DRAFT ECONOMIC ANALYSIS OF CRITICAL HABITAT DESIGNATION FOR THE ARKANSAS RIVER SHINER

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TABLE OF CONTENTS

LIST OF EXHIBITS

LIST OF EXHIBITS (continued)

LIST OF EXHIBITS (continued)

LIST OF EXHIBITS (continued)

LIST OF EXHIBITS (continued)

LIST OF EXHIBITS (continued)

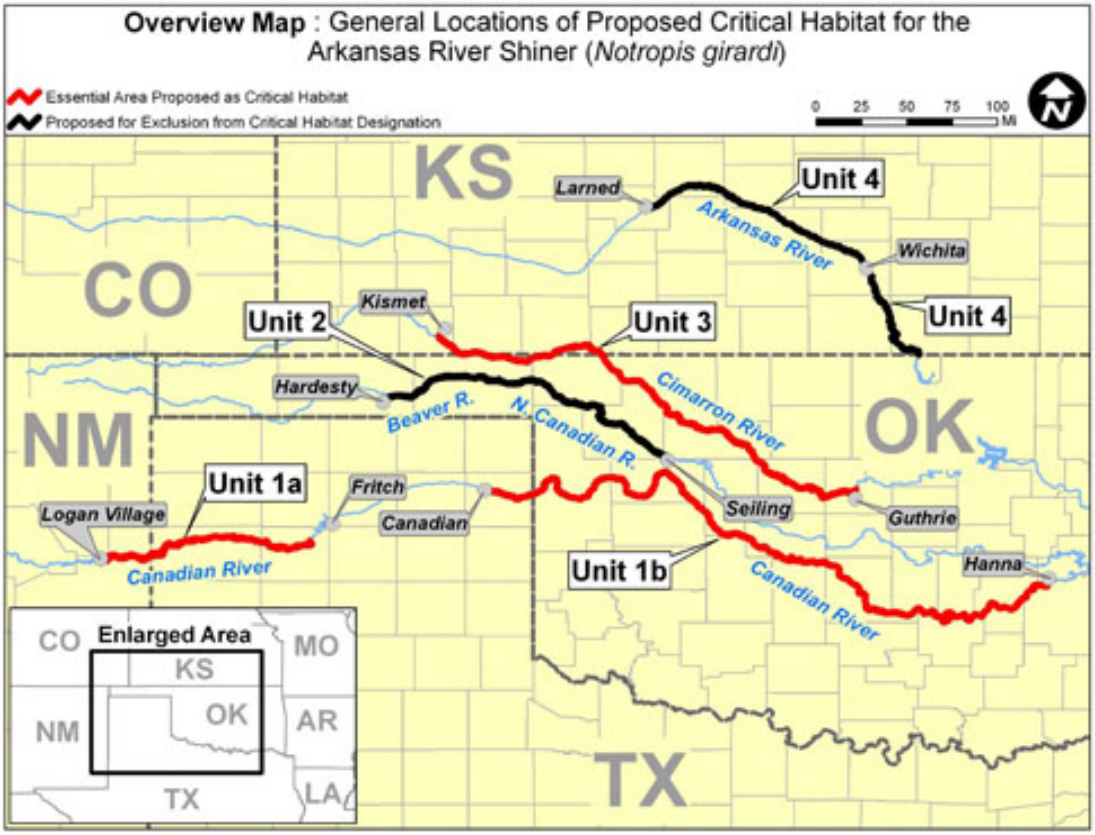
EXECUTIVE SUMMARY

1. The purpose of this report is to identify and analyze the potential economic impacts associated with the proposed critical habitat designation for the Arkansas river shiner (shiner) *(Notropis girardi*). This report was prepared by Industrial Economics, Incorporated (IEc), under contract to the U.S. Fish and Wildlife Service's (Service) Division of Economics.

2. The Service identifies five units (Units 1a, 1b, 2, 3, and 4) of essential habitat for the shiner totaling approximately 1,244 river miles and 144,852 acres of riparian habitat in Kansas, Oklahoma, Texas, and New Mexico. Approximately 98 percent of essential habitat is under private ownership, with the remaining two percent under State and Federal ownership. The region that contains the essential habitat is predominantly rural and agricultural, and contains important crop and livestock production areas. Exhibit ES-1 provides a map of the five units.

Exhibit ES-1

MAP OF ESSENTIAL HABITAT FOR THE SHINER



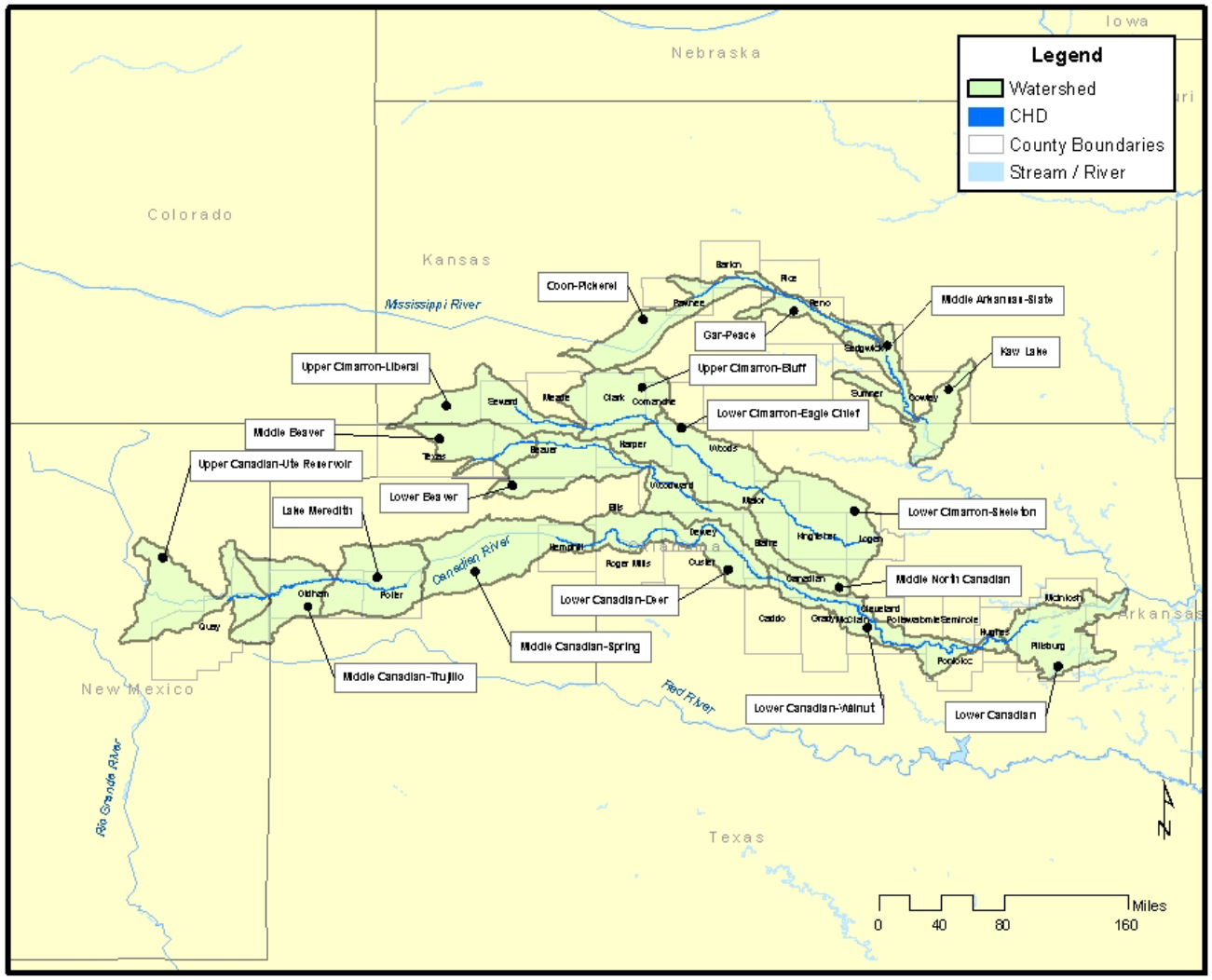
3. Of these five units, the Service proposes to exclude from critical habitat designation approximately 405 river miles and 38,273 acres representing two of the five units (Units 2

and 4). These areas include the Arkansas River in Kansas (Unit 4) and the Beaver/North Canadian River in Oklahoma (Unit 2). Potential economic impacts are analyzed for all units of essential habitat, but results are presented separately for units that are proposed for designation and those proposed for exclusion from the final rule.

4. The analysis presents costs at the watershed level, allowing for an understanding of the distribution of costs within units. Costs presented at the watershed level are also aggregated by unit to allow comparison of costs across units. The analysis identifies 18 watersheds that contain essential habitat for the shiner. A map of these watersheds is presented in Exhibit ES-2. These watersheds range in size from 377,000 to 2 million acres; however, most watersheds are similar in size, and average approximately 1.2 million acres. In all watersheds, the area represented by essential shiner habitat is a very small proportion of the total watershed area, ranging from 0.12 percent to 2.7 percent.

Exhibit ES-2

MAP OF WATERSHEDS INCLUDED IN THE ECONOMIC ANALYSIS



5. Throughout the report, "essential shiner habitat" is used to denote all units proposed for inclusion as well as units proposed for exclusion from the final rule. When referencing specific areas of essential shiner habitat, units proposed for inclusion and those proposed for exclusion are referred to separately as "proposed shiner habitat" and "shiner habitat proposed for exclusion," respectively.

6. Exhibit ES-3 presents key findings. Cost estimates are presented for affected activities in units proposed for inclusion. Exhibits ES-4a, ES-4b, and ES-4c provide detailed costs for each affected activity in both included and excluded units, presented in constant dollars, annualized using a seven percent discount rate, and annualized using a three percent discount rate, respectively.

Exhibit ES-3

KEY FINDINGS[1]

- **Total impacts**: $9 to $11 million on an annualized basis ($198 million in constant dollars). The low-end of this range assumes zero impact to private agricultural activities and lower-bound estimates for all other activities; the high-end of this range assumes upper-bound estimates for private agriculture and all other activities.

- **Activities most impacted:** Concentrated animal feeding operations (CAFOs), oil and gas production, and water management activities are expected to experience the greatest economic impact related to shiner conservation activities.

    - CAFOs could experience project modification costs of up to $4.5 million on an annualized basis (approximately 40 percent of total annualized costs).
    - Oil and gas production and distribution activities could experience costs between $1.5 and $3.1 million on an annualized basis (also approximately 27 percent of total annualized costs).
    - Water management at Ute Reservoir and Lake Meredith (Sanford Dam) in Unit 1a could generate approximately $1.7 million in shiner-related costs on an annualized basis (approximately 15 percent of total annualized costs). These costs are primarily associated with potential water releases at Ute Reservoir to protect shiner habitat downstream.

- **Units with highest impacts:** Units 1b and 3 contribute the highest potential impacts, up to $3.9 million and $4.7 million on an annualized basis, respectively.

- **Watersheds with highest impacts:** Watersheds with the highest potential impacts are the Lower Canadian-Walnut ($2 million) and Upper Cimarron-Liberal ($1.9 million) watersheds.

[1] Cost estimates included in the Key Findings section represent annualized values presented in 2004 dollars, assuming a discount rate of seven percent. Total constant dollar costs are presented in Exhibit ES-4a. The discussion in this text box relies on annualized impacts, because costs occur at different times across affected activities and watersheds.

Framework for the Analysis and Regulatory Alternatives Considered

7. 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.[2] In addition, this analysis provides information to allow the Service to address the requirements of Executive Orders 12866 and 13211, and the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA).[3] This report also complies with direction from the U.S. 10th Circuit Court of Appeals that, when deciding which areas to designate as critical habitat, the economic analysis informing that decision should include "co-extensive" effects.[4]

8. Executive Order 12866 directs Federal Agencies to evaluate regulatory alternatives.[5] The Service identifies five separate units of essential habitat, and proposes three for designation as critical habitat. An alternative to the proposed rule is the designation of all five units, and the potential impacts of all the units are estimated in this report. In addition, as discussed in the previous paragraph, section 4(b)(2) of the Act allows the Service to exclude additional areas proposed for designation based on economic impact and other relevant impact. Consideration of impacts at a sub-unit level (e.g., watershed level impacts) may result in alternate combinations of essential habitat that may or may not ultimately be designated as critical habitat. Because this analysis presents costs by watershed, the impacts of multiple combinations of essential habitat are also available to the Service.

9. To comply with the 10th Circuit's direction to include all co-extensive effects, this analysis considers the potential economic impacts of efforts to protect the shiner and its habitat (hereinafter referred to collectively as "shiner conservation activities") in essential shiner habitat. It does so by taking into account the cost of conservation-related measures that are likely to be associated with future economic activities that may adversely effect the habitat within the proposed boundaries. Actions undertaken to meet the requirements of other Federal, State, and local laws and policies may afford protection to the shiner and its habitat, and thus contribute to the efficacy of critical habitat-related conservation and recovery efforts. Thus, the impacts of these activities are relevant for understanding the full impact of the proposed designation.

[2] 16 U.S.C. §1533(b)(2).
[3] Executive Order 12866, "Regulatory Planning and Review," September 30, 1993; Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," May 18, 2001; 5. U.S.C. §§601 *et seq*; and Pub Law No. 104-121.
[4] In 2001, the U.S. 10th Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of proposed critical habitat designation, regardless of whether those impacts are attributable co-extensively to other causes (*New Mexico Cattle Growers Ass'n v. U.S.F.W.S.*, 248 F.3d 1277 (10th Cir. 2001)).
[5] Office of Management and Budget, Circular A-4, September 17, 2003, p. 7.

10. This analysis considers both economic efficiency and distributional effects. In the case of habitat conservation, efficiency effects generally reflect the opportunity costs associated with the commitment of resources to comply with habitat protection measures (e.g., lost economic opportunities associated with restrictions on land use). This analysis also addresses how potential economic impacts are likely to be distributed (distributional effects), including an assessment of any local or regional impacts of shiner conservation activities and the potential effects of conservation activities on small entities and the energy industry. This information can be used by decision-makers to assess whether the effects of the designation might unduly burden a particular group or economic sector. Also, this analysis looks retrospectively at costs that have been incurred since the date the species was listed and considers those costs that may occur after the designation is finalized.

11. To conduct the analysis, best available data are gathered from a variety of sources, including government agencies, industry associations, potentially affected private parties, municipalities, and other stakeholders. Specifically, data were gathered from the following entities: private stakeholder groups, including the Arkansas River Shiner Coalition, water facility owners and water distributors (e.g., the Canadian River Municipal Water Authority and the Eastern New Mexico Rural Water Authority), and farming and ranching associations; Bureau of Reclamation (USBR); Army Corps of Engineers (USACE), Bureau of Land Management (BLM); Bureau of Indian Affairs (BIA); National Park Service (NPS); State and local agencies, including departments of water resources, agriculture, energy, game and fish, natural resources, recreation, transportation; and various County and City governments. In addition, Census Bureau and other Department of Commerce data were relied upon to characterize the regional economy.

Results of the Analysis

12. This analysis addresses the impacts of shiner conservation efforts on activities occurring in areas identified as essential shiner habitat. The analysis uses a number of economic impact measures: lost economic efficiency (including the cost of administrative measures and project modifications, reductions in the value of grazing lands, reductions in the value of crop production, and the value of water lost from beneficial use), and impacts to regional economic output and jobs (quantified for lost livestock production, lost crop production, and lost recreational opportunities).

