begins with a general description of the activity and the methodology this analysis employs to estimate the number of activities expected. The following activities are expected to result in Section 7 impacts:

- technical assistance efforts;
- Habitat Conservation Plans;
- Partners for Fish and Wildlife projects;
- Camp Bullis Karst Management Plan; and
- road expansion of Loop 1604.

The level at which each of these activities impacts each unit is described in this section and is summarized in Exhibit 3-1, presented at the end of this section. Project modifications resulting from these activities are described in Section 4.2 and summarized in Exhibit 4-3.

3.2.1 Anticipated Technical Assistance in Proposed Critical Habitat Area

68. In Bexar County, Texas, the Service intends to send notification letters to landowners holding land within the proposed critical habitat area outlining the definition and proposed area of critical habitat for the nine karst invertebrates. This analysis anticipates that approximately 25 percent of all landowners receiving this letter will respond to the Service in the form of letters or phone calls. This estimate is based on the preliminary responses the

²³ Section 7(a)(1) requires Federal agencies to utilize their authorities to further the purposes of the Act by carrying out programs for the conservation of listed species.

Service has received thus far in response to such letters.²⁴ Such responses may be instigated by concern regarding the impact of the designation on the responders property, or request for further information regarding the species or habitat area and are regarded as technical assistance efforts. This analysis further assumes that approximately half of these technical assistance efforts will be due to heightened awareness of critical habitat designation created by the letters mailed from the Service informing landowners of the designation, and would therefore not occur absent critical habitat designation. The remaining half of the technical assistance efforts are assumed to be coextensive to the listing of the species. Therefore, the total number of technical assistance efforts in each unit is the total number of landowners within the unit, less the number of landowners expected to engage in a formal or informal Section 7 consultation, divided by four.²⁵ Half of the total technical assistance efforts in each unit are assumed to be attributable to critical habitat designation.

69. As described in Section 1.2 of this analysis, five units within the proposed critical habitat area contain lands owned by La Cantera Development Company.²⁶ Accordingly, one landowner was subtracted from the total number of landowners within these five units before technical assistance efforts were estimated in order to account for La Cantera, which is not likely to request technical assistance because of its existing HCP excluding these lands from critical habitat designation.

3.2.1.(a) Unit 1

70. Units 1a through 1d of the proposed critical habitat area are contained entirely within Texas Parks and Wildlife Department's (TPWD) Government Canyon State Natural Area (GCSNA). In addition, a portion of Unit 1e lies on this State property. The remainder of Unit 1e is owned by five landowners, including City-owned park land (Iron Horse Canyon), and private lands. GCSNA is a 5,839-acre area located northwest of downtown San Antonio on the Edwards Aquifer recharge zone.²⁷
71. Currently, GCSNA is not accessible to the public. However, the Master Plan for development and management, approved by TPWD in June of 1998, includes recreational provisions in the form of 41 miles of trails, administrative and maintenance buildings, educational facilities, two residences, and a pavilion. Despite the intended use of the Natural Area as a recreational resource, the protection of its natural resources, including the

²⁴ Personal communication with Austin Fish and Wildlife Office, September 26, 2002.

²⁵ Number of landowners within each unit were attained through personal communication with the Service, August 6, 2002.

²⁶ See footnote 3.

²⁷ See footnote 15.

endangered invertebrates, is the first priority of management.²⁸ The Service has not yet reviewed the GCSNA's karst management plan, though a **technical assistance** effort is anticipated for such a review. If a karst management plan is submitted to and approved by the Service during the public comment period for the critical habitat proposal, these lands (Units 1a-1d and a portion of 1e) may be excluded from critical habitat designation if the Service determines that these areas are not in need of special management and, therefore, would not meet the definition of critical habitat.²⁹

72. As noted above, the remaining portion of Unit 1e is owned by five landowners. This unit is also zoned for commercial use. Therefore, this analysis assumes that one landowner within this unit will develop an HCP for commercial development project(s) as detailed in section 3.2.2. Of the remaining landowners, this analysis estimates **one technical assistance effort** within proposed critical habitat Unit 1e. This effort is conservatively attributed to critical habitat designation.

3.2.1.(b) Unit 2

73. Unit 2 of the proposed critical habitat area consists of large wooded tracts of land that are mostly undeveloped. Currently, 18 private landowners own parcels within the unit. High potential for residential development exists.³⁰ Further, this unit is zoned for commercial development. Therefore, this analysis assumes that one landowner within the unit will develop an HCP for commercial development project(s) as detailed in section 3.2.2. Of the remaining landowners, this analysis estimates **four technical assistance efforts** within proposed critical habitat Unit 2, two of which are attributable to critical habitat designation.³¹

3.2.1.(c) Unit 3

74. Unit 3 of the proposed critical habitat area consists of large wooded tracts of land. Currently, 34 private landowners own parcels within the unit. The tracts along the northern side of the unit have been developed with single family homes, with the remainder of properties currently undeveloped. Some residential development is likely within proposed critical habitat Unit 3. This analysis estimates **9 technical assistance efforts** within proposed critical habitat Unit 3, five of which are attributable to critical habitat designation.

²⁸ Personal communication with Manager, Government Canyon State Natural Area, June 23, 2002.

²⁹ Personal communication with Austin Field Office, Fish and Wildlife Service, September 24, 2002.

³⁰ Personal communication with Austin Field Office, Fish and Wildlife Service, June 13, 2002.

³¹ Estimates for numbers of technical assistance efforts are rounded to the nearest whole number.

3.2.1.(d) Unit 4

75. Unit 4 of the proposed critical habitat area consists of large wooded tracts of land. Currently, 49 private landowners own parcels within the unit. The land is subdivided, and is likely to experience residential development. Therefore, this analysis estimates **12 technical assistance efforts** within proposed critical habitat Unit 4, six of which are attributable to critical habitat designation.

3.2.1.(e) Unit 5

76. Unit 5 of the proposed critical habitat area consists of one large tract, and several smaller tracts of wooded land. Currently, 17 private landowners own parcels within the unit. Lands within this unit are zoned for residential development. Therefore, this analysis estimates **four technical assistance efforts** within proposed critical habitat Unit 5, with two of the technical assistance efforts being attributable to critical habitat designation.

3.2.1.(f) Unit 6

77. Unit 6 of the proposed critical habitat area consists of large wooded tracts of land. Some of the land is likely to experience residential development. Currently eight landowners own parcels of land within proposed critical habitat Unit 6. This analysis estimates **two technical assistance efforts** within proposed critical habitat Unit 6, one of which is attributable to critical habitat designation.

3.2.1.(g) Unit 7

78. Unit 7 of the proposed critical habitat area consists of large tracts of wooded land, some of which are developed with single family homes. Currently, 19 private landowners own parcels within the unit, high potential exists for further residential development. Therefore, this analysis estimates **five technical assistance efforts** within Unit 7, with three being attributable to critical habitat designation.

3.2.1.(h) Unit 8

79. Unit 8 of the proposed critical habitat area consists of large tracts of woodland, some with residential development in the southeastern portion of the unit. Currently, 51 private landowners own parcels within the unit, with high potential for further residential development. This analysis estimates **13 technical assistance efforts** within proposed critical habitat Unit 8, with seven being attributable to critical habitat designation.

3.2.1.(i) Unit 9

80. Unit 9 consists of 175 acres of State land owned by the University of Texas, San Antonio (UTSA). The Service anticipates **one technical assistance effort** regarding management concerns for the species and cave associated with the possible expansion of

UTSA on critical habitat lands.³² This technical assistance would likely occur absent critical habitat designation and is therefore an impact coextensive with the listing of the species.

³² Personal communication with Austin Field Office, Fish and Wildlife Service, September 26, 2002.

3.2.1.(j) Unit 10

81. No technical assistance efforts are anticipated within Unit 10.

3.2.1.(k) Unit 11

82. No technical assistance efforts are anticipated within Unit 11.

3.2.1.(l) Unit 12

83. Unit 12 of the proposed critical habitat area consists of lands that are subdivided for residential and commercial development. Currently, 159 private landowners own parcels within the unit. Roughly half of the subdivided lots have been developed with single family homes.³³ This analysis assumes that one landowner within the unit will develop an HCP associated with commercial development project(s) as detailed section 3.2.2. Therefore, of the remaining landowners, this analysis estimates **40 technical assistance efforts** within proposed critical habitat Unit 12, with 20 being attributable to critical habitat designation.

3.2.1.(m) Unit 13

84. Unit 13 of the proposed critical habitat area consists of large, mostly undeveloped tracts of land, along with smaller tracts developed with single family homes. Currently, 26 private landowners own parcels within the unit. Bulverde Road (a major roadway) bisects the western portion of the unit and the footprint of the cave spreads under this roadway. Unit 13 is likely to experience further residential development. Therefore, this analysis estimates **seven technical assistance efforts** within Unit 13, with four of these being attributable to critical habitat designation.

3.2.1.(n) Unit 14

85. Unit 14 of the proposed critical habitat area consists of a few large tracts of undeveloped woodland, mostly vacant ranch land with some agricultural lands. Currently, three private landowners own large parcels within the unit. One of the landholders is an investment firm that is likely to subdivide the land into parcels for residential development.³⁴ Therefore, this analysis estimates **one technical assistance effort** within proposed critical habitat Unit 14. This effort is conservatively attributed to critical habitat designation.

3.2.1.(o) Unit 15

³³ Personal communication with Austin Field Office, Fish and Wildlife Service, June 13, 2002.