13. It is important to note that shiner conservation measures may accelerate and compound ongoing trends in natural resource use in the region that contains essential shiner habitat. For example, many potentially affected areas are currently experiencing declining groundwater levels in the High Plains/Ogallala Aquifer, which is a significant source of water for irrigation, agriculture, and municipal use. At the same time, many surface water supplies are fully appropriated. As a result, numerous plans for acquiring additional or alternate water supplies are under development. Shiner conservation measures impose costs and changes on top of these significant ongoing trends.

Efficiency Impacts

14. Efficiency impacts can be separated into costs associated with implementing shiner and shiner habitat conservation activities and administrative costs associated with section 7 consultations. Costs are estimated for a variety of activities, including: water management, oil and gas production, concentrated animal feeding operations, crop production, Federal farm assistance, livestock grazing, transportation, and recreation. Exhibits ES-4a through ES-4c summarize impacts by unit, watershed, and impacted activity. The low and high costs presented for administrative activities reflects the potential range in the amount of time and types of correspondence and/or biological assessments undertaken by the Service, Action agencies, and third parties. For oil and gas projects and transportation projects, the reported ranges in costs reflect the variety of potential project modifications that may be undertaken by regulated entities.

EXHIBIT ES-4a

SUMMARY OF TOTAL COSTS OF SHINER CONSERVATION IN WATERSHEDS THAT CONTAIN ESSENTIAL SHINER HABITAT
(constant dollars)

Unit Number	HUC[a] Number	Watershed Name	Primary State Overlaid	Administrative		Water Operations	Oil and Gas		CAFO	Federal Farm Assistance	Grazing	Crops	Transportation		Recreation	Total Costs (constant, 2004 dollars)	
				Low	High		Low	High					Low	High		Low	High
PROPOSED FOR INCLUSION																	
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	$42,000	$100,000	$31,817,000	$0	$0	$0	$156,000	$342,000	$0	$0	$0	$0	$31,859,000	$32,415,000
	11090101	Middle Canadian-Trujillo	Texas	$366,000	$1,015,000	$0	$285,000	$585,000	$0	$183,000	$529,000	$0	$24,000	$69,000	$0	$675,000	$2,382,000
	11090105	Lake Meredith	Texas	$425,000	$1,112,000	$0	$285,000	$585,000	$3,274,000	$175,000	$463,000	$0	$24,000	$69,000	$9,271,000	$13,279,000	$14,950,000
1b	11090106	Middle Canadian-Spring	Texas	$418,000	$1,145,000	$0	$435,000	$756,000	$3,038,000	$132,000	$323,000	$3,000	$24,000	$69,000	$0	$3,915,000	$5,465,000
	11090201	Lower Canadian-Deer	Oklahoma	$976,000	$2,759,000	$0	$4,410,000	$8,836,000	$2,571,000	$622,000	$1,366,000	$152,000	$7,000	$35,000	$0	$7,964,000	$16,341,000
	11090202	Lower Canadian-Walnut	Oklahoma	$1,751,000	$4,936,000	$0	$11,016,000	$22,462,000	$6,173,000	$859,000	$879,000	$525,000	$7,000	$35,000	$0	$18,947,000	$35,869,000
	11090204	Lower Canadian	Oklahoma	$600,000	$1,696,000	$0	$782,000	$1,654,000	$8,184,000	$114,000	$55,000	$38,000	$7,000	$35,000	$0	$9,572,000	$11,775,000
3	11040006	Upper Cimarron-Liberal	Kansas	$303,000	$855,000	$0	$932,000	$1,824,000	$25,577,000	$370,000	$625,000	$34,000	$5,000	$50,000	$0	$26,817,000	$29,336,000
	11040008	Upper Cimarron-Bluff	Kansas	$283,000	$801,000	$0	$1,182,000	$2,107,000	$6,382,000	$425,000	$706,000	$20,000	$5,000	$50,000	$0	$7,853,000	$10,491,000
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	$1,057,000	$2,991,000	$0	$5,192,000	$10,489,000	$3,246,000	$279,000	$360,000	$39,000	$7,000	$35,000	$0	$9,502,000	$17,440,000
	11050002	Lower Cimarron-Skeleton	Oklahoma	$1,059,000	$2,995,000	$0	$4,128,000	$7,749,000	$10,229,000	$263,000	$255,000	$141,000	$7,000	$35,000	$0	$15,423,000	$21,668,000
SUBTOTAL INCLUDED HUCS[b]				**$7,279,000**	**$20,405,000**	**$31,817,000**	**$28,646,000**	**$57,047,000**	**$68,674,000**	**$3,579,000**	**$5,903,000**	**$952,000**	**$117,000**	**$482,000**	**$9,271,000**	**$145,804,000**	**$198,131,000**
PROPOSED FOR EXCLUSION																	
2	11100102	Middle Beaver	Oklahoma	$617,000	$1,744,000	$0	$0	$0	$34,752,000	$115,000	$345,000	$13,000	$7,000	$35,000	$0	$35,375,000	$37,005,000
	11100201	Lower Beaver	Oklahoma	$741,000	$2,096,000	$0	$2,014,000	$3,818,000	$7,299,000	$203,000	$543,000	$21,000	$7,000	$35,000	$0	$10,061,000	$14,014,000
	11100301	Middle North Canadian	Oklahoma	$817,000	$2,312,000	$0	$2,264,000	$4,101,000	$6,722,000	$155,000	$325,000	$52,000	$7,000	$35,000	$0	$9,810,000	$13,702,000
4	11030004	Coon-Pickerel	Kansas	$346,000	$978,000	$0	$782,000	$1,654,000	$22,842,000	$357,000	$455,000	$372,000	$5,000	$50,000	$0	$23,975,000	$26,707,000
	11030010	Gar-Peace	Kansas	$231,000	$654,000	$0	$0	$0	$16,685,000	$502,000	$503,000	$183,000	$5,000	$50,000	$0	$16,921,000	$18,576,000
	11030013	Middle Arkansas-Slate	Kansas	$255,000	$708,000	$0	$0	$0	$14,229,000	$461,000	$442,000	$168,000	$5,000	$50,000	$0	$14,489,000	$16,058,000
	11060001	Kaw Lake	Kansas	$120,000	$325,000	$0	$0	$0	$2,451,000	$47,000	$24,000	$13,000	$5,000	$50,000	$0	$2,576,000	$2,910,000
SUBTOTAL EXCLUDED HUCS[b]				**$3,127,000**	**$8,817,000**	**$0**	**$5,061,000**	**$9,573,000**	**$104,979,000**	**$1,840,000**	**$2,636,000**	**$822,000**	**$40,000**	**$305,000**	**$0**	**$113,207,000**	**$128,972,000**

Source: IEc analysis as reported in Sections 3 through 9 of this report.
Notes:
(a) HUC refers to "hydrologic unit code" as delineated by the United States Geological Survey (USGS).
(b) Totals may not sum due to rounding.

EXHIBIT ES-4b

SUMMARY OF ANNUALIZED COSTS OF SHINER CONSERVATION IN WATERSHEDS THAT CONTAIN ESSENTIAL SHINER HABITAT
(seven percent discount rate)[a]

Unit Number	HUC[b] Number	Watershed Name	Primary State Overlaid	Administrative		Water Operations	Oil and Gas		CAFO	Federal Farm Assistance	Grazing	Crops	Transportation		Recreation	Total Annualized Costs (7%)	
				Low	High		Low	High					Low	High		Low	High
PROPOSED FOR INCLUSION																	
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	$2,000	$5,000	$1,705,000	$0	$0	$0	$8,000	$15,000	$0	$0	$0	$0	$1,708,000	$1,734,000
	11090101	Middle Canadian-Trujillo	Texas	$20,000	$54,000	$0	$15,000	$31,000	$0	$10,000	$23,000	$0	$1,000	$4,000	$0	$36,000	$122,000
	11090105	Lake Meredith	Texas	$23,000	$59,000	$0	$15,000	$31,000	$219,000	$9,000	$20,000	$0	$1,000	$4,000	$496,000	$754,000	$839,000
1b	11090106	Middle Canadian-Spring	Texas	$22,000	$61,000	$0	$23,000	$40,000	$202,000	$7,000	$14,000	$0	$1,000	$4,000	$0	$249,000	$329,000
	11090201	Lower Canadian-Deer	Oklahoma	$52,000	$148,000	$0	$236,000	$473,000	$163,000	$33,000	$60,000	$8,000	$0	$2,000	$0	$452,000	$886,000
	11090202	Lower Canadian-Walnut	Oklahoma	$94,000	$264,000	$0	$589,000	$1,202,000	$399,000	$46,000	$38,000	$28,000	$0	$2,000	$0	$1,082,000	$1,979,000
	11090204	Lower Canadian	Oklahoma	$32,000	$91,000	$0	$42,000	$88,000	$508,000	$6,000	$2,000	$2,000	$0	$2,000	$0	$582,000	$699,000
3	11040006	Upper Cimarron-Liberal	Kansas	$16,000	$46,000	$0	$50,000	$98,000	$1,700,000	$20,000	$27,000	$2,000	$0	$3,000	$0	$1,766,000	$1,895,000
	11040008	Upper Cimarron-Bluff	Kansas	$15,000	$43,000	$0	$63,000	$113,000	$399,000	$23,000	$31,000	$1,000	$0	$3,000	$0	$477,000	$612,000
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	$57,000	$160,000	$0	$278,000	$561,000	$207,000	$15,000	$16,000	$2,000	$0	$2,000	$0	$541,000	$962,000
	11050002	Lower Cimarron-Skeleton	Oklahoma	$57,000	$160,000	$0	$221,000	$415,000	$677,000	$14,000	$11,000	$8,000	$0	$2,000	$0	$955,000	$1,287,000
SUBTOTAL INCLUDED HUCS[b]				**$389,000**	**$1,092,000**	**$1,705,000**	**$1,533,000**	**$3,052,000**	**$4,473,000**	**$191,000**	**$258,000**	**$51,000**	**$6,000**	**$26,000**	**$496,000**	**$8,603,000**	**$11,344,000**
PROPOSED FOR EXCLUSION																	
2	11100102	Middle Beaver	Oklahoma	$33,000	$93,000	$0	$0	$0	$2,311,000	$6,000	$15,000	$1,000	$0	$2,000	$0	$2,344,000	$2,428,000
	11100201	Lower Beaver	Oklahoma	$40,000	$112,000	$0	$108,000	$204,000	$486,000	$11,000	$24,000	$1,000	$0	$2,000	$0	$634,000	$840,000
	11100301	Middle North Canadian	Oklahoma	$44,000	$124,000	$0	$121,000	$219,000	$439,000	$8,000	$14,000	$3,000	$0	$2,000	$0	$604,000	$809,000
4	11030004	Coon-Pickerel	Kansas	$19,000	$52,000	$0	$42,000	$88,000	$1,420,000	$19,000	$20,000	$20,000	$0	$3,000	$0	$1,481,000	$1,623,000
	11030010	Gar-Peace	Kansas	$12,000	$35,000	$0	$0	$0	$1,044,000	$27,000	$22,000	$10,000	$0	$3,000	$0	$1,057,000	$1,141,000
	11030013	Middle Arkansas-Slate	Kansas	$14,000	$38,000	$0	$0	$0	$885,000	$25,000	$19,000	$9,000	$0	$3,000	$0	$899,000	$979,000
	11060001	Kaw Lake	Kansas	$6,000	$17,000	$0	$0	$0	$152,000	$3,000	$1,000	$1,000	$0	$3,000	$0	$159,000	$177,000
SUBTOTAL EXCLUDED HUCS[c]				**$167,000**	**$472,000**	**$0**	**$271,000**	**$512,000**	**$6,739,000**	**$98,000**	**$115,000**	**$44,000**	**$2,000**	**$16,000**	**$0**	**$7,179,000**	**$7,997,000**

Source: IEc analysis as reported in Sections 3 through 9 of this report.
Notes:
(a) Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.
(b) HUC refers to "hydrologic unit code" as delineated by the United States Geological Survey (USGS).
(c) Totals may not sum due to rounding.

EXHIBIT ES-4c

SUMMARY OF ANNUALIZED COSTS OF SHINER CONSERVATION IN WATERSHEDS THAT CONTAIN ESSENTIAL SHINER HABITAT
(three percent discount rate)[a]

Unit Number	HUC[b] Number	Watershed Name	Primary State Overlaid	Administrative		Water Operations	Oil and Gas		CAFO	Federal Farm Assistance	Grazing	Crops	Transportation		Recreation	Total Annualized Costs (3%)	
				Low	High		Low	High					Low	High		Low	High
PROPOSED FOR INCLUSION																	
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	$2,000	$5,000	$1,640,000	$0	$0	$0	$8,000	$18,000	$0	$0	$0	$0	$1,642,000	$1,671,000
	11090101	Middle Canadian-Trujillo	Texas	$19,000	$52,000	$0	$15,000	$30,000	$0	$9,000	$27,000	$0	$1,000	$4,000	$0	$35,000	$123,000
	11090105	Lake Meredith	Texas	$22,000	$57,000	$0	$15,000	$30,000	$173,000	$9,000	$24,000	$0	$1,000	$4,000	$477,000	$688,000	$774,000
1b	11090106	Middle Canadian-Spring	Texas	$22,000	$59,000	$0	$22,000	$39,000	$159,000	$7,000	$17,000	$0	$1,000	$4,000	$0	$205,000	$284,000
	11090201	Lower Canadian-Deer	Oklahoma	$50,000	$142,000	$0	$227,000	$455,000	$131,000	$32,000	$70,000	$8,000	$0	$2,000	$0	$408,000	$840,000
	11090202	Lower Canadian-Walnut	Oklahoma	$90,000	$254,000	$0	$567,000	$1,157,000	$318,000	$44,000	$45,000	$27,000	$0	$2,000	$0	$975,000	$1,847,000
	11090204	Lower Canadian	Oklahoma	$31,000	$87,000	$0	$40,000	$85,000	$410,000	$6,000	$3,000	$2,000	$0	$2,000	$0	$482,000	$595,000
3	11040006	Upper Cimarron-Liberal	Kansas	$16,000	$44,000	$0	$48,000	$94,000	$1,342,000	$19,000	$32,000	$2,000	$0	$3,000	$0	$1,405,000	$1,535,000
	11040008	Upper Cimarron-Bluff	Kansas	$15,000	$41,000	$0	$61,000	$109,000	$451,000	$22,000	$36,000	$1,000	$0	$3,000	$0	$527,000	$663,000
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	$54,000	$154,000	$0	$267,000	$540,000	$165,000	$14,000	$19,000	$2,000	$0	$2,000	$0	$488,000	$896,000
	11050002	Lower Cimarron-Skeleton	Oklahoma	$55,000	$154,000	$0	$213,000	$399,000	$535,000	$14,000	$13,000	$7,000	$0	$2,000	$0	$803,000	$1,124,000
SUBTOTAL INCLUDED HUCS[b]				**$375,000**	**$1,051,000**	**$1,640,000**	**$1,475,000**	**$2,938,000**	**$3,684,000**	**$184,000**	**$304,000**	**$49,000**	**$6,000**	**$25,000**	**$477,000**	**$7,657,000**	**$10,352,000**
PROPOSED FOR EXCLUSION																	
2	11100102	Middle Beaver	Oklahoma	$32,000	$90,000	$0	$0	$0	$1,824,000	$6,000	$18,000	$1,000	$0	$2,000	$0	$1,856,000	$1,940,000
	11100201	Lower Beaver	Oklahoma	$38,000	$108,000	$0	$104,000	$197,000	$383,000	$10,000	$28,000	$1,000	$0	$2,000	$0	$526,000	$729,000
	11100301	Middle North Canadian	Oklahoma	$42,000	$119,000	$0	$117,000	$211,000	$349,000	$8,000	$17,000	$3,000	$0	$2,000	$0	$508,000	$708,000
4	11030004	Coon-Pickerel	Kansas	$18,000	$50,000	$0	$40,000	$85,000	$1,147,000	$18,000	$23,000	$19,000	$0	$3,000	$0	$1,205,000	$1,346,000
	11030010	Gar-Peace	Kansas	$12,000	$34,000	$0	$0	$0	$841,000	$26,000	$26,000	$9,000	$0	$3,000	$0	$853,000	$938,000
	11030013	Middle Arkansas-Slate	Kansas	$13,000	$36,000	$0	$0	$0	$715,000	$24,000	$23,000	$9,000	$0	$3,000	$0	$728,000	$809,000
	11060001	Kaw Lake	Kansas	$6,000	$17,000	$0	$0	$0	$123,000	$2,000	$1,000	$1,000	$0	$3,000	$0	$129,000	$147,000
SUBTOTAL EXCLUDED HUCS[c]				**$161,000**	**$454,000**	**$0**	**$261,000**	**$493,000**	**$5,381,000**	**$95,000**	**$136,000**	**$42,000**	**$2,000**	**$16,000**	**$0**	**$5,805,000**	**$6,616,000**

Source: IEc analysis as reported in Sections 3 through 9 of this report.
Notes:
(a) Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.
(b) HUC refers to "hydrologic unit code" as delineated by the United States Geological Survey (USGS).
(c) Totals may not sum due to rounding.