³⁴ Personal communication with Austin Field Office, Fish and Wildlife Service, June 13, 2002.

86. The majority of the lands within Unit 15 are within a developed subdivision. Currently, 119 private landowners own parcels within the unit. Two large tracts of undeveloped land are located east of the subdivision. Several small roadways exist within the unit, but no major roadways. This analysis estimates **30 technical assistance efforts** within proposed critical habitat Unit 15, with 15 being attributable to critical habitat designation.

3.2.1.(p) Unit 16

87. Unit 16 is mostly undeveloped land with some developed residential lots on the eastern boarder of the unit. One major roadway runs through the unit. Currently, eight landowners own parcels of land within this unit. Because this unit is zoned for commercial use, this analysis assumes that one landowner within the unit will develop an HCP for commercial development project(s) as detailed in section 3.2.2. Therefore, of the remaining landowners, this analysis estimates **two technical assistance efforts** within proposed critical habitat Unit 16, with one being attributable to critical habitat designation.

88. TxDOT performs preventative maintenance on the major roadway. Although the road maintenance activities do not require a consultation, TxDOT may contact the FWS for technical assistance before undertaking maintenance activities within critical habitat boundaries. TxDOT's Odessa District personnel, indicate that they would likely contact FWS before engaging in maintenance activity in or near critical habitat as a precaution, even though it is not required by law.³⁵ Expected maintenance activities over the next ten year may include: (1) one standard sealant treatment to the road surface, (2) regular mowing for aesthetic purposes, and (3) annual ditch cleaning.³⁶ This analysis assumes that TxDOT will contact FWS regarding each of these maintenance activities on Loop 1604 once over the next ten years, resulting in **three technical assistance efforts**, all attributable to critical habitat.

3.2.1.(q) Unit 17

89. Unit 17 of the proposed critical habitat area consists of large, mostly undeveloped tracts of land. Currently, five private landowners own parcels within the unit. The largest parcel, including the one cave and surrounding area, is owned by one family. The family

³⁵ Personal communication with Public Information Officer, Texas Department of Transportation, Odessa District, February 26, 2002 in regard to development of an Economic Analysis of critical habitat designation for endangered invertebrates in southeastern New Mexico and western Texas. The District Environmental Coordinator in San Antonio was unsure of the protocol regarding road maintenance activities in critical habitat area and suggested contacting a regional TxDOT office with project experience in critical habitat areas; Personal communication with District Environmental Coordinator, Texas Department of Transportation, San Antonio, August 2, 2002.

³⁶ Personal communication with Director of Maintenance Section, Texas Department of Transportation Maintenance Division, Austin, Texas, March 21, 2002.

does not currently have any anticipated development plans for the land.³⁷ This analysis conservatively estimates **one technical assistance efforts** within proposed critical habitat Unit 17, this effort being attributable to critical habitat designation.

³⁷ Personal communication with Austin Field Office, Fish and Wildlife Service, June, 2002.

3.2.1.(r) Unit 18

90. The northern portion of Unit 18 in the proposed critical habitat area consists of large tracts of undeveloped wooded land that will likely be developed with single family homes. The southern portion is developed with residential lots. Currently, 35 landowners own parcels within Unit 18. Therefore, this analysis estimates **nine technical assistance efforts** within Unit 18, with five of these being attributable to critical habitat designation.

3.2.1.(s) Unit 19

91. The majority of land within Unit 19 is currently developed both residentially and commercially. Currently, six landowners own land parcels within Unit 19. This unit is entirely developed and, therefore, the land surface of the unit is excluded from critical habitat. Only the subsurface area is proposed for critical habitat designation. Surface vegetation within Unit 19 has been significantly reduced and degraded as a result of urban development. Lands within this unit do not contain the primary constituent element of a healthy surface community of native vegetation. Therefore, this unit is being designated as critical habitat based on the presence of an intact subsurface environment only. This analysis estimates **two technical assistance efforts**, with one of these being attributable to critical habitat designation.

3.2.1.(t) Unit 20

92. Unit 20 is entirely residentially developed and contains numerous local, and one major, roadways. The cave within this unit is the longest one in Bexar County.³⁸ Currently, 611 private landowners own parcels within proposed critical habitat Unit 20. Land surface of the unit is excluded from critical habitat. Similar to Unit 19, lands within Unit 20 do not contain the primary constituent element of a healthy surface community of native vegetation. Therefore, this unit is being designated as critical habitat based on the presence of an intact subsurface environment only. This analysis estimates **153 technical assistance efforts** within proposed critical habitat Unit 20, with 77 of these being attributable to critical habitat designation.

93. The cave within Unit 20 has a gated entrance and there are no current plans to develop the land on which the cave lies. Because the surface plant community has been degraded as a result of urban development, intensive management may be needed to provide nutrients and water to ensure the species' survival. However, TCMA currently manages this cave and has consulted with the Service through the Partners for Fish and Wildlife Program regarding cave management in the past.³⁹ Future technical assistance with TCMA are covered under the anticipated Section 7 informal consultations for Partners for Fish and

³⁸ Personal communication with Austin Field Office, Fish and Wildlife Service, June, 2002.

³⁹ Personal communication with Austin Field Office, Fish and Wildlife Service, September 26, 2002.

Wildlife as discussed in Section 3.2.3 of this analysis. Therefore, this analysis does not anticipate additional technical assistance for cave management within Unit 20.

3.2.1.(u) Unit 21

94. Unit 21 of the proposed critical habitat area consists of large tracts of undeveloped woodland, and several smaller tracts developed with single family homes. There is high potential for further residential development. Currently, 49 landowners own parcels within Unit 21. Because this unit is zoned for commercial use, this analysis assumes that one landowner within the unit will develop an HCP for commercial development project(s) as detailed in section 3.2.2. Therefore, of the remaining landowners, this analysis estimates **12 technical assistance efforts** within Unit 21, with six being attributable to critical habitat designation.

3.2.2 Anticipated Habitat Conservation Plans (HCPs) in Proposed Critical Habitat Area

95. Under Section 10(a)(1)(B) of the Endangered Species Act (ESA), a non-Federal entity (i.e., a landowner or local government) may develop an HCP in order to meet the conditions for issuance of an incidental take permit in connection with the development and management of a property.⁴⁰ The HCP intends to counterbalance potential harmful effects that a proposed activity may have on a species, while allowing the otherwise lawful activity to proceed. Statutory requirements for approval of an HCP depend on the species of concern and area subject to the development plan. The purpose of the habitat conservation planning process is to ensure that the effects of incidental take are adequately minimized and mitigated. As such, HCPs are generally developed to meet the requirements of section 10 of the Act, and thus the costs associated with HCPs are generally distinct from those associated with a designation.
96. However, stakeholders may assert a connection between the establishment of HCPs (and the costs these actions impose) and designation of critical habitat. For example, in some cases landowners may develop an HCP in order to have lands that are planned for development excluded from critical habitat designation. Such HCPs would be an effect of critical habitat designation because of the motivation to create them. Additionally, because the HCP process includes the issuance of a Federal permit (i.e., the incidental take permit), the Service is required to conduct an intra-agency (i.e., internal) section 7 consultation as part of the process. Such linkages make it necessary to clarify when and whether to incorporate HCP costs within a critical habitat economic analysis.
97. Therefore, although this analysis focuses on impacts that are solely related to Section 7 of the Act, consultations on HCPs and resulting project modification costs are included.

⁴⁰ U.S. Fish and Wildlife Service, "Endangered Species and Habitat Conservation Planning." From: <http://endangered.fws.gov/hcp/>, August 6, 2002.

The following provides general guidance regarding the inclusion of such costs in the critical habitat designation economic analysis:

- In cases in which an HCP existed prior to a proposed designation, the costs of developing the HCP and the added costs of management imposed by the HCP are not considered in a section 7 economic analysis. These costs are appropriately considered to be part of the regulatory baseline, as in the case of the La Cantera HCP.⁴¹
- In cases in which an HCP is proposed, or reasonably foreseeable, the administrative costs associated with that consultation should be included in the economic analysis of critical habitat. In addition, if, as a result of the designation of critical habitat, additional project modifications will be recommended by the Service and incorporated into the HCP in order to avoid adversely modifying critical habitat, the costs of these project modifications should also be included in the economic analysis of critical habitat.⁴²
- In cases in which development of one or more HCPs can be documented as being precipitated by critical habitat designation (i.e., to avoid designation or to reduce the costs of the designation), the costs of development of the HCP and the added costs of management imposed by the HCP should be included in the critical habitat economic analysis. In such cases the analysis should be presented with appropriate caveats as to the uncertainty regarding the extent to which the HCP would have existed absent critical habitat designation.

98. Because the Service is informing all landowners of the proposed designation through a notification letter, heightened awareness of the invertebrate species and their habitat is expected among landowners. While this may generate increased technical assistance efforts as enumerated in Section 3.2.1 of this analysis, it may also trigger an increased tendency to

⁴¹ See footnote 3.

⁴² Section 10(a)(2)(B) of the Act requires that for the issuance of an incidental take permit, the HCP must assure that "the taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild." According to the Service's *Habitat Conservation Planning and Incidental Take Permit Processing Handbook*, "the wording of this criterion is identical to the "jeopardy" definition under the section 7 regulations (50 CFR Part 402.02)...Congress was explicit about this link, stating in the Conference Report on the 1982 ESA amendments that the Services will determine whether or not to grant a permit, 'in part, by using the same standard as found in section 7(a)(2) of the ESA, as defined by the [Services'] regulations.'" (U.S. Department of the Interior and U.S. Department of Commerce, *Habitat Conservation Planning and Incidental Take Permit Processing Handbook*, November 4, 1996, obtained at <http://endangered.fws.gov/hcp/hcpbook.htm>). As a result, during the HCP process, actions undertaken to meet the jeopardy provision of section 7 are also required under section 10 of the Act and are therefore considered to be part of the baseline of the economic analysis.

develop HCPs among landowners. Accordingly, this analysis accounts for the possibility that future HCPs would be triggered by the critical habitat designation due to the sensitivity to the species and habitat inspired by the notification letter, and in some instances, to exclude project lands from critical habitat designation. To account for this affect, this analysis calculates the number of anticipated HCPs and the costs associated with their respective consultations and project modifications.

99. This analysis assumes that within critical habitat units containing lands zoned for commercial development, an HCP will be developed in connection with commercial development project(s). It should be noted, that because the critical habitat area is undergoing rapid development, it is possible that available lands within any unit may be purchased at a future date and re-zoned allowing commercial development. However, as there are no definitive current plans, such actions are viewed as speculative, and are not quantified in this analysis. Development of HCPs is anticipated in the following units zoned for commercial development within the proposed critical habitat area:

- Unit 1e,
- Unit 2,
- Unit 12,
- Unit 16, and
- Unit 21.

100. Units 1a, 1b, 1c, and 1d also are zoned for commercial development. However, as these lands lie within GCSNA, they are preserved by TPWD and will not develop an HCP associated with commercial development.⁴³ Additionally, Units 19 and 20 are zoned for commercial development. In these cases, the land surface of these units is entirely developed, making creation of an HCP unlikely. Exhibit 3-1 summarizes the anticipated HCPs by unit in the critical habitat area. Project modifications likely to be recommended for HCPs are detailed in Section 4.2.1 of this analysis.

3.2.3 Partners for Fish and Wildlife (PFW) Conservation Projects

101. Partners for Fish and Wildlife (PFW) is a voluntary partnership program with landowners interested in restoring wetlands and other important fish and wildlife habitats on their own lands. The program provides various types of support ranging from technical assistance to private landowners through voluntary cooperative agreements, to funding restoration projects on private lands. Voluntary habitat restoration on private lands usually involves dollar-for-dollar cost share through working with private landowners and Federal,

⁴³ Personal communication with Austin Fish and Wildlife Office, October, 2002.

State, and local entities. Landowners sign agreements to keep the restoration projects for the life of the agreement and otherwise retain full control of their land.⁴⁴

102. The Service is planning to seek private landowners within the critical habitat to participate in the PFW program to restore karst regions. The Service hopes to implement one to two restoration projects per year on private lands. Therefore, this analysis makes a conservative assumption that ten to 20 restoration projects will take place within the next ten years.⁴⁵ Since the projects are funded and/or carried out by the Service, internal consultation will take place for each project. Because these projects will be beneficial to the nine invertebrates and their caves, no major issues and/or project modifications are expected. As such, the internal consultations are likely to be informal. Therefore, **ten to 20 informal consultations** are expected within the next ten years.

3.2.4 Camp Bullis Karst Management Plan

103. About half of Unit 10, and all of Unit 11 fall within lands owned and operated by the Department of Defense's (DOD) Camp Bullis. This installation supports medical emergency field training and military maneuvers training. The area is not extensively developed, containing some small buildings and roads. Critical habitat area, and caves on the installation lands, are monitored and managed by the Camp Bullis Environmental Office. The main activities on the proposed critical habitat lands within Camp Bullis are firing range training, and field navigation exercises. The land around the firing range has been clear cut, whereas the land used for navigation training maintains native vegetation. Impervious cover, land surface incapable of being penetrated, at Camp Bullis is less than one percent.⁴⁶
104. The Sikes Act Improvements Act (SAIA) of 1997 requires military installations to prepare and implement an Integrated Natural Resources Management Plan (INRMP). The purpose of the INRMP is to provide for:

the conservation and rehabilitation of natural resources on military installations;

the sustainable multipurpose use of the resources, which shall include hunting, fishing, trapping, and nonconsumptive uses; and

⁴⁴ U.S. Fish & Wildlife Service, Partners for Fish and Wildlife Program. Accessed at <http://www.fws.gov>, July 2002.

⁴⁵ Personal communication with Austin Field Office, Fish and Wildlife Service, July 2002.

⁴⁶ Veni and Associates, 1999.

subject to safety requirements and military security, public access to military installations to facilitate the use of the resources.⁴⁷

Each military installation that supports listed species or critical habitat lands consults with the Service on its INRMP.

105. On November 18, 2001, Camp Bullis' INRMP was approved and adopted by the installation.⁴⁸ In addition, in anticipation of the listing of the nine karst invertebrates, the military installation submitted a karst management plan for review on September 30, 1999 with the goal of developing "...a management plan to conserve the species of concern to meet or exceed the standards recommended by the USFWS for the recovery of listed species and/or the preclusion of the listing."⁴⁹ The Service provided a comment letter regarding the proposed plan on July 10, 2000. The comment letter provides recommendations for modifications to the plan that are necessary to ensure that the management protocol for the karst species will provide at least as much protection to the species as a critical habitat designation. The Service anticipates **one informal consultation** for review of a redraft of Camp Bullis' proposed karst management plan.⁵⁰ No project modifications are expected to be proposed as part of the informal consultation as all recommendations were made in the comment letter regarding the initial draft karst management plan.⁵¹ This karst management plan will eventually be integrated into the current INRMP.⁵² Upon implementation of a karst management plan that meets the approval of both the Service and the Department of Defense, Camp Bullis lands may be excluded from critical habitat designation.⁵³

3.2.5__Loop 1604 Expansion⁵⁴

⁴⁷ "Sikes Act Improvement Act of 1997." From <http://www.denix.osd.mil/denix/Public/ES-Programs/Conservation/Laws/sikesamend.html>, August 5, 2002.

⁴⁸ Personal communication with Directorate of Safety, Environment, and Fire, Camp Bullis, June 26, 2002.

⁴⁹ Veni and Associates, 1999.

⁵⁰ Personal communication with Austin Field Office, Fish and Wildlife Service, August 6, 2002.

⁵¹ Personal communication with Austin Field Office, Fish and Wildlife Service, July, 2002.

⁵² Personal communication with Directorate of Safety, Environment, and Fire, Camp Bullis, June 26, 2002.

⁵³ Personal communication with Austin Field Office, Fish and Wildlife Service, July 10, 2002.

⁵⁴ Personal communication with personnel from Texas Department of Transportation, June 25, 2002.

106. Loop 1604, a two-lane roadway encircling the San Antonio metropolitan area, runs through Unit 16, bisecting the eastern half of the unit. This major roadway is maintained by TxDOT. Currently TxDOT is in the process of expanding 1604, adding two additional lanes to a portion of the loop with the goal of alleviating the heavy traffic in the area. The area of expansion begins at the intersection of 1604 and Road 471, and extends to the intersection of 1604 and Route 90. The road development is currently in its initial phase of construction. TxDOT estimates that it will be completed in two to five years.
107. As the expansion of Loop 1604 is partially funded by the Federal Highway Administration (FHA), the Service has conducted an informal consultation regarding the project and the endangered karst invertebrates. However, the Service is currently addressing possible discrepancies between the scope and effects of the project described under the initial informal consultation and the actual construction activities in process. Specifically, the Service is concerned that the road expansion is disturbing a larger area than previously described and approved through the initial informal consultation. As a result, the Service anticipates that the consultation may be reinitiated, resulting in **a formal consultation**.⁵⁵ Expected recommendations for project modifications are detailed in Section 4.2.2 of this analysis.
108. Within the next ten years, TxDOT is planning to do additional upgrading of this section of Loop 1604 by adding frontage roads, extra roads used to approach and exit the loop, and interchanges. This development would involve further expansion of the roadway footprint, and therefore the possibility of greater disturbance to Caracol Creek Coon Cave and/or its primary constituent elements (i.e., the surface vegetative community). As a result, the Service anticipates this project will require **one additional formal consultation**.

3.3 Summary of Results

109. Exhibit 3-1 summarizes the potential for consultations and other activities affecting the proposed critical habitat designation for the nine endangered karst invertebrates in Bexar County, Texas. These estimates reflect the total consultation and technical assistance profiles associated with the proposed designation, regardless of whether these consultations or assistance calls can be attributed co-extensively to the listing of these species. As a result, these estimates reflect an upper-bound measure of impact likely to be associated with this designation.

⁵⁵ Personal communication with Austin Field Office, Fish and Wildlife Service, July 2002.