15. The following bullets summarize the efficiency impacts reported in Exhibit ES-4b for each type of potentially affected industry or activity in proposed critical habitat.[6] Exhibit ES-5 illustrates the breakdown of estimated costs (reported on an annualized basis) of shiner conservation activities across industries. CAFOs, oil and gas, and water operations are expected to incur the greatest economic impacts, accounting for approximately 78 percent of total costs on an annualized basis. The remaining activities bear approximately 22 percent of total impacts on an annualized basis.

- ***Costs associated with concentrated animal feeding operations (40 percent of total costs).*** Potential future costs to CAFOs are driven primarily by potential shiner-related requirements that exceed wastewater regulations contained within the Federal National Pollutant Discharge Elimination System (NPDES). Additional requirements to protect the shiner may range from larger wastewater retention structures to increased vegetated buffers. All CAFOs located within watersheds that contain essential shiner habitat are assumed to incur 100 percent of the costs associated with these requirements. The analysis estimates potential costs of compliance to these CAFOs at up to $4.5 million on an annualized basis, assuming all CAFOs within watersheds that contain proposed shiner habitat incur the full cost of implementing additional shiner-related requirements. Based on the conservative (i.e., more likely to overstate than understate impacts) assumptions employed in the analysis, Unit 3 may experience the highest shiner-related CAFO costs. However, to the extent that CAFOs within watersheds that contain proposed shiner habitat already comply with additional requirements, or are not required to implement all recommended requirements, this estimate overstates costs.

- ***Costs associated with oil and gas production (27 percent of total costs).*** Oil and natural gas extraction and transmission occurring in the vicinity of proposed shiner habitat may impact the shiner through disturbance and contamination of the surface waters on which the species depends. Project modifications to oil and gas production and transmission activities include directional drilling of wells and pipelines and well pad and pipeline relocation outside of shiner habitat. In total, impacts to oil and gas structures within essential shiner habitat are expected to range from $1.5 million to $3.1 million on an annualized basis. This range reflects lower- and upper-bound estimates of potential project modification costs.

- ***Costs associated with water management activities (15 percent of total costs).*** Two reservoirs located on unit 1a may experience impacts related to shiner conservation: (1) Ute Reservoir in New Mexico; and (2) Lake Meredith in Texas. Impacts range from shiner-related NEPA activities associated with project plans to potential water releases required to augment downstream flow for the shiner. The analysis estimates impacts of up to $1.7 million on an annualized basis to water operations. Approximately 95 percent of this annualized cost ($1.6 million) represents the value

[6] The percentage of total costs reported for each activity, and the subsequent text, rely on estimates of annualized costs (seven percent discount rate), because impacts occur at different times across activities.

associated with maintaining a flow downstream of Ute equivalent to the current seepage rate, which contributes to shiner habitat in this unit.

- ***Reduced crop production in the riparian area (less than one percent of total costs).*** Shiner conservation activities may prompt farmers to retire agricultural land in proposed shiner habitat from production. According to the analysis, a total of 4,209 acres of land is currently used to produce a variety of small grains and row crops within proposed habitat. The potential losses resulting from a reduction in crop production on these lands are expected to range from zero to $51,000 on an annualized basis, assuming all currently cultivated land is removed from production. The wide range of potential impacts to crop production activities underscores the fact that the shiner has not impacted crop production since the listing of the species. As a result, the predicted upper-bound economic impact ($51,000 on an annualized basis) is unlikely and will overstate costs to the extent that farmers retire less than 100 percent of cropland in proposed habitat from production, choose not to retire land from production, or relocate production to other on-farm areas. In addition, the Service and Natural Resources Conservation Service (NRCS) have existing riparian habitat conservation programs which could be used by landowners to offset some of the economic losses associated with any reduction in crop production within the riparian zone.

- ***Impacts to Federal farm assistance (two percent of total costs).*** Similar to crop production, farmers in proposed shiner habitat may choose to discontinue participation in Federal farm assistance programs, such as those provided by the NRCS and the Farm Service Agency (FSA) of the United States Department of Agriculture (USDA), to avoid a Federal nexus and the associated consultation under section 7 of the Act. Key Federal programs in the proposed designation include the Environmental Quality Incentives Program (EQIP), the Wildlife Habitat Incentives Program (WHIP) and the Conservation Reserve Program (CRP). The analysis estimates a potential reduction of $191,000 on an annualized basis from these Federal farm assistance programs within the counties that contain proposed habitat. The analysis assumes that farmers may discontinue participation in Federal farm assistance programs *and* retire cropland/pastureland in proposed habitat from productive economic activity, but that a choice of one option or the other is more likely. Therefore, the analysis does not sum costs of agricultural land retirement and non-participation in Federal farm programs. It is important to note, however, that this estimate will overstate costs where Farmers choose not to decline participation in Federal farm assistance program.

- ***Reduced livestock grazing resulting from shiner-related restrictions (two percent of total costs).*** This analysis considers a scenario in which livestock grazing activity is limited on private lands within proposed shiner habitat. The potential loss resulting from a reduction in animal unit months (AUMs) grazed on private lands is expected to range from zero to 49,000 AUMs, depending on the extent to which the designation limits grazing on these lands. The wide range of potential economic impacts is presented to underscore the fact that the shiner has not impacted grazing

activities since the listing of the species in 1998, and the probability of future impacts is low. The upper-bound of potential costs associated with impacts to grazing activity are estimated at $258,000 on an annualized basis, assuming the high end of impacts to livestock grazing (i.e., 49,000 lost AUMs). To the extent that farmers retire less than 100 percent of pastureland from grazing, choose not to retire pasture land, or relocate grazing activities to other on-farm areas, these upper-bound estimates likely overstate costs.

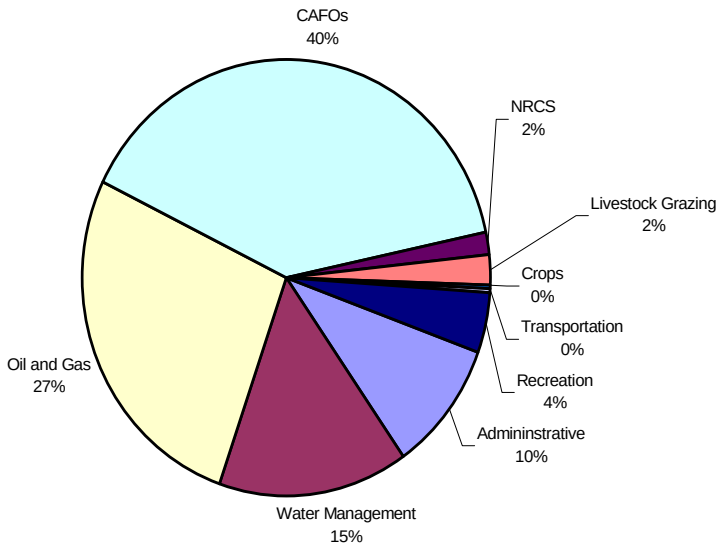
- ***Impacts on transportation activities (less than one percent of total costs).*** Transportation projects in proposed habitat may incur costs related to timing restrictions, fencing, survey and monitoring, and habitat conservation and restoration. The future cost of shiner conservation measures for transportation projects is expected to range from $6,000 to $26,000 on an annualized basis.

- ***Impacts to recreation activities (four percent of total costs)***. The analysis considers a scenario in which off-road vehicle (ORV) users at the Rosita ORV use area within Lake Meredith National Recreation Area (Unit 1a) are restricted from using the park during the months of July through September due to shiner conservation. Estimated welfare losses associated with lost ORV user days at Rosita are $496,000 on an annualized basis.

- ***Administrative costs incurred by the Service, Action agencies, and third parties associated with shiner conservation activities (10 percent of total costs).*** Administrative costs are costs associated with attending meetings, preparing letters and biological assessments and management plans, and in the case of formal consultations, developing biological opinions. Administrative costs resulting from shiner conservation activities are forecast to range from $390,000 to $1.1 million on an annualized basis. The majority of these costs are driven by potential consultation requirements pursuant to Federal regulatory changes governing oil and gas and CAFO activities.

Exhibit ES-5

ANNUALIZED COSTS OF SHINER CONSERVATION ACTIVITIES BY ACTIVITY TYPE (seven percent discount rate)



Distributional Impacts

16. This analysis also analyzes how potential economic impacts are likely to be distributed across the affected communities in order to assess whether a particular group or economic sector bears an undue proportion of the impacts. This section includes an assessment of any local or regional impacts of shiner conservation and the potential effects of conservation activities on small entities and the energy industry. The regional impact estimates discussed below for crop production, grazing activity, and ORV recreation represent regional impacts in the first year after the actions take place. These impacts would occur and persist for some period of time until the economy adjusts to the change.

- ***Distributional impacts related to potential reductions in crop production in the area.*** As noted, the analysis considers a scenario in which farmers retire agricultural land in the lateral extent of proposed habitat from production. Shiner-related reductions in crop production may result in a regional impact of $142,000 in the first year if the scenario is true. Under this scenario, the greatest impact may occur in the Lower Canadian-Walnut watershed (potentially $51,000 in lost crop production value annually), which contains a portion of unit 1b.

- ***Distributional impacts related to potential reductions in grazing activity in the area.*** As noted above, this analysis considers a scenario in which livestock grazing activity is limited on private lands within proposed habitat. Shiner-related reductions in livestock production may result in a regional economic impact of $1.9 million in the first year if the scenario is true. Under this regional scenario, the greatest impacts may occur in the Lower Canadian-Deer ($535,000) and Lower Canadian-Walnut ($345,000) watersheds, both of which contain segments of unit 1b.

- ***Distributional impacts related to potential reductions in recreational activity at Rosita within the Lake Meredith National Recreation Area.*** This analysis considers the potential impact of shiner conservation on recreational activity, and the resulting regional impacts of changes to these activities. Shiner-related (annual) regional economic impacts of up to $1.6 million in revenue in the first year and as many as 44 lost jobs may occur if visitor days at the Rosita ORV use area within Lake Meredith National Recreation Area are limited.

- ***Impacts to small business entities***. Up to 33 small CAFOs may experience financial stress related to shiner conservation activities. These small CAFOs represent 1.6 percent of the small animal feeding operations in Kansas, Oklahoma, and Texas. Similarly, potential compliance costs to other affected activities discussed in this report are generally less than one percent of small business revenues in these states.

- ***Impacts to the energy industry***. Potential annual compliance costs for the oil and gas industry represent 0.02 percent of total costs of production in these states. Therefore, significant impacts to the energy industry pursuant to Executive Order 31211 are not anticipated.

17. It is important to note that measures of regional economic impact are entirely distinct from the reported efficiency effects. As such these two measures of impact cannot be directly compared and should not be summed.

Summary of Areas Most Likely to Experience Impacts

18. Exhibit ES-6 presents annualized costs of shiner conservation by potentially affected activity at the watershed level, using upper-bound annualized (seven percent discount rate) cost estimates for all activities. The areas most likely to experience impacts include:

- Overall, units 1b and 3 may experience the largest impacts due to shiner conservation. Both units may experience costs largely related to oil and gas and CAFOs.

- Of the watersheds proposed for inclusion in the final rule, the greatest economic impacts are anticipated in the Lower Canadian-Walnut watershed on unit 1b in Oklahoma and the Upper Cimarron-Liberal watershed on unit 3 in Kansas. High potential costs in the Lower Canadian-Walnut are largely driven by potential impacts

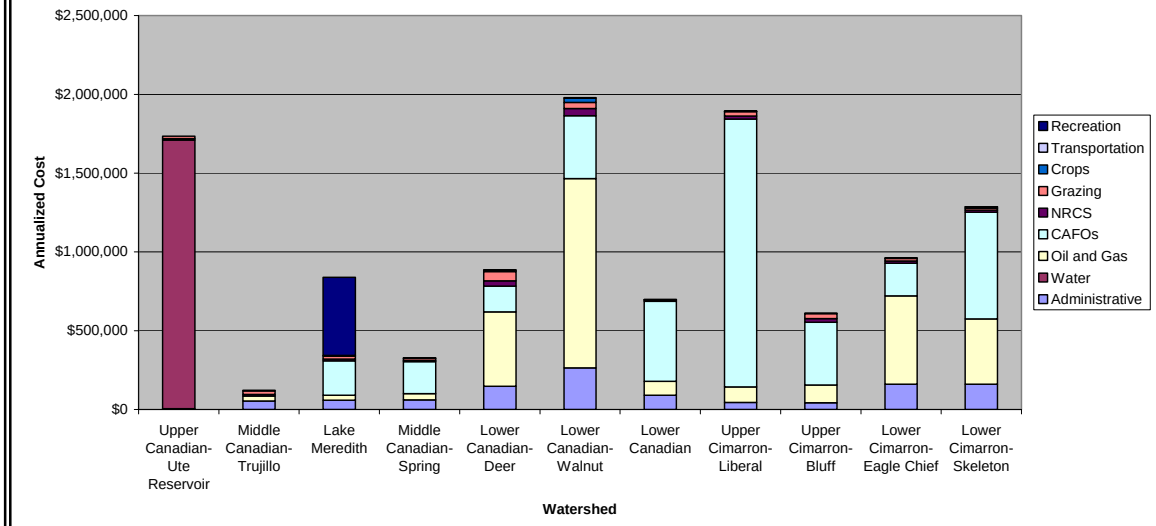
to CAFOs and oil and gas operations and associated administrative costs. Costs in the Upper Cimarron-Liberal watershed are driven by potential impacts to CAFOs.

- Potential impacts to oil and gas are anticipated to be largest in the Lower Canadian-Walnut watershed on unit 1b in Oklahoma. This area contains a significant number of oil and gas wells that may incur administrative and project modification costs pursuant to shiner conservation activities.

- Potential impacts to water operations are concentrated in the Upper Canadian-Ute Reservoir and Lake Meredith watersheds that contain unit 1a, due to the presence of Lake Meredith and Ute Reservoir on the unit.

- Potential impacts to recreation activities are concentrated in the Lake Meredith watershed on unit 1a in Texas; recreation impacts are not expected in other areas that contain proposed shiner habitat.

EXHIBIT ES-6
ANNUALIZED COSTS OF SHINER CONSERVATION BY ACTIVITY IN WATERSHEDS PROPOSED FOR INCLUSION
(seven percent discount rate)



19. The purpose of this report is to estimate the economic impact of actions taken to protect the federally-listed Arkansas River Shiner (shiner) (*Notropis girardi*) and its habitat. It attempts to quantify the economic effects associated with the proposed designation of critical habitat. It does so by taking into account the cost of conservation-related measures that are likely to be associated with future economic activities that may adversely effect the habitat within the proposed boundaries. The analysis looks retrospectively at costs incurred since the shiner was listed in 1998, and it attempts to predict future costs likely to occur after the 2004 proposed designation is finalized in 2005.

20. This information is intended to assist the Secretary in determining whether the benefits of excluding particular areas from the designation outweigh the benefits of including those areas in the designation.[7] In addition, this information allows the Service to address the requirements of Executive Orders 12866 and 13211, and the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA).[8] This report also complies with direction from the U.S. 10th Circuit Court of Appeals that "co-extensive" effects should be included in the economic analysis to inform decision-makers regarding which areas to designate as critical habitat.[9]

21. This section describes the framework for this analysis. First, it describes the general analytic approach to estimating economic effects, including a discussion of both efficiency and distributional effects. Next, this section discusses the scope of the analysis, including the link between existing and critical habitat-related protection efforts and economic impacts. Finally, it presents the analytic time frame used in the report.

[7] 16 U.S.C. §1533(b)(2).
[8] Executive Order 12866, "Regulatory Planning and Review," September 30, 1993; Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," May 18, 2001; 5. U.S.C. §§601 *et seq*; and Pub Law No. 104-121.
[9] In 2001, the U.S. 10th Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of proposed CHD, regardless of whether those impacts are attributable co-extensively to other causes (*New Mexico Cattle Growers Ass'n v. U.S.F.W.S.*, 248 F.3d 1277 (10th Cir. 2001)).

1.1 Approach to Estimating Economic Effects

22. This economic analysis considers both the economic efficiency and distributional effects that may result from efforts to protect the shiner and its habitat (hereinafter referred to collectively as "shiner conservation activities"). Economic efficiency effects generally reflect "opportunity costs" associated with the commitment of resources required to accomplish species and habitat conservation. For example, if activities that can take place on a parcel of land are limited as a result of the designation or the presence of the species, and thus the market value of the land is reduced, this reduction in value represents one measure of opportunity cost or change in economic efficiency. Similarly, the costs incurred by a Federal action agency to consult with the Service under section 7 represent opportunity costs of shiner conservation activities.

23. This analysis also addresses the distribution of impacts associated with the designation, including an assessment of any local or regional impacts of habitat conservation and the potential effects of conservation activities on small entities and the energy industry. This information may be used by decision-makers to assess whether the effects of shiner conservation activities unduly burden a particular group or economic sector. For example, while conservation activities may have a relatively small impact relative to the national economy, individuals employed in a particular sector of the regional economy may experience relatively greater impacts. The difference between economic efficiency effects and distributional effects, as well as their application in this analysis, are discussed in greater detail below.

1.1.1 Efficiency Effects

24. At the guidance of the Office of Management and Budget (OMB) and in compliance with Executive Order 12866 "Regulatory Planning and Review," Federal agencies measure changes in economic efficiency in order to understand how society, as a whole, will be affected by a regulatory action. In the context of regulations that protect shiner habitat, these efficiency effects represent the opportunity cost of resources used or benefits foregone by society as a result of the regulations. Economists generally characterize opportunity costs in terms of changes in producer and consumer surpluses in affected markets.[10]

25. In some instances, compliance costs may provide a reasonable approximation for the efficiency effects associated with a regulatory action. For example, a Federal landowner or manager may enter into a consultation with the Service to ensure that a particular activity will not adversely modify critical habitat. The effort required for the consultation is an economic opportunity cost because the landowner or manager's time and effort would have been spent in an alternative activity had the parcel not been included in the designation. When compliance activity is not expected to significantly affect markets — that is, not result

[10] For additional information on the definition of "surplus" and an explanation of consumer and producer surplus in the context of regulatory analysis, see Gramlich, Edward M., *A Guide to Benefit-Cost Analysis (2nd Ed.)*, Prospect Heights, Illinois: Waveland Press, Inc., 1990; and U.S. Environmental Protection Agency, *Guidelines for Preparing Economic Analyses*, EPA 240-R-00-003, September 2000, available at http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html.

in a shift in the quantity of a good or service provided at a given price, or in the quantity of a good or service demanded given a change in price — the measurement of compliance costs can provide a reasonable estimate of the change in economic efficiency.

26. Where habitat protection measures are expected to significantly impact a market, it may be necessary to estimate changes in producer and consumer surplus. For example, a designation that impacts the timing of water delivery or storage may shift the price and quantity of water supplied in a region. In this case, changes in economic efficiency (i.e., social welfare) can be measured by considering changes in producer and consumer surplus in the market.

27. This analysis begins by measuring costs associated with measures taken to protect shiner and its habitat. As noted above, in some cases, compliance costs can provide a reasonable estimate of changes in economic efficiency. However, if the cost of conservation measures is expected to significantly impact markets, the analysis will consider potential changes in consumer and/or producer surplus in affected markets.

1.1.2 Distributional and Regional Economic Effects

28. Measurements of changes in economic efficiency focus on the net impact of conservation activities, without consideration of how certain economic sectors or groups of people are affected. Thus, a discussion of efficiency effects alone may miss important distributional considerations. OMB encourages Federal agencies to consider distributional effects separately from efficiency effects.[11] This analysis considers several types of distributional effects, including impacts on small entities; impacts on energy supply, distribution, and use; and regional economic impacts. It is important to note that distributional effects (e.g., multiplier effects such as reduced output or lost jobs) are fundamentally different measures of economic impact than efficiency effects, and thus cannot be added to or compared with estimates of changes in economic efficiency.

Impacts on Small Entities and Energy Supply, Distribution, and Use

29. This analysis considers how small entities, including small businesses, organizations, and governments, as defined by the Regulatory Flexibility Act, might be affected by future shiner conservation activities.[12] In addition, in response to Executive Order 13211 "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," this analysis considers the future impacts of conservation activities on the energy industry and its customers.[13]

[11] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.
[12] 5 U.S.C. § 601 *et seq.*
[13] Executive Order 13211, "Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use," May 18, 2001.

Regional Economic Effects

30. Regional economic impact analysis can provide an assessment of the potential localized effects of conservation activities. Specifically, regional economic impact analysis produces a quantitative estimate of the potential magnitude of the initial change in the regional economy resulting from a regulatory action. Regional economic impacts are commonly measured using regional input/output models. These models rely on multipliers that represent the relationship between a change in one sector of the economy (e.g., expenditures by recreationists) and the effect of that change on economic output, income, or employment in other local industries (e.g., suppliers of goods and services to recreationists). These economic data provide a quantitative estimate of the magnitude of shifts in jobs and revenues in the local economy.

31. The use of regional input/output models in an analysis of the impacts of species and habitat conservation efforts can overstate the long-term impacts of a regulatory change. Most importantly, these models provide a static view of the economy of a region. That is, they measure the initial impact of a regulatory change on an economy but do not consider long-term adjustments that the economy will make in response to this change. For example, these models provide estimates of the number of jobs lost as a result of a regulatory change, but do not consider re-employment of these individuals over time or other adaptive responses by impacted businesses. In addition, the flow of goods and services across the regional boundaries defined in the model may change as a result of the regulation, compensating for a potential decrease in economic activity within the region.

32. Despite these and other limitations, in certain circumstances regional economic impact analysis may provide useful information about the scale and scope of localized impacts. It is important to remember that measures of regional economic effects generally reflect shifts in resource use rather than efficiency losses. Thus, these types of distributional effects are reported separately from efficiency effects (i.e., not summed). In addition, measures of regional economic impact cannot be compared with estimates of efficiency effects, but should be considered as distinct measures of impact.

1.2 Scope of the Analysis

33. This analysis identifies those economic activities believed to most likely threaten the listed species and its habitat and, where possible, quantifies the economic impact to avoid, mitigate, or compensate for such threats within the boundaries of the designation. In instances where critical habitat is being proposed after a species is listed, some future impacts may be unavoidable, regardless of the final designation and exclusions under 4(b)(2). However, due to the difficulty in making a credible distinction between listing and critical habitat effects within critical habitat boundaries, this analysis considers all future conservation-related impacts to be coextensive with the designation.[14,15]

[14] In 2001, the U.S. 10th Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of proposed CHD, regardless of whether those impacts are attributable co-extensively to other causes (New Mexico Cattle Growers Assn v. U.S.F.W.S., 248 F.3d 1277 (10th Cir. 2001)).

34. Coextensive effects may also include impacts associated with overlapping protective measures of other Federal, State, and local laws that aid habitat conservation in the areas proposed for designation. We note that in past instances, some of these measures have been precipitated by the listing of the species and impending designation of critical habitat. Because habitat conservation efforts affording protection to a listed species likely contribute to the efficacy of the critical habitat designation efforts, the impacts of these actions are considered relevant for understanding the full effect of the proposed critical habitat designation. Enforcement actions taken in response to violations of the Act, however, are not included.

1.2.1 Sections of the Act Relevant to the Analysis

35. This analysis focuses on activities that are influenced by the Service through sections 4, 7, 9, and 10 of the Act. Section 4 of the Act focuses on the listing and recovery of endangered and threatened species, as well as the critical habitat designation. In this section, the Secretary is required to list species as endangered or threatened "solely on the basis of the best available scientific and commercial data."[18]

36. The protections afforded to threatened and endangered species and their habitat are described in sections 7, 9, and 10 of the Act, and economic impacts resulting from these protections are the focus of this analysis:

- Section 7 of the Act requires Federal agencies to consult with the Service to ensure that any action they authorize, fund, or carry out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of the species' designated critical habitat. The administrative costs of these consultations, along with the costs of project

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[15] In 2004, the U.S. 9th Circuit invalidated the Service's regulation defining destruction or adverse modification of critical habitat (Gifford Pinchot Task Force v. United States Fish and Wildlife Service). The Service is currently reviewing the decision to determine what effect it (and to a limited extent Center for Biological Diversity v. Bureau of Land Management (Case No. C-03-2509-SI, N.D. Cal.)) may have on the outcome of consultations pursuant to section 7 of the Act.

[16] In 2001, the U.S. 10th Circuit Court of Appeals instructed the Service to conduct a full analysis of all of the economic impacts of proposed CHD, regardless of whether those impacts are attributable co-extensively to other causes (New Mexico Cattle Growers Ass=n v. U.S.F.W.S., 248 F.3d 1277 (10th Cir. 2001)).

[17] In 2004, the U.S. 9th Circuit invalidated the Service's regulation defining destruction or adverse modification of critical habitat (Gifford Pinchot Task Force v. United States Fish and Wildlife Service). The Service is currently reviewing the decision to determine what effect it (and to a limited extent Center for Biological Diversity v. Bureau of Land Management (Case No. C-03-2509-SI, N.D. Cal.)) may have on the outcome of consultations pursuant to section 7 of the Act.

[18] 16 U.S.C. 1533.

modifications resulting from these consultations, represent compliance costs associated with the listing of the species and critical habitat designation.[19]

- Section 9 defines the actions that are prohibited by the Act. In particular, it prohibits the "take" of endangered wildlife, where "take" means to "harass, harm, pursue, or collect, or to attempt to engage in any such conduct." The economic impacts associated with this section manifest themselves in sections 7 and 10.

- Under section 10(a)(1)(B) of the Act, an entity (e.g., a landowner or local government) may develop a Habitat Conservation Plan (HCP) for a species in order to meet the conditions for issuance of an incidental take permit in connection with the development and management of a property.[20] The requirements posed by the HCP may have economic impacts associated with the goal of ensuring that the effects of incidental take are adequately minimized and mitigated. The designation of critical habitat does not require completion of an HCP; however, the designation may influence conservation measures provided under HCPs. In the case of the shiner, there no HCPs covering areas included in essential shiner habitat.

1.2.2 Other Relevant Protection Efforts

37. The protection of listed species and habitat is not limited to the Act. Other Federal agencies, as well as State and local governments, may also seek to protect the natural resources under their jurisdiction.[21] For the purpose of this analysis, such protective efforts are considered to be co-extensive with the protection offered by critical habitat, and costs associated with these efforts are included in this report. In addition, under certain circumstances, the designation may provide new information to a community about the sensitive ecological nature of a geographic region, potentially triggering additional economic impacts under other State or local laws. In cases where these costs would not have been triggered absent the designation of critical habitat, they are included in this economic analysis.

[19] The Service notes, however, that a recent Ninth Circuit judicial opinion, *Gifford Pinchot Task Force v. United States Fish and Wildlife Service*, has invalidated the Service's regulation defining destruction or adverse modification of critical habitat. The Service is currently reviewing the decision to determine what effect it (and to a limited extent *Center for Biological Diversity v. Bureau of Land Management* (Case No. C-03-2509-SI, N.D. Cal.)) may have on the outcome of consultations pursuant to section 7 of the Act.

[20] U.S. Fish and Wildlife Service, "Endangered Species and Habitat Conservation Planning. "From: http://endangered.fws.gov/hcp/, as viewed on August 6, 2002. Sections 9 and 10 of the Act do not apply to plants.

[21] For example, the Sikes Act Improvement Act (Sikes Act) of 1997 requires Department of Defense (DoD) military installations to develop Integrated Natural Resources Management Plans (INRMPs) that provide for the conservation, protection, and management of wildlife resources (16 U.S.C. §§ 670a - 670o). These plans must integrate natural resource management with the other activities, such as training exercises, taking place at the facility.

1.2.3 Additional Analytic Considerations

38. This analysis also considers the potential for other types of economic impacts that can be related to section 7 consultations in general and critical habitat in particular, including time delay, regulatory uncertainty, and stigma impacts.

Time Delay and Regulatory Uncertainty Impacts

39. Time delays are costs due to project delays associated with the consultation process or compliance with other regulations. Regulatory uncertainty costs occur in anticipation of having to modify project parameters (e.g., retaining outside experts of legal counsel to better understand their responsibilities with regard to critical habitat).

Stigma Impacts

40. Stigma refers to the change in economic value of a particular project or activity due to negative (or positive) perceptions of the role critical habitat will play in developing, implementing, or conducting that policy. For example, changes to private property values associated with public attitudes about the limits and costs of implementing a project in critical habitat are known as "stigma" impacts. While stigma impacts are possible in locations where critical habitat is designated, the analysis does not anticipate stigma impacts related to shiner conservation activities.

1.2.4 Benefits

41. Under Executive Order 12866, OMB directs Federal agencies to provide an assessment of both the social costs and benefits of proposed regulatory actions.[24] OMB's Circular A-4 distinguishes two types of economic benefits: *direct benefits and ancillary benefits*. Ancillary benefits are defined as favorable impacts of a rulemaking that are typically unrelated, or secondary, to the statutory purpose of the rulemaking.[25]

42. In the context of critical habitat designation, the primary purpose of the rulemaking (i.e., the direct benefit) is the potential to enhance conservation of the species. The published economics literature has documented that social welfare benefits can result from the conservation and recovery of endangered and threatened species. In its guidance for implementing Executive Order 12866, OMB acknowledges that it may not be feasible to monetize, or even quantify, the benefits of environmental regulations due to either an absence of defensible, relevant studies or a lack of resources on the implementing agency's part to conduct new research.[26] *Rather than rely on economic measures, the Service believes*

[22] Executive Order 12866, September 30,1993, "Regulatory Planning and Review."
[23] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.
[24] Executive Order 12866, September 30,1993, "Regulatory Planning and Review."
[25] U.S. Office of Management and Budget, "Circular A-4," September 17, 2003, available at http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf.
[26] Ibid.

that the direct benefits of the proposed rule are best expressed in biological terms that can be weighed against the expected cost impacts of the rulemaking.