Exhibit 3-1						
UPPER-BOUND ESTIMATE OF TOTAL CONSULTATIONS AND TECHNICAL ASSISTANCE EFFORTS AFFECTING PROPOSED CRITICAL HABITAT FOR THE NINE BEXAR COUNTY KARST INVERTEBRATES OVER A TEN YEAR TIME HORIZON						
Unit	Landowner or Manager	Current or Future Activities	Federal Nexus	Technical Assistance	Formal Consultations	Informal Consultations
1a-1e	GCSNA	Review of Master Plan	none	1	0	0
	Private Landowners	Communication with Service	none	1	0	0
	Private Landowners	HCP	FWS	0	1	0
2	Private Landowners	Communication with Service	none	4	0	0
	Private Landowners	HCP	FWS	0	1	0
3	Private Landowners	Communication with Service	none	9	0	0
4	Private Landowners	Communication with Service	none	12	0	0
5	Private Landowners	Communication with Service	none	4	0	0
6	Private Landowners	Communication with Service	none	2	0	0
7	Private Landowners	Communication with Service	none	5	0	0
8	Private Landowners	Communication with Service	none	13	0	0
9	Private Landowners	Communication with Service	none	1	0	0
10-11	Camp Bullis	Review of Karst Management Plan	Department of Defense	0	0	1
12	Private Landowners	Communication with Service	none	40	0	0
	Private Landowners	HCP	FWS	0	1	0
13	Private Landowners	Communication with Service	none	7	0	0
14	Private Landowners	Communication with Service	none	1	0	0
15	Private Landowners	Communication with Service	none	30	0	0
16	TxDOT	Roadway expansions	FHA	0	2	0
	TxDOT	Road maintenance	none	3	0	0

Exhibit 3-1						
UPPER-BOUND ESTIMATE OF TOTAL CONSULTATIONS AND TECHNICAL ASSISTANCE EFFORTS AFFECTING PROPOSED CRITICAL HABITAT FOR THE NINE BEXAR COUNTY KARST INVERTEBRATES OVER A TEN YEAR TIME HORIZON						
Unit	Landowner or Manager	Current or Future Activities	Federal Nexus	Technical Assistance	Formal Consultations	Informal Consultations
	Private Landowners	Communication with Service	none	2	0	0
	Private Landowners	HCP	FWS	0	1	0
17	Private Landowners	Communication with Service	none	1	0	0
18	Private Landowners	Communication with Service	none	9	0	0
19	Private Landowners	Communication with Service	none	2	0	0
20	Private Landowners	Communication with Service	none	153	0	0
21	Private Landowners	Communication with Service	none	12	0	0
	Private Landowners	HCP	FWS	0	1	0
Multiple Units	Private Landowners	Land management/Partners for Fish and Wildlife	FWS	0	0	20
TOTAL				312	7	21

**ESTIMATED COSTS OF THE DESIGNATION OF CRITICAL HABITAT
FOR THE NINE KARST INVERTEBRATES IN
BEXAR COUNTY, TEXAS**

SECTION 4

110. This section presents the expected total economic cost of actions taken under section 7 of the Act associated with the proposed critical habitat designation for the nine karst invertebrates over the next ten years. This section presents high end and low end cost estimates of the technical assistance efforts, consultations, and project modifications that are likely to result from the designation of critical habitat and/or the listing as outlined in the previous section. Based on these estimates, upper bound and lower bound total cost estimates are derived.

111. This report assesses the economic impacts that may be associated with activities affecting the proposed critical habitat area. The listing of these nine invertebrates as endangered under the Act may impact land use activities in ways that are not associated with section 7. For example, section 9 of the Act prohibits take of an endangered species, and section 10 outlines permitting procedures for entities without a Federal nexus. Economic costs associated exclusively with these impacts are not included in this analysis as they are distinctly attributable to the listing and are therefore separable from critical habitat impacts. However, circumstances may exist where a section 9 or 10 consultation may be precipitated in part, or entirely, by the designation of critical habitat in an area (i.e., HCPs are developed in order to avert inclusion in critical habitat designation). In such cases, this analysis conservatively attributes these costs to critical habitat. For example, although HCPs are developed under Section 10(a)(1)(B) of the Act, this analysis includes the costs of HCP consultations as an impact of designation of critical habitat under the assumption that these consultations are triggered by the designation as described in Section 3.2.2.

4.1 Estimated Costs of Consultations and Technical Assistance

112. Estimates of the cost of an individual consultation were developed from a review and analysis of historical section 7 files from a number of Service field offices around the country. These files addressed consultations conducted for both listings and critical habitat designations. Cost figures were based on an average level of effort for consultations of low,

medium, or high complexity, multiplied by the appropriate labor rates for staff from the Service and other Federal agencies.

113. Estimates take into consideration the level of effort of the Service, the Action agency, and the applicant during both formal and informal consultations, as well as the varying complexity of consultations. Costs associated with these consultations include the administrative costs associated with conducting the consultation, such as the cost of time spent in meetings, preparing letters, and the development of a biological opinion.
114. Per-effort costs associated with formal consultations, informal consultations, and technical assistance calls are presented in Exhibit 4-1.

Exhibit 4-1				
ESTIMATED ADMINISTRATIVE COSTS OF CONSULTATION AND TECHNICAL ASSISTANCE EFFORTS FOR THE NINE INVERTEBRATES (PER EFFORT)				
Critical Habitat Impact	Scenario	Service	Action Agency	Third Party
Technical Assistance Effort	<i>Low</i>	\$260	n/a	\$600
	<i>High</i>	\$680	n/a	\$1,500
Informal Consultation <u>without</u> 3 rd party	<i>Low</i>	\$1,000	\$1,300	n/a
	<i>High</i>	\$3,100	\$7,900 ^o	n/a
Informal Consultation <u>with</u> 3 rd party (Internal)	<i>Low</i>	\$1,000	n/a	\$1,200
	<i>High</i>	\$3,100	n/a	\$6,900 ^o
Formal Consultation <u>with</u> 3 rd party	<i>Low</i>	\$3,100	\$3,900	\$6,900 ^o
	<i>High</i>	\$6,100	\$6,500	\$9,700 ^o
Formal Consultation <u>with</u> 3 rd party (Internal)	<i>Low</i>	\$3,100	n/a	\$6,900 ^o
	<i>High</i>	\$6,100	n/a	\$9,700 ^o
<p><u>Sources:</u> IEC analysis based on data from the Federal Government General Schedule Rates, 2002, Office of Personnel Management, 2002, and level of effort information from U.S. Fish and Wildlife Service, Austin, TX Field Office.</p> <p><u>Notes:</u> Low and high estimates primarily reflect variations in staff wages and level of effort. Technical assistance calls also have educational benefits to the landowner or manager and to the Service.</p> <p>^o Includes a Biological Assessment, ranging in cost depending on the level of effort.</p>				

115. Exhibit 4-2 presents estimates of the total expected consultation costs associated with activities affecting the proposed critical habitat for these nine invertebrates. The cost estimates were calculated by multiplying the number of expected consultations or technical assistance calls (shown in Exhibit 3-1) by the per effort cost of these actions. Based on this analysis, the estimated total administrative Section 7 costs for these nine invertebrates range from \$392,000 to \$1,010,000. The Service is expected to incur costs of \$124,000 to

\$320,000 with other Federal agencies incurring costs of \$9,100 to \$20,900. Costs to the State, local, and private entities may range from \$260,000 to \$674,000.

Exhibit 4-2					
UPPER-BOUND ESTIMATE OF ADMINISTRATIVE CONSULTATION AND TECHNICAL ASSISTANCE COSTS ASSOCIATED WITH CRITICAL HABITAT FOR THE NINE INVERTEBRATES (TEN YEARS)					
Action	Range	Costs to the Service	Costs to Action Agencies	Costs to Third Parties	Total Costs
Technical Assistance	<i>Low</i>	\$81,100	n/a	\$187,000	\$268,000
	<i>High</i>	\$212,000	n/a	\$468,000	\$680,000
Informal Consultation	<i>Low</i>	\$1,000	\$1,300	n/a	\$2,300
	<i>High</i>	\$3,100	\$7,900	n/a	\$11,000
Informal Consultation (Internal w/ Third Party)	<i>Low</i>	\$20,000	n/a	\$24,000	\$44,000
	<i>High</i>	\$62,000	n/a	\$138,000	\$200,000
Formal	<i>Low</i>	\$6,200	\$7,800	\$13,800	\$27,800
	<i>High</i>	\$12,200	\$13,000	\$19,400	\$44,600
Formal (Internal)	<i>Low</i>	\$15,500	n/a	\$34,500	\$50,000
	<i>High</i>	\$30,500	n/a	\$48,500	\$79,000
Total	<i>Low</i>	\$124,000	\$9,100	\$260,000	\$392,000
	<i>High</i>	\$320,000	\$20,900	\$674,000	\$1,010,000
<p><u>Sources:</u> IEC analysis based on data from the Federal Government General Schedule Rates, 2002, Office of Personnel Management, 2002, and information from biologists in the U.S. Fish and Wildlife Service, Austin, TX Office.</p> <p><u>Note:</u> Third parties are defined as State agencies, local municipalities, and private parties. Figures have been rounded to three significant digits and are reported in 2002 dollars. Subtotals may not sum to the total value due to rounding.</p>					

4.2 Estimated Number and Costs of Project Modifications

116. This analysis provides estimates of the number and cost of several types of project modifications that are likely to occur as a result of critical habitat designation for these invertebrate species. In order to understand the types of project modifications that might be imposed as a result of this designation, this analysis largely relies on a recent Habitat Conservation Plan (HCP) completed for an incidental take of three of the nine invertebrates in San Antonio, Bexar County and past consultations on these species.

4.2.1 Modifications Resulting from HCPs (multiple units)

117. As described in Section 3.2.2 of this analysis, approximately five private landowners are expected to complete HCPs. Although the extent of the proposed project modifications will depend on factors such as the population and distribution of the species affected and the size of the geographic area disturbed, the *nature* of modifications is expected to be similar for all HCPs as the species depend upon the same primary constituent elements. As such, possible project modifications and their costs for each HCP include, but are not limited to the following:⁵⁶

- 1) **Outreach and Research Programs.** Monetary contributions toward outreach efforts and further research may be recommended for the purpose of raising awareness, understanding and appreciation for the invertebrate species in Bexar County, and for aiding karst fauna conservation in the area. This potential project modification is estimated to cost approximately \$35,000 for the next ten years.
- 2) **Creation of On-site and/or off-site Preserves.** In order to sustain populations of the species affected by the take permit(s), the Service may request that on-site and off-site preserves be acquired and maintained in perpetuity. An example of an on-site preserve is a strategically delineated area within the development project lands that is to be left undisturbed and maintained. Off-site preserves may include lands that encompass portions of a cave's footprint known to host the affected species, and necessary to sustain a viable population, and the surrounding features essential for a healthy karst ecosystem. This analysis conservatively estimates that the Service may request 180 acres of karst region be preserved under an HCP. Based on a recent HCP completed by La Cantera, purchasing open space land in and/or near karst region in Bexar County, preserves are likely to cost approximately \$17,318 per acre.⁵⁷ As such, purchasing off-site preserves may cost about \$3.1 million.
- 3) **Karst Preserve Management and Monitoring.** The Service is likely to recommend active management of preserves to ensure adequate sources for nutrition, protection from vandalism, over-visitation, contamination and viable surface native plant community. In order to achieve these objectives, several management activities may be recommended. Such provisions may include:
 - Routine inspections;
 - Vegetation/Habitat management;
 - Fire ant control;

⁵⁶ These activities and associated costs are based on information from a recent HCP completed by La Cantera Development Company for a take permit of three of the invertebrate species as necessary for the development and operation of its 1000-acre property; see footnote 3.

⁵⁷ Personal communication with La Cantera Development Company, October 2002.

- Fencing, signage, and access point maintenance;
- Cave-access gating;
- Control of mammals;
- Setting protocol for foreseeable threats;
- Controlling use of fertilizers, herbicides or pesticides; presence of certain animals and motorized vehicles; public access; etc.; and
- Monitoring.

These management activities, together, may cost approximately \$380,000 for the next ten years. In addition, management costs for mitigation lands will continue beyond the ten year time horizon. These costs are estimated to be \$38,000 per year for each HCP.

As noted above, this cost estimate relies on a recent HCP for La Cantera property that covers take permits for three invertebrate species and disturbance of their caves in the area. Costs associated with each type of project modification would depend on the number of affected species, the number of existing caves thought to contain the species, and the size of the designated preserves. Therefore, the actual costs of each HCP may be less or greater than the cost estimated above. However, the distinct circumstances of each individual development project makes it difficult to forecast the number of species, and their associated caves that might be affected by any one private developer. As such, this analysis assumes that all future HCPs would impose commensurate costs.

4.2.2 Potential Project Modifications for Road Expansion and Upgrade (Unit 16)

118. TxDOT is expanding loop 1604 that cuts through Unit 16. As discussed earlier, the Service is concerned that this activity may be disturbing an area closer to the cave than originally anticipated. Moreover, TxDOT is also planning to upgrade this part of the loop upon completion of the expansion project. This upgrade is likely to involve an incidental take permit for direct disturbance of the cave. Although the expansion and upgrade of the loop are considered two separate projects, they will impact the same species and its cave. Therefore, for the purpose of this analysis, possible project modifications for the two separate projects are considered together. Based on the past consultation regarding a new highway project in Travis and Williams County, Texas, that involved similar activities and impacts to the invertebrate species as the road expansion and upgrade in Unit 16, the following project modifications and their associated costs are expected.⁵⁸

⁵⁸ Memorandum to Federal Highway Administration from Supervisor, U.S. Fish and Wildlife Service, Austin Office, February 21, 2001.

- 1) **Karst Preserve.** As discussed above, on-site and off-site preserves may be required to be managed in perpetuity in order to sustain populations of the species affected by the take permit. Approximately 160 acres of karst region may need to be purchased and managed as karst preserves. Based on a recent HCP completed by La Cantera, purchasing open space land in and/or near karst region in Bexar County, preserves are likely to cost approximately \$17,318 per acre.⁵⁹ As such, purchasing off-site preserves may cost about \$2.8 million.
- 2) **Karst preserve management and monitoring.** Management activities for the karst preserve are expected to be similar to those discussed under Section 4.2.1. As such, similar costs are also expected for management of the preserve—i.e., \$380,000 for the next ten years.
- 3) **Right-of-way maintenance.** In addition to managing karst preserve, TxDOT may need to maintain and manage right-of-way areas within 200 meters of the proposed karst preserve. This may involve controlling invasive nonnative species and implementing fire ant control in the area. In essence, maintaining and managing a right-of-way would involve activities similar to managing and monitoring karst preserve. Therefore, this project modification is likely to involve a cost similar to that of managing and monitoring karst preserve. As such, maintaining right-of-way may also cost approximately \$380,000 for the next ten years.
- 4) **Storm water quality protection.** The Service is likely to recommend installing the best available storm water runoff sedimentations and filtration basins and traps for hazardous material to protect water quality from runoff. Costs of installing such water treatment facilities would depend on various factors such as the topography of the location, whether the construction area is on the recharge zone, and the gradient of the area. However, various regulations and programs protecting the Edwards Aquifer already require strict water quality protection for any activities on the aquifer's recharge, contributing, transition, and artesian zones (see Chapter 2, section 2.2.1 for more details on this baseline protection). Since Unit 16 lies on the artesian zone, these regulations and programs would already impose strict standards on TxDOT to protect water quality during the construction. Therefore, costs associated with this project modification are baseline costs, and as such not attributable to the listing or the proposed critical habitat designation. Therefore, this analysis does not estimate possible costs for this particular project modification.
- 5) **Construction control and monitoring.** Qualified geologists or geohydrologists as well as biologists may need to be present to ensure detection of any caves, karst features, or subterranean holes during any land clearing or excavation in areas known to contain any of the invertebrate species, or highly likely to have suitable habitat for the species. However, because the karst features of the project area are already well known and explored, encountering unknown caves or karst features is unlikely.

⁵⁹ Personal communication with La Cantera Development Company, October, 2002.

Therefore, no additional costs are expected from this particular project modification.

4.2.3 Summary of Project Modification Costs

119. Exhibit 4-3 presents estimates of per effort and total project modification costs associated with activities affecting the proposed critical habitat. The cost estimates were calculated by multiplying the number of anticipated consultations likely to require modifications by the per effort cost of these actions. This analysis assumes that 1) 100 percent of formal consultations for HCPs will require modifications (five consultations); 2) the formal consultation for expanding and upgrading a portion of Loop 1604 will lead to modifications; and 3) all other consultations—i.e., an informal consultations for Camp Bullis' Karst Management Plan and PFW-funded conservation projects—will not involve modifications. Based on this analysis, the upper-bound total cost of modifications for projects affecting these nine invertebrates is estimated at \$21,100,000 for units 1e, 2, 12, 16 and 21, \$17,600,000 of this is attributable solely to the critical habitat designation for the species. No project modifications are anticipated in the remaining units.

Exhibit 4-3				
ESTIMATED ECONOMIC COSTS ASSOCIATED WITH POTENTIAL PROJECT MODIFICATIONS (PER EFFORT AND TOTAL OVER TEN YEARS)				
Unit	Affected Activity	Possible Project Modifications	Per Effort	Total
1e	Private Development HCP (1)	Outreach and research	\$35,000	\$35,000
		Purchasing karst preserves	\$3,100,000	\$3,100,000
		Karst preserve management	\$380,000	\$380,000
2	Private Development HCP (1)	Outreach and research	\$35,000	\$35,000
		Purchasing karst preserves	\$3,100,000	\$3,100,000
		Karst preserve management	\$380,000	\$380,000
12	Private Development HCP (1)	Outreach and research	\$35,000	\$35,000
		Purchasing karst preserves	\$3,100,000	\$3,100,000
		Karst preserve management	\$380,000	\$380,000
16	Road Expansion	Purchasing karst preserve	\$2,800,000	\$2,800,000
		Karst preserve management	\$380,000	\$380,000
		Right-of-way maintenance	\$380,000	\$380,000
	Private Development HCP (1)	Outreach and research	\$35,000	\$35,000
		Purchasing karst preserves	\$3,100,000	\$3,100,000
		Karst preserve management	\$380,000	\$380,000

Unit	Affected Activity	Possible Project Modifications	Per Effort	Total
21	Private Development HCP (1)	Outreach and research	\$35,000	\$35,000
		Purchasing karst preserves	\$3,100,000	\$3,100,000
		Karst preserve management	\$380,000	\$380,000
Total Project Modification Costs		Unit 1e		\$3,520,000
		Unit 2		\$3,520,000
		Unit 12		\$3,520,000
		Unit 16		\$7,080,000
		Unit 21		\$3,520,000
<p><u>Source:</u> Based on IEC review of La Cantera Development Company HCP (October, 2001); and biological opinions regarding the nine invertebrate species in Bexar County, Travis County and William County, TX; and personal communication with La Cantera Development Company.</p> <p><u>Note:</u> Estimates are rounded to three significant figures, and therefore may not add up due to rounding.</p>				

4.2.4 Data Limitations

120. Because of the difficulty generating estimates of potential modifications to specific projects on a case-by-case basis, this analysis models modifications after average or "typical" projects likely to affect the proposed critical habitat of these invertebrate species. Actual modification costs are likely to vary according to the specific characteristics of individual projects and consultation outcomes.