43. Critical habitat designation may also generate ancillary benefits. Critical habitat aids in the conservation of species specifically by protecting the primary constituent elements on which the species depends. To this end, critical habitat designation can result in maintenance of particular environmental conditions that may generate other social benefits aside from the preservation of the species. That is, management actions undertaken to conserve a species or habitat may have coincident, positive social welfare implications, such as water quality or increased recreational opportunities in a region. While they are not the primary purpose of critical habitat, these ancillary benefits may result in gains in employment, output, or income that may offset the direct, negative impacts to a region's economy resulting from actions to conserve a species or its habitat.

44. It is often difficult to evaluate the ancillary benefits of critical habitat designation. To the extent that the ancillary benefits of the rulemaking may be captured by the market though an identifiable shift in resource allocation, they are factored into the overall economic impact assessment in this report. For example, if decreased off-road vehicle use to improve species habitat leads to an increase in opportunities for wildlife viewing or hiking within the region, the local economy may experience an associated measurable, positive impact. Where data are available, this analysis attempts to capture the *net* economic impact (i.e., the increased regulatory burden less any discernable offsetting market gains), of species conservation efforts imposed on regulated entities and the regional economy.

1.3 Analytic Time Frame

45. The analysis estimates impacts based 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. This analysis estimates economic impacts to activities from 1998 (the year of the species' final listing) to twenty years from the year of final designation (2005). Forecasts of economic conditions and other factors beyond the next 20 years would be speculative, and are not included in the analysis.

1.4 Information Sources

46. The primary sources of information for this report were communications with and data provided by personnel from the Service, Federal action agencies, affected private parties, and local and State governments within Kansas, Oklahoma, Texas, and New Mexico. Specifically, the analysis relies on data collected in communication with personnel from the following entities:

- U.S. Environmental Protection Agency (EPA);

[27] Ibid.

- U.S. Bureau of Reclamation (USBR);
- U.S. Army Corps of Engineers (USACE);
- U.S. Department of Agriculture (USDA);
- U.S. Bureau of Land Management (BLM);
- U.S. Fish and Wildlife Service (Service);
- National Park Service (NPS);
- State agencies, including departments of water resources, agriculture, energy, game and fish, recreation, transportation;
- Various county and city governments;
- Private stakeholder groups, including water facility owners and water distributors (Canadian River Municipal Water Authority and Eastern New Mexico Rural Water Authority), farming and ranching interest groups, and others.

47. Publicly available data from the Census Bureau and other Department of Commerce data were relied upon to characterize the regional economy. In addition, this analysis relies upon the Service's section 7 consultation records, public comments, and published journal sources. The reference section at the end of this document provides a full list of information sources consulted.

1.5 Structure of Report

48. The remainder of this report is organized into the following sections:

- Section 2: Background and Socioeconomic Profiles of Affected Areas
- Section 3: Administrative Costs
- Section 4: Water Management Activities
- Section 5: Oil and Gas Activities
-
- Section 6: Concentrated Animal Feeding Operations
- Section 7: Agricultural Activities (Row Crop Activities, Federal Farm Assistance Activities, Livestock Grazing, and Groundwater Pumping)

- Section 8: Transportation Activities

- Section 9: Other Activities (Recreation, Utility Activities, Exotic Plant Control, Wildlife Management Areas, Residential Development, and Shiner Management Plans)

- Appendix A: RFA/SBREFA Screening Analysis

- Appendix B: Energy Impacts

- Appendix C: Methodology Employed to Disaggregate Unit Costs by Watershed

- Appendix D: Methodology Employed to Estimate Impacts to Concentrated Animal Feeding Operations

- References

Sections 3 through 9 are organized by affected activity. For each of these activities, the analysis presents potential costs at both the watershed and management unit level. In addition, in these sections, costs are estimated for all units of essential habitat identified for the shiner, but are presented separately for units proposed for inclusion and those proposed for exclusion from the final rule.[28]

[28] The analysis uses "essential habitat" to refer to the entire designation, including those units proposed for exclusion from the final rule.

49. This section provides information on the history of the shiner listing and essential habitat and describes the socioeconomic characteristics of identified essential habitat areas. Because agriculture is the most predominant activity in the region, an overview of the agricultural industry is also provided. The geographic scope of essential shiner habitat covers a large area. The Service is proposing approximately 1,244 river miles and 300 feet of adjacent riparian zone on each side of the river. Critical habitat is proposed for segments of the Canadian and Cimarron Rivers in Kansas, New Mexico, Oklahoma and Texas. Segments of the Beaver/North Canadian and Arkansas Rivers in Kansas and Oklahoma are included in the proposed rule, but are recommended for exclusion from the final rule. The riparian areas along these streams cross through predominantly rural lands that support agricultural activity such as rowcropping, ranching, and animal feeding. Exceptions are the few urban areas through which shiner habitat runs, Wichita and Oklahoma City.

2.1 Background of Arkansas River Shiner Critical Habitat Designation

50. In 1994, the Service published a proposal to list the shiner as threatened; critical habitat was noted as prudent but not determinable at the time of the proposed listing due to a lack of information regarding specific habitat features.[28] The rule was finalized in 1998, at which time the Service found designation of critical habitat not prudent, citing lack of benefit.[29] In 2000, the Service proposed critical habitat for the shiner as a result of a court settlement (*Center for Biological Diversity v. Bruce Babbitt, et al*. C99-3202 DC) that directed the Service to designate shiner habitat.[30] The proposal consisted of 1,160 river miles and 300 feet of the adjacent riparian zone; the final rule in 2001 designated 1,148 river miles and 300 feet of the adjacent riparian zone subsequent to completion of a public comment period and economic analysis of the proposed designation.[31] Critical habitat for the shiner was subsequently vacated in 2003 as a result of a court order in *New Mexico Cattle Growers Association* et al. *V. Norton,* et al. *Civ No*. 02-0461; the previous designation of critical habitat was remanded and the Service directed to repropose critical habitat and prepare a

[28] 59 CFR 39532 – 39540.
[29] 63 CFR 64796.
[30] 65 CFR 40576.
[31] 66 CFR 18002.

new economic analysis of the designation.[32] On October 6, 2004, the Service reproposed critical habitat for the shiner. The 2004 proposal identifies 1,244 river miles and 300 feet of the adjacent riparian zone as essential habitat. Of this total essential habitat, 404.9 miles are proposed for exclusion.[33] The Service is required to publish a final rule designating critical habitat for the shiner by September 30, 2005.

2.2 Proposed Critical Habitat Designation

51. The Service has identified essential shiner habitat covering approximately 1,244 river miles and 300 feet of adjacent riparian areas measured laterally from the riverbank within five critical habitat units (Units 1a, 1b, 2, 3, and 4). Of this total, the Service is proposing to exclude approximately 405 miles representing two of the five units (Units 2 and 4). Potential economic impacts of shiner conservation activities are analyzed for all units of essential habitat for the shiner, but results are presented separately for units that are proposed for inclusion and those proposed for exclusion from the final rule in each of the subsequent activity chapters.

52. Essential shiner habitat crosses four states: Kansas, Oklahoma, Texas, and New Mexico as highlighted in Exhibit 2-1. Exhibit 2-2 provides information on the individual units of essential habitat. The Service derived the lateral extent of essential habitat by measuring 300 feet from the bankfull width of the river, defined as the width of a stream or river at bankfull discharge, or the flow at which water leaves the channel and begins to move into the floodplain.[34]

[32] 69 CFR 59859.
[33] 69 CFR 59859.
[34] 69 CFR 59867.

Exhibit 2-1

MAP OF ESSENTIAL HABITAT FOR THE SHINER

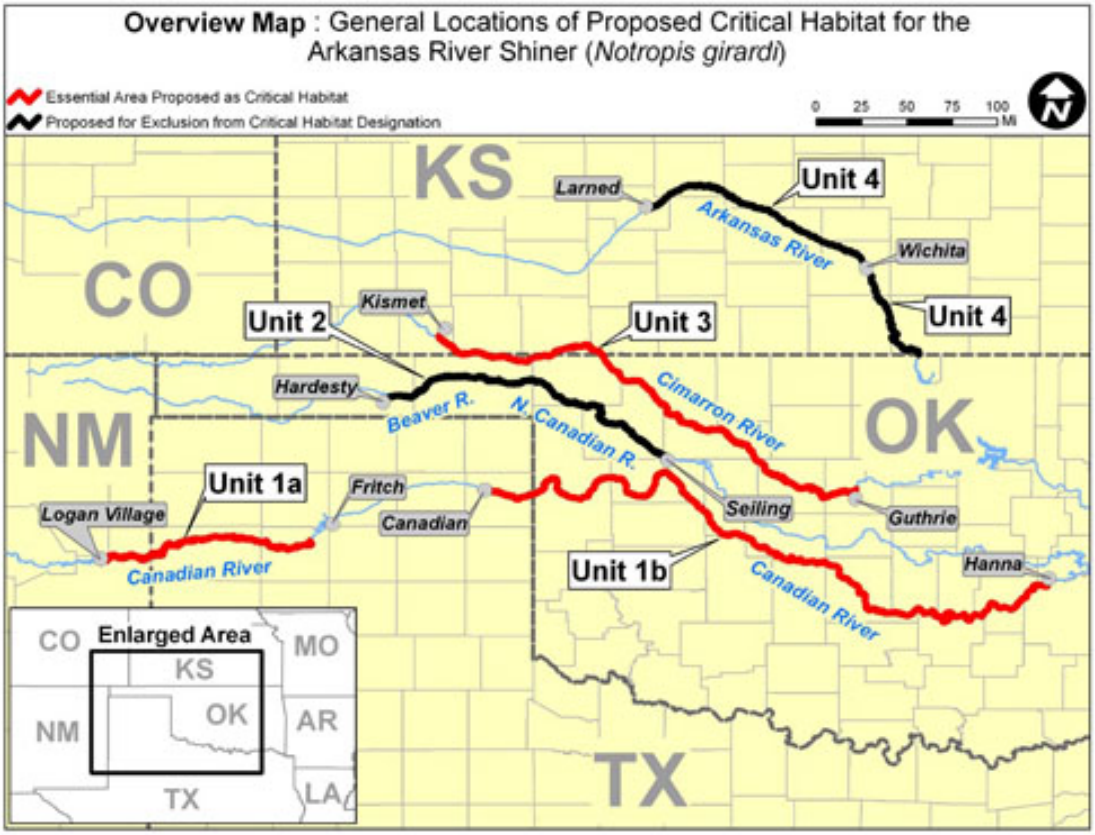


Exhibit 2-2

DETAIL OF ESSENTIAL HABITAT UNITS

Unit	River Lengths Proposed (miles)	Estimated Riparian Area Proposed (acres)
Proposed for Inclusion		
1a	154	11,200
1b	399	29,018
3	286	20,800
Subtotal	**839**	**61,018**
Proposed for Exclusion		
2	211	15,345
4	194	14,109
Subtotal	**405**	**29,454**
Total	**1,244**	**90,473**

Notes: Riparian acreage calculated from proposed river mile lengths.
Source: 69 CFR 59868 – 59870.

53. The majority (98 percent) of essential habitat land is privately owned. The remaining two percent consists of small parcels of state, Federal, and Tribal land.

54. Certain types of activities occurring within essential habitat are likely to be impacted by efforts to protect the shiner. Exhibit 2-3 identifies potentially affected activities by Federal land management agency. These activities are discussed in detail in the following sections.

Exhibit 2-3

ACTIVITIES OCCURRING WITHIN ESSENTIAL SHINER HABITAT

Federal Agency/ Affected Party	Potentially Affected Activities
Army Corps of Engineers	Water management, dam operations, road, bridge and rail construction, oil and gas production, utility operations
Bureau of Reclamation	Water management, dam operations
Bureau of Land Management	Oil and gas production, livestock grazing, road construction, military activities
Environmental Protection Agency	Wastewater management, water supply
Federal Highway Administration	Transportation projects, bridge construction and maintenance
National Park Service	Recreation activities, trail and site maintenance, construction activities
U.S. Fish and Wildlife Service	Refuge operations, recreation, restoration projects, vegetation management
Private	Agriculture, livestock grazing, development, habitat restoration projects, recreation
Sources: Review of consultation history and personal communication with stakeholder groups and agencies.	

2.3 Description of the Species and Habitat[35]

55. The Arkansas River shiner (*Notropis girardi*) is a small minnow with a small, dorsally flattened head, rounded snout, and small subterminal mouth. Adults attain a maximum length of 51 millimeters (two inches). Dorsal coloration is light tan, with silvery sides grading to white on the belly. The shiner is believed to have historically inhabited the main channels of wide, shallow, sandy-bottomed rivers and streams of the Arkansas River Basin, and are usually not found in quiet pools, backwaters, or tributaries having deep water and mud or stone bottoms. The shiner is a generalized forager that feeds on detritus (decaying organic material), invertebrates, grass seeds, and sediment.

56. Arkansas River shiners are pelagic (i.e., open water) broadcast spawners, releasing the eggs and sperm over an unprepared substrate. Spawning occurs primarily in May, June, and July, but may occur as early as April and as late as September, and usually coincides with flood flows that follow heavy rains. The fertilized eggs are non-adhesive and semi-buoyant, and remain suspended in the water column as long as current is present. In the absence of sufficient stream flows, the eggs would likely settle to the channel bottom where silt would hinder the oxygen uptake and lead to the mortality of the embryos. Fertilized eggs

[35] Information on the shiner and its habitat included in this section are obtained from 69 CFR 59859 – 59879.

can be transported long distances (45 to 90 miles) before hatching. After hatching, the developing larvae can be transported up to an additional 130 miles. Within three to four days of hatching, the larvae are capable of swimming and seek out backwater pools and quiet water at the mouth of tributaries where food is more abundant.

57. Considering the species' habitat requirements and population biology, the Service has identified several primary constituent elements for the shiner. These primary constituent elements are:

- A natural, unregulated hydrologic regime complete with episodes of flood and drought or, if flows are modified or regulated, a hydrologic regime characterized by the duration, magnitude, and frequency of flow events capable of forming and maintaining channel and instream habitat necessary for particular shiner life stages in appropriate seasons;

- A complex, braided channel with pool, riffle (shallow area in a streambed causing ripples), run, and backwater components that provide a suitable variety of depths and current velocities in appropriate seasons;

- A suitable unimpounded stretch of flowing water of sufficient length to allow hatching and development of the larvae;

- Substrates of predominantly sand, with some patches of silt, gravel, and cobble;

- Water quality characterized by low concentrations of contaminants and natural, daily and seasonally variable temperature, turbidity, conductivity, dissolved oxygen, and pH;

- Suitable reaches of aquatic habitat, as defined by the primary constituent elements above, and adjacent riparian habitat sufficient to support an abundant terrestrial, semiaquatic, and aquatic invertebrate food base; and

- Few or no predatory or competitive nonnative fish species present.

58. Threats to the shiner and its habitat are discussed in the proposed rule. No recovery plan currently exists for the species.