4.3 Total Section 7 Costs Associated with Designation of Critical Habitat

121. The cost estimates presented in Exhibit 4-4 are a function of the estimated number of technical assistance efforts, consultations, and project modifications associated with activities affecting the proposed critical habitat for these invertebrate species, along with the per effort costs outlined above. Based on this analysis, the total section 7 costs associated with the proposed critical habitat designation for these invertebrate species may range from \$21,500,000 to \$22,100,000 over ten years, representing about 0.06 percent of the total annual personal income of Bexar County residents in 2000.

Exhibit 4-4							
SUMMARY OF SECTION 7 COSTS FOR THE NINE INVERTEBRATE SPECIES (TEN YEARS)							
Unit	Critical Habitat Impacts	Range	Costs to the Service	Costs to the Action Agency	Costs to Third Parties	Total Section 7 Costs	Costs Associated Solely with Critical Habitat Designation
1a-1e	Technical assistance	Low	\$520	n/a	\$1,200	\$1,720	\$860
		High	\$1,360	n/a	\$3,000	\$4,360	\$2,180
	Formal consultations	Low	\$3,100	n/a	\$6,900	\$10,000	\$10,000
		High	\$6,100	n/a	\$9,700	\$15,800	\$15,800
	Project modifications	Low	n/a	n/a	\$3,520,000	\$3,520,000	\$3,520,000
		High	n/a	n/a	\$3,520,000	\$3,520,000	\$3,520,000
2	Technical assistance	Low	\$1,040	n/a	\$2,400	\$3,440	\$1,720
		High	\$2,720	n/a	\$6,000	\$8,720	\$4,360
	Formal consultations	Low	\$3,100	n/a	\$6,900	\$10,000	\$10,000
		High	\$6,100	n/a	\$9,700	\$15,800	\$15,800
	Project modifications	Low	n/a	n/a	\$3,520,000	\$3,520,000	\$3,520,000
		High	n/a	n/a	\$3,520,000	\$3,520,000	\$3,520,000
3	Technical assistance	High	\$2,340	n/a	\$5,400	\$7,740	\$4,300
		Low	\$6,120	n/a	\$13,500	\$19,600	\$10,900
4	Technical assistance	Low	\$3,120	n/a	\$7,200	\$10,300	\$5,160
		High	\$8,160	n/a	\$18,000	\$26,200	\$13,100
5	Technical assistance	Low	\$1,040	n/a	\$2,400	\$3,440	\$1,720
		High	\$2,720	n/a	\$6,000	\$8,720	\$4,360
6	Technical Assistance	Low	\$520	n/a	\$1,200	\$1,720	\$860
		High	\$1,360	n/a	\$3,000	\$4,360	\$2,180
7	Technical assistance	Low	\$1,300	n/a	\$3,000	\$4,300	\$2,580
		High	\$3,400	n/a	\$7,500	\$10,900	\$6,540
8	Technical assistance	Low	\$3,380	n/a	\$7,800	\$11,200	\$6,020
		High	\$8,840	n/a	\$19,500	\$28,300	\$15,300
9	Technical assistance	Low	\$260	n/a	\$600	\$860	\$0
		High	\$680	n/a	\$1,500	\$2,180	\$0

Exhibit 4-4							
SUMMARY OF SECTION 7 COSTS FOR THE NINE INVERTEBRATE SPECIES (TEN YEARS)							
Unit	Critical Habitat Impacts	Range	Costs to the Service	Costs to the Action Agency	Costs to Third Parties	Total Section 7 Costs	Costs Associated Solely with Critical Habitat Designation
10-11	Informal consultation	Low	\$1,000	\$1,300	n/a	\$2,300	\$0
		High	\$3,100	\$7,900	n/a	\$11,000	\$0
12	Formal consultation	Low	\$3,100	n/a	\$6,900	\$10,000	\$10,000
		High	\$6,100	n/a	\$9,700	\$15,800	\$15,800
	Technical assistance	Low	\$10,400	n/a	\$24,000	\$34,400	\$17,200
		High	\$27,200	n/a	\$60,000	\$87,200	\$43,600
	Project modifications	Low	n/a	n/a	\$3,520,000	\$3,520,000	\$3,520,000
		High	n/a	n/a	\$3,520,000	\$3,520,000	\$3,520,000
13	Technical assistance	Low	\$1,820	n/a	\$4,200	\$6,020	\$3,440
		High	\$4,760	n/a	\$10,500	\$15,300	\$8,720
14	Technical Assistance	Low	\$260	n/a	\$600	\$860	\$860
		High	\$680	n/a	\$1,500	\$2,180	\$2,180
15	Technical assistance	Low	\$7,800	n/a	\$18,000	\$25,800	\$12,900
		High	\$20,400	n/a	\$45,000	\$65,400	\$32,700
16	Formal consultations	Low	\$9,300	\$7,800	\$20,700	\$37,800	\$10,000
		High	\$18,300	\$13,000	\$29,100	\$60,400	\$15,800
	Technical assistance	Low	\$780	n/a	\$1,800	\$2,580	\$3,440
		High	\$2,040	n/a	\$4,500	\$6,540	\$8,720
	Project modifications	Low	n/a	n/a	\$7,080,000	\$7,080,000	\$3,520,000
		High	n/a	n/a	\$7,080,000	\$7,080,000	\$3,520,000
17	Technical Assistance	Low	\$260	n/a	\$600	\$860	\$860
		High	\$680	n/a	\$1,500	\$2,180	\$2,180
18	Technical assistance	Low	\$2,340	n/a	\$5,400	\$7,740	\$4,300
		High	\$6,120	n/a	\$13,500	\$19,600	\$10,900
19	Technical assistance	Low	\$520	n/a	\$1,200	\$1,720	\$860
		High	\$1,360	n/a	\$3,000	\$4,360	\$2,180
20	Technical Assistance	Low	\$39,800	n/a	\$91,800	\$132,000	\$66,200
		High	\$104,000	n/a	\$230,000	\$334,000	\$168,000
21	Formal consultations	Low	\$3,100	n/a	\$6,900	\$10,000	\$10,000

Exhibit 4-4							
SUMMARY OF SECTION 7 COSTS FOR THE NINE INVERTEBRATE SPECIES (TEN YEARS)							
Unit	Critical Habitat Impacts	Range	Costs to the Service	Costs to the Action Agency	Costs to Third Parties	Total Section 7 Costs	Costs Associated Solely with Critical Habitat Designation
		<i>High</i>	\$6,100	n/a	\$9,700	\$15,800	\$15,800
	Technical assistance	<i>Low</i>	\$3,120	n/a	\$7,200	\$10,300	\$5,160
		<i>High</i>	\$8,160	n/a	\$18,000	\$26,200	\$13,100
	Project modifications	<i>Low</i>	n/a	n/a	\$3,520,000	\$3,520,000	\$3,520,000
		<i>High</i>	n/a	n/a	\$3,520,000	\$3,520,000	\$3,520,000
Multiple Units	Informal consultations	<i>Low</i>	\$20,000	n/a	\$24,000	\$44,000	\$0
		<i>High</i>	\$62,000	n/a	\$138,000	\$200,000	\$0
All	Total Costs	<i>Low</i>	\$124,000	\$9,100	\$21,400,000	\$21,500,000	\$17,800,000
		<i>High</i>	\$320,000	\$20,900	\$21,800,000	\$22,100,000	\$18,000,000
All	Present value (7% discount rate) of first ten years				<i>Low</i>	\$15,100,000	\$12,500,000
					<i>High</i>	\$15,600,000	\$12,600,000
All	Annualized				<i>Low</i>	\$2,150,000	\$1,780,000
					<i>High</i>	\$2,210,000	\$1,800,000
All	Present value (3% discount rate) of first ten years				<i>Low</i>	\$18,400,000	\$15,200,000
					<i>High</i>	\$18,900,000	\$15,400,000
All	Annualized				<i>Low</i>	\$2,150,000	\$1,780,000
					<i>High</i>	\$2,210,000	\$1,800,000
Units 1e, 2, 12, 16, 21	Present value of management costs for mitigation lands years 11 and beyond (7% discount rate)					\$1,550,000	\$1,550,000
Units 1e, 2, 12, 16, 21	Present value of management costs for mitigation lands years 11 and beyond (3% discount rate)					\$5,490,000	\$5,490,000
<u>Source:</u> Based on past consultation records and conversations with Federal agencies potentially affected by the proposed critical habitat designation.							
<u>Notes:</u> Estimates may not add up due to rounding. Figures have been rounded to three significant digits and are reported in 2002 dollars.							

122. Exhibit 4-4 summarizes cost estimates for anticipated Section 7 impacts per unit. The cost of critical habitat designation is expected to be approximately 81 percent of the total Section 7 costs. Approximately 99 percent of the Section 7 costs are expected to be borne by third parties. This is due to the estimated cost of project modifications resulting from the development of Habitat Conservation Plans as discussed in Section 4.2.1, particularly the costly purchasing of mitigation lands. As previously stated, the costs of project

modifications represent an upper bound as they are based on project modification costs from a large commercial development project.⁶⁰ Not all of these project modifications will necessarily be recommended for all HCPs throughout the critical habitat area.