2.4 Socioeconomic Profile of the Essential Shiner Habitat Area

59. This section summarizes key economic and demographic information for the counties containing essential shiner habitat, including population characteristics and general economic activity. County-level data are presented to provide context for the discussion of potential economic impacts, and to illuminate trends that may influence these impacts. Although county-level data may not precisely reflect the socioeconomic characteristics of the areas immediately surrounding essential shiner habitat, these data provide context for the broader analysis.

Population Characteristics

60. Essential shiner habitat spans 39 counties in Kansas, New Mexico, Oklahoma, and Texas. Exhibit 2-4 presents the population size, change in population from 1990 to 2000, per capita income, and poverty rates for these counties, and for each of the four states as a whole.

61. In Kansas, all counties containing essential habitat, with the exception of Sedgwick, have a lower per capita income than the state average of approximately $20,000. Eight out of the eleven counties have higher poverty rates than the State average of ten percent. The counties containing essential habitat in Kansas account for approximately 24 percent of the State population.

62. New Mexico has only one county, Quay County, that contains essential shiner habitat. Quay County comprises less than one percent of the State population and has a per capita income ($14,938) that is approximately $2,323 lower than New Mexico's State average. From 1990 to 2000, Quay County experienced a 6.2 percent decrease in population, while New Mexico overall experienced a 20.1 percent increase in population.

63. The 24 counties that contain essential shiner habitat in Oklahoma collectively account for 23 percent of the State's entire population. Cleveland County accounts for approximately six percent of the total State population. Twenty of the 24 counties have a lower population density than the State average of 50.3 persons per square mile. Fourteen of the 24 counties have a poverty rate higher than the State average of 14.7 percent.

64. In Texas, three counties contain essential habitat; each county represents less than one percent of total State population. All three counties experienced decreases in population from 1990 to 2000 and have per capita incomes that are lower than the State average of $19,617.

Exhibit 2-4

SOCIOECONOMIC PROFILE OF COUNTIES CONTAINING ESSENTIAL HABITAT FOR THE ARKANSAS RIVER SHINER

State	County	Population Density (persons/ sq mi)	Population (2000)	% of Statewide Population	% Change (1990-2000)	Per Capita Income (2000)	Poverty Rate (2000)
Kansas	**State Total**	**32.9**	**2,688,418**	**100.0%**	**8.5%**	**20,506**	**9.9%**
	Barton	31.3	28,205	1.1%	-4.0%	16,695	12.9%
	Clark	2.4	2,390	0.1%	-1.2%	17,795	12.7%
	Comanche	2.5	1,967	0.1%	-15.0%	17,037	10.2%
	Cowley	32	36,291	1.4%	-1.7%	17,509	12.9%
	Meade	4.7	4,631	0.2%	9.0%	16,824	9.3%
	Pawnee	9.6	7,233	0.3%	-4.3%	17,584	11.8%
	Reno	51	64,790	2.4%	3.8%	18,520	10.9%
	Rice	14.8	10,761	0.4%	1.4%	16,064	10.7%
	Sedgwick	448.8	452,869	16.9%	12.2%	20,907	9.5%
	Seward	35.1	22,510	0.8%	20.1%	15,059	16.9%
	Sumner	21.9	25,946	1.0%	0.4%	18,305	9.5%
Oklahoma	**State Total**	**50.3**	**3,450,654**	**100.0%**	**9.7%**	**17,646**	**14.7%**
	Beaver	3.2	5,857	0.2%	-2.8%	17,905	11.7%
	Blaine	12.8	11,976	0.4%	4.4%	13,546	16.9%
	Caddo	23.4	30,150	0.9%	2.0%	13,298	21.7%
	Canadian	96.9	87,697	2.5%	17.9%	19,691	7.9%
	Cleveland	372.3	208,016	6.0%	19.4%	20,114	10.6%
	Custer	26.1	26,142	0.8%	-2.8%	15,584	18.5%
	Dewey	4.7	4,743	0.1%	-14.6%	15,806	15.0%
	Ellis	3.3	4,075	0.1%	-9.4%	16,472	12.5%
	Grady	41.2	45,516	1.3%	9.0%	15,846	13.9%
	Harper	3.4	3,562	0.1%	-12.3%	18,011	10.2%
	Hughes	17.4	14,154	0.4%	8.8%	12,687	21.9%
	Kay	50.9	48,080	1.4%	8.5%	16,643	16.0%
	Kingfisher	15.4	13,926	0.4%	5.4%	18,167	10.8%
	Logan	45.3	33,924	1.0%	16.9%	17,8,72	12.9%
	Major	7.9	7,545	0.2%	-6.3%	17,272	12.0%
	McClain	47.9	27,740	0.8%	21.7%	18,158	10.5%
	Pittsburg	31.9	43,953	1.3%	7.3%	15,494	17.2%
	Pontotoc	48.4	35,143	1.0%	3.0%	14,664	16.5%
	Pottawatomie	82.6	65,521	1.9%	11.5%	15,972	14.6%
	Roger Mills	3	3,436	0.1%	-17.1%	16,821	16.3%
	Seminole	38.9	24,894	0.7%	-2.0%	13,956	20.8%
	Texas	9.8	20,107	0.6%	22.5%	15,692	14.1%
	Woods	7	9,089	0.3%	-0.2%	17,487	15.0%
	Woodward	14.8	18,486	0.5%	-2.6%	16,734	12.5%
Texas	**State Total**	**79.6**	**20,851,820**	**100.0%**	**22.8%**	**19,617**	**15.4%**
	Hemphill	3.7	3,351	0.0%	-9.9%	16,929	12.6%
	Oldham	1.5	2,185	0.0%	-4.1%	14,806	19.8%
	Potter	123.2	113,546	0.5%	16.1%	14,947	19.2%
New Mexico	**State Total**	**15**	**1,819,046**	**100.0%**	**20.1%**	**17,261**	**18.4%**
	Quay	3.5	10,155	0.6%	-6.2%	14,938	20.9%

Source: U.S. Census Bureau, Census 2000 and State County QuickFacts, accessed at http://quickfacts.census.gov/qfd.

Economic Activity

65. The most common economic activities in counties containing essential shiner habitat do not represent the activities most likely to experience potential impacts as analyzed in this report. Exhibit 2-5 highlights the annual payroll for various industries in the 39 counties containing essential shiner habitat. The principal industries, in terms of annual payroll, include services, retail trade, manufacturing, and construction; however, the agricultural and oil and gas industries in the region are expected to experience the principal economic impacts of the designation.

Exhibit 2-5

ECONOMIC ACTIVITY WITHIN COUNTIES CONTAINING ESSENTIAL SHINER HABITAT ANNUAL PAYROLL BY INDUSTRY (2002)

Industry	Annual Payroll ($1,000)			
	Kansas	New Mexico	Oklahoma	Texas
Forestry, fishing, hunting, and agriculture support	$1,048	$0	$967	$0
Mining	$75,858	$0	$175,682	$15,053
Utilities	$40,479	$0	$77,806	$42,217
Construction	$526,137	$2,063	$316,714	$93,024
Manufacturing	$2,990,653	$0	$613,798	$174,139
Wholesale trade	$445,014	$0	$213,474	$110,197
Retail trade	$722,755	$7,031	$588,185	$158,546
Transportation and Warehousing	$248,204	$1,294	$111,327	$42,870
Information[a]	$249,769	$0	$93,018	$54,025
Finance and insurance	$431,492	$3,239	$224,095	$140,074
Real estate	$97,738	$0	$56,650	$18,080
Services and other industries[b]	$2,960,482	$17,419	$1,612,033	$697,593
Arts, entertainment, and recreation	$39,414	$0	$32,012	$9,599
Unclassified establishments[c]	$1,177	$0	$762	$79

Notes:
(a) Information sector includes media services, such as newspaper and book publishers, cable networks, and telecommunication services.
(b) Services sector includes professional, scientific, and technical services; management of companies and enterprises; admin, support, waste management, remediation services; educational services; health care and social assistance; accommodation and food services, and other services (excluding public administration).
(c) Unclassified establishments are unclassified by NAICS codes.
Source: U.S. Census Bureau, County Business Patterns, accessed at http://censtats.census.gov/cbpnaic.shtml.

66. Exhibit 2-6 provides industry and employment data for all counties that contain essential habitat for the shiner. The "Number of Establishments" column displays the total number of physical locations at which business activities were conducted with one or more paid employees in the year 2001. Approximately 39,000 business establishments operate and employ 1,454,084 individuals in the counties containing essential habitat for the shiner.

These figures provide a measure of the average density of commercial and industrial establishments in the region.

67. The largest employment sectors within the counties containing essential habitat are services, manufacturing, and retail trade.[36] Employment within the services sector represents approximately 78 percent of the job base while employment within manufacturing constitutes approximately seven percent of all jobs in the counties. The retail trade sector accounts for nearly six percent of all jobs. As stated, this economic information does not reflect expected impacts of the proposed designation on economic activity in the region.

Exhibit 2-6

ECONOMIC ACTIVITY WITHIN COUNTIES CONTAINING ESSENTIAL SHINER HABITAT
NUMBER OF ESTABLISHMENTS AND EMPLOYEES BY INDUSTRY (2002)

Industry	Kansas		New Mexico		Oklahoma		Texas	
	Employees	Establishments	Employees	Establishments	Employees	Establishments	Employees	Establishments
Forestry, fishing, hunting, and agriculture support	156	25	10	1	493	62	375	6
Mining	1,863	288	10	1	4,841	588	426	72
Utilities	1,265	46	10	6	2,245	128	807	17
Construction	15,951	1,168	106	25	12,309	1,958	2,999	312
Manufacturing	72,420	861	60	8	25,069	714	6,201	141
Wholesale trade	12,349	1,073	60	7	7,217	845	3,212	229
Retail trade	36,656	2,837	474	58	34,476	3,112	8,168	619
Transportation and Warehousing	7,801	513	71	11	4,119	591	1,415	111
Information	7,457	285	60	7	3,390	287	1,616	70
Finance and insurance	11,455	1,265	114	21	7,908	1,103	3,511	259
Real estate	3,916	741	10	11	3,023	683	735	172
Services and other industries	1,023,502	7,766	1,129	120	88,632	8,075	27,339	1,665
Arts, entertainment, and recreation	2,916	222	10	2	2,733	210	739	53
Unclassified establishments	79	54	10	2	153	81	13	7
State Totals	1,197,786	16,884	2,134	280	196,608	18,437	57,556	3,733

Notes: The U.S. Census Bureau often presents a range of numbers to represent the number of individuals employed in a sector. In such cases, this analysis takes the average of the two numbers presented in the range.
Source: U.S. Census Bureau, 2002 County Business Patterns, accessed at http://censtats.census.gov/cbpnaic/cbpnaic.shtml.

[36] Services sectors include professional, scientific and technical services; management of companies and enterprises; admin, support, waste management, remediation services; educational services; health care and social assistance; arts, entertainment and recreation; accommodation and food services; and other services (excluding public administration).

Overview of Water Use in Essential Shiner Habitat

68. This section provides county-level water use data for counties that contain essential shiner habitat. County level data are presented to provide context for the discussion of potential economic impacts to water use resulting from shiner conversation activities, and to highlight sectors that may be most effected by these impacts. Water use data is presented separately for each state.

Oklahoma

69. Groundwater is the predominant source of water in the counties that contain essential habitat for the shiner in Oklahoma. As shown in Exhibit 2-7, irrigation is the largest user of groundwater (73 percent of total groundwater use) across all counties. Of the counties that contain essential shiner habitat, overall water use is highest in Texas (273 million gallons/day) and Caddo (60.25 million gallons/day) counties.

Kansas

70. Water use data for counties in Kansas that contain essential shiner habitat are presented in Exhibit 2-8. As shown, groundwater is used more heavily than surface water in all counties that contain essential shiner habitat, and across all activities. Moreover, irrigation is the largest consumer of groundwater, representing 85 percent of total groundwater use.

Exhibit 2-7

ESTIMATED FRESHWATER WITHDRAWALS BY COUNTY IN OKLAHOMA, 2000 (Millions of gallons/day)

	Irrigation			Water Supply			Livestock and Aquaculture			Thermoelectric Power Generation			Domestic and Commercial			Industrial and Mining			Totals		
County	Ground-water	Surface Water	Total	Ground-water	Surface Water	Total	Ground-water	Surface Water	Total	Ground-water	Surface Water	Total	Ground-water	Surface Water	Total	Ground-water	Surface Water	Total	Ground-water	Surface Water	Total
Beaver	36.98	0.23	37.21	0.56	0	0.56	5.55	0	5.55	0	0	0	0.33	0	0.33	0	0	0	43.42	0.23	43.65
Blaine	1.68	1.4	3.08	1.73	0	1.73	1.76	1.76	3.52	0	0	0	0.34	0.79	1.13	0.3	0	0.3	5.81	3.95	9.76
Caddo	38.06	2.75	40.81	1.94	7.27	9.21	1.28	2.21	3.5	0.18	5.71	5.9	0.83	0.01	0.84	0.01	0	0.01	42.3	17.95	60.25
Canadian	2.37	1.05	3.42	4.43	0	4.43	0.25	1.93	2.18	1.44	0	1.44	0.12	0.78	0.9	0.17	0	0.17	8.78	3.76	12.54
Cleveland	0.13	0.33	0.45	8.89	15.66	24.55	0.07	0.67	0.74	0	0	0	2.07	0.33	2.4	0.02	0	0.02	11.18	16.99	28.17
Custer	3.53	0.89	4.42	2.75	1.35	4.1	0.41	1.14	1.55	0	0	0	0.01	0	0.01	0.04	0	0.04	6.74	3.38	10.12
Dewey	2.17	0.16	2.33	0.24	0	0.24	0.34	1.01	1.35	0	0	0	0.08	0	0.08	0.09	0	0.09	2.92	1.17	4.09
Ellis	42.26	0.09	42.55	0.69	0	0.69	2.48	0.14	2.62	0	0	0	0.13	0	0.13	0	0	0	45.56	0.23	45.79
Grady	6.15	6.49	12.64	1.51	0.1	1.61	0.43	3.6	4.03	0	0	0	0.97	0.28	1.25	0	0	0	9.06	10.47	19.53
Harper	3.71	6.88	10.59	0.92	0	0.92	2.61	0	2.61	0	0	0	0.07	0.36	0.42	0	0	0	7.31	7.24	14.55
Hughes	0.95	2.79	3.74	0.25	1.61	1.86	0.37	2.04	2.4	0	0	0	0.2	0.15	0.36	0	0	0	1.77	6.59	8.36
Kingfisher	3.85	0.36	4.21	3.5	3.23	6.73	1.16	2.04	3.2	0	0	0	0.35	0.05	0.4	0.05	0	0.05	8.91	5.68	14.59
Logan	0.06	0.57	0.63	1.01	1.33	2.34	0.12	1.16	1.28	0	0	0	1.19	0	1.19	0.95	1.38	2.33	3.33	4.44	7.77
Major	7.69	0.04	7.73	4.78	0	4.78	3.54	0	3.54	0	0	0	0.18	0	0.18	0	0	0	16.19	0.04	16.23
McClain	0.94	0.75	1.7	1.44	0.2	1.64	0.14	1.18	1.32	0	0	0	0.72	0	0.72	0	0	0	3.24	2.13	5.37
McIntosh	0	0	0	0.17	3.33	3.5	0.18	1.63	1.81	0	0	0	0	0.08	0.08	0	0	0	0.35	5.04	5.39
Pittsburg	0.04	0.21	0.25	0.04	7.32	7.36	0.21	2.09	2.3	0	0	0	0.01	0	0.01	0	1.39	1.39	0.3	11.01	11.31
Pontotoc	0.58	0.49	1.07	1.49	3	4.49	0.13	1.33	1.46	0.55	0	0.55	0.04	0	0.04	1.03	0.01	1.05	3.82	4.83	8.65
Pottawatomie	0.08	0.85	0.93	0.75	5.07	5.82	0.18	1.42	1.6	0	0	0	1.75	0	1.75	0.06	0	0.06	2.82	7.34	10.16
Roger Mills	4.82	1.15	5.97	0.37	0.22	0.59	0.38	1.13	1.5	0	0	0	0.03	0.13	0.16	0	0	0	5.6	2.63	8.23
Seminole	0.24	0.07	0.31	1.84	0.74	2.58	0.13	0.84	0.97	0	11.89	11.89	0.41	0	0.41	0	0	0	2.62	13.54	16.16
Texas	253.57	0.2	253.77	6.23	0	6.23	12.22	0	12.22	0	0	0	0.34	0	0.34	0.05	0	0.05	272.41	0.2	272.61
Woods	1.48	0.05	1.53	1.98	0	1.98	1.87	0	1.87	0	0	0	0.01	0	0.01	0	0	0	5.34	0.05	5.39
Woodward	4.93	0.55	5.48	6.17	0.17	6.34	2.76	0	2.76	0.97	0	0.97	0.02	0.03	0.05	0.28	0	0.28	15.13	0.75	15.88
Total	566.35	151.25	717.59	112.99	562.45	675.44	53.85	113.38	167.23	3.27	143.18	146.45	28.16	8.84	36.99	9.07	19.35	28.41	773.69	998.45	1,772.14

Source: Robert L. Tortorelli, Estimated Freshwater Withdrawals in Oklahoma, 2000, USGS, accessed at http://ok.water.usgs.gov/wateruse/cototals-00.html on January 27, 2005.

Exhibit 2-8

WATER WITHDRAWALS BY COUNTY IN KANSAS, 2002 (Acre-feet)

			Domestic		Industrial		Irrigation		Municipal		Recreation		Stockwater		Other		Total		Irrigated Acres	
County	# Water Rights	# Diversions	Surface Water	Ground-water	Surface Water	Ground-water	Surface Water	Ground-water	Surface Water	Ground-water	Surface Water	Ground-water	Surface Water	Ground-water	Surface Water	Ground-water	Surface Water	Ground-water	Surface Water	Ground-water
Barton	326	358	0	0	0	951.82	0	30,665	0	678.78	434	0	0	271.79	0	341.66	434	32,908.7	0	28,139
Clark	37	44	0	0	0	3.62	0	1,749.6	0	335.1	0	0	0	182.62	0	0	0	2,270.94	0	1,416
Comanche	2	4	0	0	0	35.09	0	0	0	0	0	0	0	8.2	0	0	0	43.29	0	0
Cowley	54	87	233.24	0	0	575.48	355	1,804	0	4,842.1	320.5	99	0	0	0	4,685.4	908.74	12,005.9	512	1,792.42
Meade	59	57	0	0	0	0	0	8,305.9	0	0	0	55.02	0	242.63	0	0	0	8,603.54	0	5,983
Pawnee	459	534	0	0	0	179.91	0	54349	0	1128.1	0	0	0	693.63	0	344.56	0	56,695.3	0	45,182
Reno	305	387	0	9.45	0	13683	0	15,811	0	4,923.9	0	86.85	0	13.34	0	1,869.8	0	36,396.7	0	15,901
Rice	70	188	0	0	0	18.62	0	6,806.3	0	19.6	0	0	0	20.22	0	147.31	0	7,012.02	0	6,241
Sedgwick	711	820	0	1.02	0	8994	192.51	32,585	0	6,939.4	0	1,287.2	0	0.32	0	7,028.9	192.51	56,835.6	363	31,814
Seward	699	678	0	17.06	0	3,955.8	0	204,560	0	4,657.5	0	380.27	0	2,032.8	0	1.15	0	215,604	0	131,853
Sumner	86	121	0	3.68	0	11	553.58	4,167.2	0	334.41	6.44	4.13	0	0	0	369.67	560.02	4,890.08	583	4,094

Source: Water Rights and Points of Diversions Report Sheets, Kansas Water Office.

71. Exhibit 2-9 presents water use data for the three counties in Texas that contain essential habitat for the shiner. In Hemphill and Oldham counties, irrigation and livestock comprise the majority of water use (85 and 88 percent in total, respectively). In Potter county, however, municipal and steam electric consumers of water consume the largest percentage (44 percent for municipal use and 31 percent for steam electric use).

Exhibit 2-9

WATER USE SURVEY SUMMARY ESTIMATES BY COUNTY (ACRE-FEET, SURFACE AND GROUNDWATER, 2001)

Category	Hemphill	% of Total	Oldham	% of Total	Potter	% of Total
Municipal	619	14.55%	412	6.91%	25,620	43.96%
Manufacturing	2	0.05%	0	0.00%	5,494	9.43%
Mining	0	0.00%	292	4.90%	236	0.40%
Steam Electric	0	0.00%	0	0.00%	18,018	30.92%
Irrigation	2,349	55.23%	3,994	66.96%	8364	14.35%
Livestock	1,283	30.17%	1,267	21.24%	542	0.93%
Total	4,253	100.00%	5,965	100.00%	58,274	100.00%

Source: Texas Water Development Board, 2001 Water Use Survey Summary Estimates by County, accessed at http://www.twdb.state.tx.us/data/popwaterdemand/2003Projections/HistoricalWaterUse/2001WaterUseSurvey.asp on February 2, 2005.

72. Water use data for Quay county, New Mexico, are presented in Exhibit 2-10. As shown, irrigated agriculture relies primarily on surface water supply while livestock operations rely on groundwater supply. Overall, irrigated agriculture accounts for the largest percentage of total water withdrawals (76%).

Exhibit 2-10

SUMMARY OF WATER USE IN QUAY COUNTY, NEW MEXICO (ACRE-FEET, 2000)

Category	Surface Water Withdrawal	Groundwater Withdrawal	Total Withdrawals	% of Total Withdrawals
Commercial (self-supplied)	0	10.54	10.54	0.01%
Domestic (self-supplied)	0	138.27	138.27	0.09%
Industrial (self-supplied)	0	0	0	0.00%
Irrigated Agriculture	107,954	6,546	114,500	76.01%
Livestock (self-supplied)	86.5	791.9	878.4	0.58%
Mining (self-supplied)	0	0	0	0.00%
Power (self-supplied)	0	0	0	0.00%
Public Water Supply	0	2,172.44	21,72.44	1.44%
Reservoir Evaporation	32,938	0	32,938	21.87%
Total	140,978.5	9,659.15	150,637.65	100.00%

Source: New Mexico Water Use Data 2000 by County, accessed at http://www.seo.state.nm.us/water-info/water-use/county00/mcounty.html on February 2, 2005.

Overlap with Other Endangered Species

73. The Service has conducted past consultations on the shiner in combination with numerous species, as indicated in Exhibit 2-11. Generally, if a consultation is undertaken for any listed species, the consultation process also takes into account the presence of all other listed species known to inhabit areas on or near the project lands. As a result, listing or critical habitat designation and related protections for other threatened and endangered species may benefit the shiner as well. However, due to the difficulty in apportioning the costs of consultations between various species as well as awareness that a consultation for the shiner would be required absent consultations for or involving other species, this analysis does not attempt to apportion the consultations and related costs reported by Action agencies between the shiner and other listed species, and assumes that all future section 7 consultations within the extant boundaries of the proposed critical are fully attributable to the presence of the shiner and its habitat. At the same time, it should be recognized that these multi-species consultations likely would have occurred absent the shiner listing. Therefore, these costs are cumulative, not additive.[37]

Exhibit 2-11

OTHER LISTED SPECIES INCLUDED IN PAST SERVICE CONSULTATIONS ON THE ARKANSAS RIVER SHINER

Species	Status
Interior Least Tern	Endangered
Bald Eagle	Threatened
Whooping Crane	Endangered

Overview of Regional Agriculture Industry

74. Given the importance of agriculture to the regional economy, this section provides an overview of the agriculture industry in the counties and states that contain essential habitat for the shiner. The section discusses the geography, climate, and general agricultural production patterns of the region, including livestock operations, and provides general context for potential economic impacts to agricultural activities associated with shiner protection as estimated in Sections 6 and 7 of this report.

Geography, Climate and General Agricultural Production Patterns

75. The region containing essential shiner habitat is quite diverse with respect to geography, climate, and general agricultural production systems. The altitude of the region rises subtly but persistently from east to west. The eastern end of the region is roughly 800 feet in elevation and the western extent of the region in the Oklahoma and Texas Panhandles

[37] The Service has noted that essential shiner habitat overlaps significantly with interior least tern habitat in Unit 3 of the proposed designation; however, following the methodology outlined in this paragraph, the analysis attributes all conservation-related costs in Unit 3 to the shiner under the assumption that in the absence of the tern, costs would be incurred for shiner protection. Written Service comments, Tulsa Field Office, April 19, 2005.

are over 4,000 feet in elevation. Annual rainfall ranges from over 45 inches in the east to less than 20 inches in the west.

76. The region can be divided into three sub-regions in terms of agricultural production. The eastern region is bounded on the west by Interstate 35 and includes all the lower reaches of the Canadian River in Oklahoma, as well as the lower Arkansas River in Kansas. The central region includes the area bounded on the east by Interstate 35 and bounded on the west by U.S. Highway 183. This region includes a large portion of the Cimarron, North Canadian, and Canadian River areas of Oklahoma. The central region also includes several counties in Kansas that contain the Arkansas River. The western region includes those counties west of U.S. Highway 183 including counties in Texas and New Mexico as well as counties in Oklahoma and Kansas along the Cimarron River. Each of these regions is discussed briefly in the paragraphs that follow.

77. The eastern region includes a part of Oklahoma referred to as the Cross-Timbers, and is an area of rough terrain with shallow soils and a relatively high prevalence of brush and trees. Agriculture in the region is dominated by pasture and hay production with limited crop production (mostly wheat) in creek bottoms and meadows. The region exhibits considerable use of improved (planted) pastures, including Bermuda and Fescue grass. Beef cow-calf production is the most important agricultural activity in this region. In Kansas, the eastern region of essential shiner habitat includes portions of Sedgwick, Sumner, and Cowley counties. Agricultural production in this area of Kansas is characterized by a mix of native grass, improved pasture (used primarily for cow-calf production), and considerable crop production (mostly dryland). Historically, the dominant crop has been wheat; however, in recent years grain sorghum production has increased and there is interest in cotton production as well.

78. The central region of essential shiner habitat consists of portions of Oklahoma and Kansas known as the Wheat Belt. The topography is mostly gently rolling, open fields, consisting of a mosaic of pasture and cropland. The area is an important region of dryland winter wheat production, with some grain sorghum, pasture, and hay production as well as limited acreages of other crops. The region is also an important stocker cattle production area. Summer stocker cattle production involves placing lightweight calves on summer grass through the summer growing season. Winter stocker cattle production relies on a system that is unique to this southern plains region, the dual-purpose production of winter wheat, in which wheat is grazed as a high quality forage from November to early March and subsequently harvested for grain. Additionally, a significant quantity of planted wheat acres is not harvested because the wheat is grazed-out as a forage crop (the stocker cattle are left on the wheat for grazing through May). In most stocker programs, the cattle are brought in as weaned calves and sold as feeder cattle usually to be placed in feedlots for finishing. There is also a significant quantity of beef cow-calf production in this zone, which uses the smaller acreage pastures not suitable for cropping (e.g., due to rough terrain, proximity to streams).

79. U.S. Highway 183 approximately represents the natural boundary between mixed prairie zones to the east and shortgrass prairie to west (a historical designation based on the

predominant natural vegetative cover, which is in turn dictated by historical annual rainfall). The western region includes a much higher proportion of native rangeland used for cow-calf and stocker cattle production. The area includes winter stocker grazing wheat as well as summer stocker grazing native range. Dryland crop production in the region often requires a crop-fallow rotation to accumulate sufficient moisture for crop production. Winter wheat and grain sorghum are the most important dryland crops in the region, however interest in cotton and other alternative crops is increasing. Due to the High Plains/Ogallala Aquifer, this region includes most of the irrigation located within essential habitat.

80. Exhibit 2-12 presents an agricultural profile of counties that contain essential habitat for the shiner.

Exhibit 2-12

AGRICULTURAL PROFILE OF COUNTIES CONTAINING ESSENTIAL SHINER HABITAT

		Farms Statistics				Market Value of Production (MVP)					Land Use		
State	County	Number of farms	% change 1997-2002	Land in farms (acres)	Average size of farm (acres)	Total ($1,000)	Crops ($1,000)	Livestock ($1,000)	Average per farm	State Rank	% Cropland	% Pasture	% Other
Kansas	**State Total**	**64,414**	**-2**	**47,227,944**	**733**	**8,746,244**	**2,418,447**	**6,327,797**	**135,782**		**62.55**	**32.83**	**4.62**
	Barton	772	-4	650,065	842	171,158	44,956	126,203	221,708	11	74.84	21.67	3.49
	Clark	302	9	491,756	1,628	97,872	5,035	92,837	324,080	28	39.33	59.25	1.42
	Comanche	274	-1	447,029	1,631	25,755	D	D	93,998	95	38.34	59.85	1.81
	Cowley	1,004	-3	690,125	687	62,405	22,834	39,571	62,157	43	41.54	54.01	4.45
	Meade	454	6	610,749	1,345	106,087	42,814	63,273	233,673	23	55.74	42	2.26
	Pawnee	430	-4	520,360	1,210	139,484	31,283	108,202	324,383	14	69.53	28.61	1.87
	Reno	1,570	1	735,132	468	111,670	55,286	56,384	71,127	19	72.38	23.9	3.71
	Rice	500	-10	416,224	832	105,787	33,495	72,292	211,575	24	74.85	21.88	3.27
	Sedgwick	1,355	-17	533,871	394	75,424	48,141	27,283	55,664	37	76.75	19.71	3.55
	Seward	350	32	362,682	1,036	276,113	31,007	245,106	788,894	7	66.91	30.2	2.89
	Sumner	1,072	-21	732,406	683	77,863	57,845	20,019	72,634	35	84.67	11.48	3.85
Oklahoma	**State Total**	**83,300**	**-1**	**33,661,826**	**404**	**4,456,404**	**819,078**	**3,637,326**	**53,498**		**44.1**	**46.74**	**9.16**
	Beaver	960	18	1,018,626	1,061	119,841	7,709	112,132	124,835	7	38.8	58.67	2.53
	Blaine	825	-12	537,314	651	77,215	18,757	58,458	93,594	14	56.47	38.83	4.71
	Caddo	1,504	-8	710,833	473	88,896	33,284	55,611	59,106	10	54.22	38.45	7.33
	Canadian	1,360	1	500,872	368	84,799	22,550	62,249	62,352	12	61.4	34.2	4.4
	Cleveland	1,294	6	165,483	128	13,222	4,195	9,027	10,218	75	46.98	35.82	17.2
	Custer	802	-8	544,615	679	44,457	14,733	29,724	55,432	34	52.17	D	0.18
	Dewey	774	-1	584,368	755	26,137	6,770	19,366	33,768	53	34.99	61.01	4
	Ellis	727	9	672,764	925	42,566	4,113	38,452	58,550	35	27.17	71.15	1.68
	Grady	1,804	-1	601,607	333	95,632	13,400	82,232	53,011	8	44.3	48.9	6.8
	Harper	517	6	601,162	1,163	142,047	3,335	138,712	274,752	5	34.04	64.85	1.11
	Hughes	955	-3	374,192	392	54,665	2,251	52,415	57,241	27	33.41	45.93	20.66
	Kingfisher	1,063	-3	552,561	520	88,192	20	68,192	82,965	11	67.31	28.48	4.21
	Logan	1,205	7	365,671	303	41,461	9,933	31,528	34,408	36	48.84	40.21	10.96
	Major	879	-10	508,689	579	72,427	10,185	62,242	82,398	16	50.03	42.92	7.05
	McClain	1,273	6	307,330	241	34,853	9,326	25,527	27,379	42	43.36	48.07	8.57
	McIntosh	944	-7	266,403	282	17,559	2,119	15,440	18,601	69	40	42	18
	Pittsburg	1,687	-6	505,047	299	29,901	4,596	25,304	17,724	46	31.68	42.09	26.24
	Pontotoc	1,368	6	368,306	269	26,011	2,108	23,903	19,014	54	38.68	48.05	13.27
	Pottawatomie	1,663	0.18	343,119	206	21,842	4,697	17,145	13,134	63	42.29	39.89	17.82
	Roger Mills	677	-4	738,683	1,091	27,294	2,308	24,986	40,316	51	24.58	73.53	1.89
	Seminole	1,167	0.085	279,262	239	18,483	2,476	16,007	15,838	67	41.95	41.44	16.62
	Texas	1,002	14	1,181,025	1,179	662,508	53,388	609,120	661,186	1	59.08	38.41	2.52
	Woods	761	-3	816,386	1,073	55,551	8,941	46,610	72,997	26	38.67	59.65	1.67
	Woodward	842	-4	726,473	863	67,263	3,676	63,587	79,885	21	28.33	69.76	1.91
Texas	**State Total**	**228,926**	**0.33**	**129,877,666**	**567**	**14,134,744**	**3,731,751**	**10,402,993**	**61,744**		**29.76**	**64.22**	**6.02**
	Hemphill	239	-6	546,373	2,286	92,490	463	92,027	386,988	31	15	84.19	0.81
	Oldham	136	-11	936,390	6,885	65,949	2,329	63,619	484,917	46	13.1	86.25	0.65
	Potter	305	11	521,824	1,711	19,490	1,314	18,175	63,900	155	13.34	85.91	0.75
New Mexico	**State Total**	**15,170**	**-15**	**44,810,083**	**2,954**	**1,700,030**	**397,257**	**1,302,773**	**112,065**		**5.75**	**87.34**	**6.92**
	Quay	594	-12	1,651,616	2,780	23,137	2,736	20,401	38,951	12	14.93	84.23	0.84