4.4 Economic Impacts Associated Solely with the Designation of Critical Habitat

123. The cost estimates presented under "Total Section 7 Costs" in Exhibit 4-4 are an indication of the total costs that may be associated with the designation of critical habitat over the next ten years, including protections pursuant to the listing of the species under the Act. All formal and informal consultations with Federal and State agencies are expected to occur even absent critical habitat for the following reasons:

- The Service has been working closely with Camp Bullis on various issues related to endangered species within the boundaries of the camp, including initial review of the Karst Management Plan. Moreover, the Service has already anticipated review of the Karst Management Plan and would have conducted an informal consultation on the review regardless of critical habitat designation.
- For PFW conservation projects, the Service would be consulting itself (internal consultation), and no project modifications are expected from these consultations. Since the Service is likely to be seek out participants for this program because of the direct benefit to the species, these consultations would have taken place even absent critical habitat designation.
- TxDOT has already been working with the Service in initiating a consultation for the first phase of the road expansion project in Unit 16. Based on the past behavior of TxDOT and the on-going relationship of the two agencies, future formal consultations for the project would take place even absent critical habitat. Moreover, because the project will be directly near and/or on the species' cave, all of the project modifications discussed above would have been required in order to minimize adverse impacts on the species. However, TxDOT may request technical assistance in the future regarding road maintenance activities within or near critical habitat boundaries even though such activities typically do not require consultations. The agency is likely to behave this way in order to take greater precaution because of the critical habitat.

124. As such, no change in behavior is expected from Federal agencies, and only minor change is expected from State agencies with respect to technical assistance, in a "with critical habitat" scenario versus a "without critical habitat" scenario. However, significant change in behavior is expected from private landowners for the following reasons:

⁶⁰ See footnote 3

- The Service intends to issue notification letters to all landowners, informing them of the designation. This effort is likely to heighten awareness in the area of the invertebrate species and their habitat. Such increased awareness will likely raise questions and concerns from the landowners, resulting in an increased number of technical assistance efforts. As discussed in Chapter 3, this analysis attributes about half of the total number of technical assistance—i.e., 307—to the designation due mainly to the issuance of the notification letter.
- Heightened awareness may also trigger some landowners (i.e., potential commercial developers) to complete HCPs. These HCPs may be in part, or entirely, motivated by the desire of the developer to be excluded from critical habitat designation. Although some of the future HCPs may have taken place even absent critical habitat, it is difficult to differentiate future HCPs by the triggering factor. As a result, this analysis conservatively attributes all costs associated with consultations and project modifications for future HCPs to the designation. Such inclusion is likely to overstate rather than understate the cost of critical habitat ascribable to adoption of HCPs.

125. As a result, approximately \$17.8 million to \$18 million, or 81 percent, of the total Section 7 costs are attributable to the designation of critical habitat in Bexar County. These costs stem mostly from project modification costs due to the development of HCPs on private lands, particularly the cost of purchasing and managing mitigation lands.

4.5 Potential Impacts on Small Entities (Businesses, Governments, Non-profits)

126. Under the Regulatory Flexibility Act (as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever a Federal agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (i.e., small businesses, small organizations, and small government jurisdictions).⁶¹ However, no regulatory flexibility analysis is required if the head of an agency certifies that the rule will not have a significant economic impact on a substantial number of small entities.⁶² SBREFA amended the Regulatory Flexibility Act to require

⁶¹ Small businesses are defined by the Small Business Administration, most commonly in terms of the number of employees or annual receipts. A small organization is “any not-for-profit enterprise...which is independently owned and operated and is not dominant in its field.” A small government is the government of a city, county, town, school district, or special district with a population of less than 50,000, not including tribal governments. Regulatory Flexibility Act, 5 U.S.C. 601 et. seq.

⁶² Thus, for a regulatory flexibility analysis to be required, impacts must exceed a threshold for "significant impact" and a threshold for a “substantial number of small entities.” See 5 U.S.C. 605 (b).

Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities. Accordingly, the following represents a screening level analysis of the potential effects of critical habitat designation on small entities to assist the Secretary in making this certification.

127. This analysis determines whether this critical habitat designation potentially affects a “substantial number” of small entities in counties supporting critical habitat areas. It also quantifies the probable number of small businesses likely to experience a “significant effect.” While SBREFA does not explicitly define either “substantial number” or “significant effect,”⁶³ the Environmental Protection Agency and other Federal agencies have interpreted these terms to represent an impact on 20 percent or more of the small entities in any industry and an effect equal or greater than three percent or more of a business’ annual revenues.⁶⁴ In both tests, this analysis examines the total estimated section 7 costs calculated in earlier sections of this report, including those impacts that may be “attributable co-extensively” with the listing of the species. This results in a conservative estimate (i.e., more likely to overstate impacts than understate them), because it utilizes the upper bound impact estimate from the earlier analysis.

4.5.1 Identification of Activities That May Involve Small Entities

128. Section 3 of this report identifies land use activities that are within the proposed critical habitat designation for the nine invertebrates that are expected to be affected by section 7 of the Act. The following land use activities were identified as being potentially impacted by section 7 implementation (i.e., requiring consultations or project modifications) under the “with section 7” scenario:

- Private residential and commercial development;
- Development of Karst Management Plan for Camp Bullis;
- Roadway expansions by Texas Department of Transportation (TxDOT); and
- Partners for Fish and Wildlife conservation projects on private lands.

129. Of the projects that are potentially affected by section 7 implementation for the invertebrates, one occurs exclusively on Federal lands *and* does not have third party involvement (i.e. only the Action agency and the Service are expected to be involved). Thus, small entities should not be affected by section 7 implementation for activities on lands

⁶³ Regulatory Flexibility Act, 5 U.S.C. 601 et. seq.

⁶⁴ See U.S. Environmental Protection Agency, *Revised Interim Guidance for EPA Rulewriters: Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act*, March 29, 1999.

within Camp Bullis. In addition, under SBA guidelines, State governments are considered independent sovereigns, not small governments.⁶⁵ As such TxDOT is not considered a “small entity”.

130. Of the projects potentially impacted by section 7 implementation, some do not involve any project modifications. Specifically, Partners for Fish and Wildlife conservation projects on private lands are not expected to involve any project modifications. The greatest share of the costs associated with the consultation process stem from project modifications (as opposed to the consultation itself). Indeed, costs associated with the consultation itself are relatively minor, with third party costs estimated to range from \$1,200 to \$6,900 per consultation. Therefore, small entities are unlikely to be significantly affected by consultations that do not involve costly project modifications. As such, small entities should not be affected by section 7 implementation for Partners for Fish and Wildlife conservation projects on private lands.
131. After these adjustments, several developers were identified as having a Federal nexus and therefore are potentially affected by section 7 implementation for the nine invertebrates. Six landowners are expected to complete HCPs for single/multi family homes and/or commercial development on their lands. These developers would each bear costs associated with the consultation and project modification for the HCP.

4.5.2 Description of Affected Small Entities

132. The SBA defines small development businesses as having less than \$28.5 million in average annual receipts (also referred to as sales or revenues).⁶⁶ For the purposes of this SBREFA screening analysis, the analysis assumes that all the developers completing HCPs are small businesses. Thus, these development entities are the focus of this SBREFA assessment.

4.5.3 Estimated Number of Small Businesses Affected: The “Substantial Number” Test

133. Following steps are taken to estimate number of small businesses affected:
- Estimate the number of businesses within the study area affected by section 7 implementation annually (assumed to be equal to the number of annual consultations);
 - Calculate the *percent* of businesses in the affected industry that are likely to be small;

⁶⁵ U.S.C. § 601.

⁶⁶ U.S. Small Business Administration, “Table of Small Business Size Standards,” accessed at <http://www.sba.gov/size/indextableofsize.html> on August 20, 2002.

- Calculate the *number* of affected small businesses in the affected industry;
- Calculate the *percent* of small businesses likely to be affected by critical habitat.

134. This calculation reflects conservative assumptions and nonetheless yields an estimate that is still far less than the 20 percent threshold that would be considered “substantial.” As a result, this analysis concludes that a significant economic impact on a substantial number of small entities will not result from the designation of critical habitat for the nine invertebrates. Nevertheless, an estimate of the number of small businesses that will experience effects at a significant level is provided below.

Exhibit 4-5		
ESTIMATED ANNUAL NUMBER OF SMALL BUSINESSES AFFECTED BY CRITICAL HABITAT DESIGNATION: THE "SUBSTANTIAL NUMBER" TEST		
Industry Name		Single/Multi-family and Commercial Development SIC 1531
<i>Annual</i> number of affected businesses in industry (Equal to number of total consultations divided by ten)	By formal consultation	0.5
	By informal consultation	0
Total number of <i>all</i> businesses in industry within study area		70
Number of <i>small</i> businesses in industry within study area		54
Percent of businesses that are small (Number of small businesses)/(Total Number of businesses)		77%
Annual number of small businesses affected (Number affected businesses)*(Percent of small businesses)		0.4
Annual percentage of small businesses affected (Number of small businesses affected)/(Total number of small businesses); >20 percent is substantial		1%

4.5.4 Estimated Effects on Small Businesses: The “Significant Effect” Test

135. Costs of critical habitat designation to small businesses consist primarily of the cost of participating in section 7 consultations and the cost of project modifications. To calculate the likelihood that a small business will experience a significant effect from critical habitat designation for the nine invertebrates, the following calculations were made:

- Calculate the per-business cost. This consists of the unit cost to a third party of participating in a section 7 consultation (formal or informal) and the unit

cost of associated project modifications. *To be conservative, this analysis uses the high-end estimate for each cost.*

- Determine the amount of annual sales that a company would need to have for this per-business cost to constitute a “significant effect.” This is calculated by dividing the per-business cost by the three percent “significance” threshold value.
- Estimate the likelihood that small businesses in the study area will have annual sales equal to or less than the threshold amount calculated above. This is estimated using national statistics on the distribution of sales within industries.⁶⁷
- Based on the probability that a single business may experience significant effects, calculate the expected value of the number of businesses likely to experience a significant effect.
- Calculate the percent of businesses in the study area within the affected industry that are likely to be affected significantly.

136. Calculations for costs associated with section 7 implementation for the karst invertebrates are provided in Exhibit 4-6 below.

137. Because the costs associated with designating critical habitat for the nine invertebrates are likely to be significant for less than one small business per year in the affected industries in the study area, this analysis concludes that a significant economic impact on a substantial number of small entities will not result from the designation of critical habitat for the nine invertebrates. This would be true even if all of the effects of section 7 consultation on these activities were attributed solely to the critical habitat designation.

⁶⁷ This probability is calculated based on national industry statistics obtained from the Robert Morris Associated *Annual Statement of Studies: 2001-2002* and from comparison with the SBA definitions of small businesses.

Exhibit 4-6

ESTIMATED ANNUAL EFFECTS ON SMALL BUSINESSES: THE "SIGNIFICANT EFFECT" TEST

Industry Name		Single/Multi-family and Commercial Development
Annual Number of Small Businesses Affected (from Exhibit 4-5)	By formal consultation	0.4
	By informal consultation	0
Per-Business Cost ¹		\$3,524,700
Level of Annual Sales Below which Effects Would Be Significant (Per-Business Cost/ 3%)		\$15,013,333
Probability that Per-Business Cost is Greater than 3% of Sales for Small Business ⁶⁸		200%
Probable Annual Number of Small Businesses Experiencing Significant Effects (Number Small Businesses)* (Probability of Significant Effect)		0.8
Total Annual Percentage of Small Businesses Bearing Significant Costs in Industry		1.4%

¹ See Exhibit 4-4.

⁶⁸ This probability is calculated based on national industry statistics obtained from the *RMA Annual Statement Studies: 2001-2002*, which provides data on the distribution of annual sales in an industry within the following ranges: \$0-1 million, \$1-3 million, \$3-5 million, \$5-10, \$10-25 million, and \$25+ million. This analysis uses the ranges that fall within the SBA definition of small businesses (i.e., for industries in which small businesses have sales of less than \$5.0 million, it uses \$0-1 million, \$1-3 million, and \$3-5 million) to estimate a distribution of sales for small businesses. It then calculates the probability that small businesses have sales below the threshold value using the following components: (1) all small businesses (expressed as a percentage of all small businesses) in ranges whose upper limits fall below the threshold value experience the costs as significant; (2) for the range in which the threshold value falls, the percentage of companies in the bin that fall below the threshold value is calculated as $[(\text{threshold value} - \text{range minimum}) / (\text{bin maximum} - \text{range minimum})] \times \text{percent of small businesses captured in range}$. This percentage is added to the percentage of small businesses captured in each of the lower ranges to reach the total probability that small businesses have sales below the threshold value. Note that in instances in which the threshold value exceeds the definition of small businesses (i.e., the threshold value is \$10 million and the definition of small businesses is sales less than \$5.0 million), all small businesses experience the effects as significant.

POTENTIAL BENEFITS OF PROPOSED CRITICAL HABITAT**SECTION 5**

138. The published economics literature has documented that real social welfare benefits can result from the conservation and recovery of endangered and threatened species (Bishop (1978, 1980), Brookshire and Eubanks (1983), Boyle and Bishop (1986), Hageman (1985), Samples *et al.* (1986), Stoll and Johnson (1984). Such benefits have also been ascribed to preservation of open space and biodiversity (see examples in Pearce and Moran (1994) and Fausold and Lilieholm (1999), both of which are associated with species conservation). Likewise, regional economies can benefit from the preservation of healthy populations of endangered and threatened species, and the habitat on which these species depend.
139. The primary goal of the Act is to enhance the potential for species recovery. Thus, the benefits of actions taken under the Act are primarily measured in terms of the value the public places on species preservation (e.g., avoidance of extinction, and/or an increase in a species' population). Such social welfare values may reflect both use and non-use (i.e., existence) values. For example, use values might include the potential for recreational use of a species, should recovery be achieved. Non-use values are not derived from direct use of the species, but instead reflect the utility the public derives from knowledge that a species continues to exist.
140. In addition, as a result of actions taken to preserve endangered and threatened species, various other benefits may accrue to the public. Such benefits may be a direct result of modifications to projects made following section 7 consultation, or may be collateral to such actions. For example, a section 7 consultation may result in the requirement for purchasing of mitigation lands, which may then result in enhancing nearby residential property values (e.g., preservation of open space).
141. It is not feasible to fully describe and accurately quantify the benefits of this designation in the context of this economic analysis. The discussion presented in this report provides examples of potential benefits, which derive primarily from the listing of the species, based on information obtained in the course of developing the economic analysis. It is not intended to provide a complete analysis of the benefits that could result from section 7 of the Act in general or critical habitat designation in particular. Given these limitations, the Services believe that the benefits of critical habitat designation are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.

5.1 Categories of Benefits

142. Implementation of section 7 of the Act is expected to substantially increase the probability of recovery for the species. Such implementation includes both the jeopardy provisions afforded by the listing, as well as the adverse modification provisions provided by the designation. Specifically, the section 7 consultations that address the endangered invertebrates will assure that actions taken by Federal agencies do not jeopardize the continued existence of the species or adversely modify their habitat. Note that these measures are separate and distinct from the section 9 “take” provisions of the Act, which also provide protection to this species.

143. The benefits of critical habitat designation can therefore be placed into two broad categories: those associated with the primary goal of species recovery, and those that derive mainly from the habitat protection required to achieve this primary goal. The sections below describe these two categories of benefits.

5.1.1 Benefits Associated with Species Recovery

Existence Value

144. The nine karst invertebrates have some intrinsic existence value that will be enhanced by its survival and recovery. Existence value reflects the utility the public derives from knowledge that a species continues to exist.

Use Value

145. Because of the unique nature of the karst invertebrate species, they are emerging subjects of study. For example, it is known that the invertebrates can survive in atmospheres with extremely low levels of oxygen that would not support human life. Additionally, the spider species possess venoms that rapidly paralyze their prey. More information would be necessary to fully understand and accurately quantify the potential benefits of these unique characteristics.

5.1.2 Benefits Associated with Habitat Protection

Ecosystem Health

146. These invertebrates are an integral part of the ecosystems in which they live. Invertebrates are key indicators of overall ecosystem health and water quality. Actions to protect the habitat of these invertebrate species will also benefit other karst-dwelling wildlife, such as cave crickets and cave bats. These organisms may in turn provide some level of direct or indirect benefit. The karst ecosystem is a small and fragile one. Removing any element would impact the entire ecosystem because of the delicate balance that exists in a healthy cave. Understanding the changes in ecosystem stability resulting from this designation would entail significant original research.⁶⁹
147. Clean, potable groundwater is a valuable commodity important to the economy, human health, and the environment. The Edwards Aquifer in Bexar County, Texas is designated as a Sole Source Aquifer for the county. Protection and conservation of the karst fauna region that lies on the Aquifer recharge zone may provide an incremental benefit to the quality of the groundwater resource in Bexar County.

Real Estate Values

148. Real estate values may be enhanced by this critical habitat designation. Such enhancement may occur if substantial open space is preserved through purchasing of mitigation lands. Published studies have shown that open space creates important amenities that are reflected in land and housing values (Nelson et al., 2002). Increased open space within a region may also enhance views of homes and reduce suburban sprawl. Quantification and monetization of these effects, however, would require detailed information on the existing housing markets in the designated areas, such as the current availability of home-sites with these attributes.

Recreational Benefits

149. Although it is unlikely that the immediate habitat of these species, the caves, will be opened for recreational use in the species substantially recovers, there may be some recreational benefit associated with the increased open space preserved in the area through purchase and preservation of mitigation lands. The surface area of these mitigation lands will be managed in order to provide for a healthy subsurface habitat for the species and therefore, may result in improved surface ecosystem health. This in turn may encourage nature-based tourism in the area. Monetization of these benefits, however, would require substantial research that is currently unavailable for this area.

⁶⁹ Personal communication with karst biologist, Texas Tech University, Natural Science Research Laboratory, Division of Invertebrates, October 3, 2002.

Other Benefits

150. Additional benefits of designating critical habitat for the invertebrates may include educational/informational benefits (increased awareness by the public of the extent of the karst invertebrate habitat), increased support for existing conservation efforts, and reduced uncertainty regarding the extent of the karst invertebrate habitat. For example, critical habitat designation will provide a firm legal definition of the extent of currently-known habitat for the nine invertebrates, which may reduce regulatory uncertainty. At this time sufficient information does not exist to quantify or monetize the benefits of this designation, and thus it is not possible to present monetized benefits on a unit-by-unit basis. Again, quantification and monetization of these categories of benefits would require additional, particularized research.

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- Edwards Aquifer Authority
- Federal Highway Administration
- Government Canyon State Natural Area
- U.S. Fish and Wildlife Service, Austin Field Office
- U.S. Department of Agriculture
- U.S. Housing and Urban Development
- Camp Bullis
- Texas Department of Transportation
- Texas Tech University, Natural Science Research Laboratory, Division of Invertebrates
- City of San Antonio Planning Office
- San Antonio Proposition 3 Office
- San Antonio Water Systems