Source: 2002 Census of Agriculture, National Agricultural Statistics Service, United States Department of Agriculture.
(D) = Cannot be disclosed.

Irrigated Agriculture

81. Most of the irrigated crop production in essential habitat is located along the Cimarron and North Canadian River drainages in the Oklahoma panhandle and southwestern Kansas. Principal irrigated crops include corn, alfalfa hay, grain sorghum, winter wheat, and corn silage, though soybeans and more recently cotton may be found in the crop rotation mix. The area includes numerous cattle feedlots and, more recently, swine production facilities (discussed below). Irrigation in the region is based on groundwater from the Ogallala (High Plains) aquifer and is primarily delivered to crops through center pivot irrigation systems. Irrigation accounts for a majority of harvested crop acres in some of the counties in this region.

82. The southern end of the central region also includes a sizable area of irrigated crop production. Located mostly in Caddo and Grady counties in Oklahoma, the area includes production of irrigated peanuts and alfalfa hay along with some corn and upland cotton.

83. Exhibit 2-13 summarizes irrigation in the counties that contain essential shiner habitat.

Exhibit 2-13

IRRIGATION PROFILE OF COUNTIES THAT CONTAIN ESSENTIAL SHINER HABITAT

State	County	Total Cropland (acres)	Harvested Cropland (acres)	Cropland Used Only for Pasture or Grazing (acres)	Pastureland and Rangeland, other than cropland pasture (acres)	Woodland Pastured (acres)	Pastureland - all types (acres)	Irrigated Land - Harvested Cropland (acres) (1)	% of Harvested Cropland Irrigated	Irrigated Land - Pastureland and other land (acres)	% of Pastureland irrigated
Kansas	**State Total**	**29,542,022**	**18,976,719**	**2,401,459**	**15,504,008**	**356,223**	**18,261,690**	**2,665,750**	**14.05%**	**12,527**	**0.07%**
	Barton	486,510	343,096	31,684	140,883	732	173,299	(D)	N/A	(D)	N/A
	Clark	193,412	63,523	34,477	291,357	-	325,834	6,385	10.05%	-	N/A
	Comanche	171,390	73,479	16,198	267,550	956	284,704	5,606 (1997)	7.63%	360 (1997)	0.13%
	Cowley	286,696	209,065	59,112	372,734	5,079	403,342	4,133	1.98%	-	N/A
	Meade	340,423	191,805	(D)	256,509	(D)	276,002	102,685	53.54%	920	0.33%
	Pawnee	361,782	230,709	(D)	148,856	(D)	166,555	65,856 (1997)	28.55%	2986 (1997)	1.79%
	Reno	532,119	397,103	34,243	175,720	1,324	211,287	41,895	10.55%	219 (1997)	0.10%
	Rice	311,530	247,552	11,637	91,069	1,521	104,227	16,384	6.62%	(D)	N/A
	Sedgwick	409,741	354,393	32,645	105,201	1,571	139,417	28,598 (1997)	8.07%	407 (1997)	0.29%
	Seward	242,675	136,820	(D)	109,543	(D)	124,154	79,741 (1997)	58.28%	1460 (1997)	1.18%
	Sumner	620,129	537,273	53,191	84,103	2,877	140,171	7,552	1.41%	(D)	N/A
Oklahoma	**State Total**	**14,843,357**	**7,705,860**	**5,050,399**	**15,732,765**	**1,638,323**	**22,421,487**	**517,553**	**6.72%**	**46,610**	**0.21%**
	Beaver	395,247	106,399	84,939	597,626	2,464	685,029	19,613	18.43%	3,285	0.48%
	Blaine	303,410	198,074	84,047	208,613	15,674	308,334	(D)	N/A	(D)	N/A
	Caddo	385,415	235,514	124,486	273,321	27,492	425,299	34,121	14.49%	3,533	0.83%
	Canadian	307,552	201,010	93,425	171,134	7,419	271,978	4,095	2.04%	594	0.22%
	Cleveland	77,737	36,064	36,992	59,282	14,751	111,025	375	1.04%	1,869	1.68%
	Custer	284,129	174,681	78,109	(D)	(D)	329,472	3,041	1.74%	538	0.16%
	Dewey	204,487	106,180	60,071	356,531	13,775	430,377	1,504	1.42%	265	0.06%
	Ellis	182,789	57,570	56,664	478,670	1,610	536,944	10,242	17.79%	1,860	0.35%
	Grady	266,594	153,207	100,136	294,200	17,810	412,146	7,691	5.02%	260	0.06%
	Harper	204,620	43,543	52,350	389,883	450	442,683	6,058	13.91%	960	0.22%
	Hughes	125,002	47,857	70,900	171,875	53,897	296,672	2,646	5.53%	290	0.10%
	Kingfisher	371,906	243,241	112,701	157,372	6,027	276,100	2,853	1.17%	1,952	0.71%
	Logan	178,586	89,510	75,870	147,037	21,688	244,595	2,715	3.03%	284	0.12%
	Major	254,522	133,840	72,804	218,317	18,633	309,754	7,470	5.58%	846	0.27%
	McClain	133,271	63,538	62,646	147,721	11,322	221,689	1,096	1.72%	196	0.09%
	McIntosh	106,146	50,355	51,654	111,882	30,239	193,775	(D)	N/A	(D)	N/A

Exhibit 2-13

IRRIGATION PROFILE OF COUNTIES THAT CONTAIN ESSENTIAL SHINER HABITAT

State	County	Total Cropland (acres)	Harvested Cropland (acres)	Cropland Used Only for Pasture or Grazing (acres)	Pastureland and Rangeland, other than cropland pasture (acres)	Woodland Pastured (acres)	Pastureland - all types (acres)	Irrigated Land - Harvested Cropland (acres) (1)	% of Harvested Cropland Irrigated	Irrigated Land - Pastureland and other land (acres)	% of Pastureland irrigated
	Pittsburg	159,989	63,969	87,358	212,572	85,240	385,170	628	0.98%	424	0.11%
Oklahoma	Pontotoc	142,472	50,685	86,426	176,963	29,272	292,661	748	1.48%	238	0.08%
	Pottawatomie	145,093	66,631	68,016	136,869	33,536	238,421	982	1.47%	65	0.03%
	Roger Mills	181,586	49,240	94,081	543,126	2,261	639,468	3,431	6.97%	1,150	0.18%
	Seminole	117,152	41,358	69,024	115,715	29,041	213,780	(D)	N/A	(D)	N/A
	Texas	697,744	276,672	(D)	453,574	(D)	537,006	152,225	55.02%	9,344	1.74%
	Woods	315,735	156,926	68,737	487,003	1,413	557,153	2,012	1.28%	206	0.04%
	Woodward	205,806	72,311	77,695	506,762	2,445	586,902	4,424	6.12%	1,044	0.18%
Texas	**State Total**	**38,657,710**	**17,750,938**	**12,937,991**	**83,402,865**	**4,202,337**	**100,543,193**	**4,571,339**	**25.75%**	**503,299**	**0.50%**
	Hemphill	81,950	16,331	44,639	459,973	110	504,722	1,701	10.42%	1,136	0.23%
	Oldham	122,671	14,541	35,443	807,600	-	843,043	5,639	38.78%	2,600	0.31%
	Potter	69,591	(D)	(D)	448,322	(D)	464,075	4,369	N/A	532	0.11%
New Mexico	**State Total**	**2,575,107**	**856,166**	**821,547**	**39,136,229**	**1,739,507**	**41,697,283**	**654,172**	**76.41%**	**190,627**	**0.46%**
	Quay	246,558	38,007	56,802	1,391,209	837	1,448,848	16,243	42.74%	13,441	0.93%

Notes:
(D) = Cannot be disclosed.
(1) Of the counties included in essential habitat in Kansas, acreage for pastureland and other land was only reported for Meade county, Kansas which reported 920 acres of irrigated pasture and other land in 2002. Where 2002 data is not reported by county, 1997 data is used and noted.
Source: 2002 Census of Agriculture, National Agricultural Statistics Service, United States Department of Agriculture.

Overview of Regional Animal Feeding Industry

84. Animal feeding operations in essential shiner habitat consist of cattle feedlots, swine production facilities, and dairies. Exhibit 2-14 summarizes the number and type of animal feeding operations in the counties that contain essential habitat.[38]

Exhibit 2-14

ANIMAL FEEDING OPERATIONS IN COUNTIES THAT CONTAIN ESSENTIAL SHINER HABITAT

State	County	Cattle Feedlots (112112)[1]	Beef Cattle Ranching and Farming (112111)	Dairy Cattle and Milk Production (1121)	Hogs and Pig Farming (1122)	Poultry and Egg Production (1123)	Sheep and Goat Farming (1124)	Total Animal Feeding Operations
Oklahoma	**State**	**1,799**	**49,043**	**1,037**	**940**	**1,504**	**1,426**	**55,749**
	Beaver	8	424	6	22	0	3	463
	Blaine	8	466	4	8	1	5	492
	Caddo	13	921	8	18	1	14	975
	Canadian	26	730	14	21	5	32	828
	Cleveland	55	622	12	16	27	34	766
	Custer	4	446	10	4	2	10	476
	Dewey	5	495	4	2	1	6	513
	Ellis	3	366	9	5	0	2	385
	Grady	22	1,141	61	27	1	59	1,311
	Harper	7	276	2	6	0	5	296
	Hughes	25	643	7	28	7	10	720
	Kingfisher	23	617	15	6	1	7	669
	Logan	24	672	11	12	8	35	762
	McClain	55	718	21	21	11	25	851
	McIntosh	19	633	13	6	7	4	682
	Major	16	495	12	11	4	18	556
	Pittsburg	50	1,246	25	13	24	9	1,367
	Pontotoc	22	859	19	10	11	24	945
	Pottawatomie	50	951	11	26	17	35	1,090
	Roger Mills	5	495	13	4	2	0	519
	Seminole	39	792	8	10	5	13	867
	Texas	15	256	5	15	0	4	295
	Woods	7	391	2	12	2	6	420
	Woodward	11	588	3	7	2	14	625
	Total CHD	**512**	**15,243**	**295**	**310**	**139**	**374**	**16,873**
Kansas	**State**	**1,506**	**20,314**	**608**	**634**	**299**	**497**	**23,858**
	Barton	12	158	4	7	4	6	191
	Clark	8	101	0	2	2	1	114
	Comanche	6	132	0	0	0	0	138
	Cowley	24	376	6	15	12	17	450

[38] Concentrated animal feeding operations (CAFOs) are a subset of animal feeding operations (AFOs) subject to significant regulatory oversight due to their size and/or potential to pollute waterways of the United States. Exhibit 2-14 presents animal feeding operations in the counties that contain essential habitat for the shiner; some but not all of these will be CAFOs.

Exhibit 2-14

ANIMAL FEEDING OPERATIONS IN COUNTIES THAT CONTAIN ESSENTIAL SHINER HABITAT

State	County	Cattle Feedlots (112112)[1]	Beef Cattle Ranching and Farming (112111)	Dairy Cattle and Milk Production (1121)	Hogs and Pig Farming (1122)	Poultry and Egg Production (1123)	Sheep and Goat Farming (1124)	Total Animal Feeding Operations
Kansas	Meade	15	96	3	2	0	4	120
	Pawnee	7	77	2	4	0	6	96
	Reno	23	248	58	11	9	24	373
	Rice	14	88	2	10	1	5	120
	Sedgwick	21	247	33	10	10	11	332
	Seward	9	81	1	2	3	2	98
	Sumner	10	216	12	6	4	9	257
	Total CHD	**149**	**1,820**	**121**	**69**	**45**	**85**	**2,289**
Texas	**State**	**5,035**	**127,974**	**1,221**	**1,760**	**3,032**	**8,786**	**147,808**
	Hemphill	3	162	0	7	0	2	174
	Oldham	4	43	1	2	1	1	52
	Potter	9	124	2	23	11	8	177
	Total CHD	**16**	**329**	**3**	**32**	**12**	**11**	**403**
New Mexico	**State**	**142**	**5,395**	**185**	**96**	**116**	**344**	**6,278**
	Quay	8	303	0	3	2	11	327
TOTAL IN CHD		**685**	**17,695**	**419**	**414**	**198**	**481**	**19,892**

Notes: (1) NAICS codes were informed by potentially regulated entities under the February 2003 NPDES Rule governing CAFOs, U.S. EPA, *National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations (CAFOs), Final Rule,* Federal Register, Vol. 68, No. 29, February 12, 2003.

Source: 2002 Census of Agriculture, USDA.

85. Numerous cattle feedlots are located in the Oklahoma panhandle and in Seward, Mead, and Clark counties in Kansas (the western region of essential shiner habitat). This area includes several large feeding operations with one-time capacities ranging from 10,000 to 60,000 head (and a few that are larger). In Kansas there are several large feedlots in the central region of essential habitat, including operations in Pawnee, Barton, Rice, and Reno counties. Oklahoma marketed over 730,000 head of fed cattle in 2004 with more than 90 percent originating in the areas of essential habitat. Kansas markets over 5 million head of cattle from feedlots annually, however a smaller percentage of total marketings are attributable to feedlots in essential habitat. Exhibit 2-15 presents livestock industry information for the counties that contain essential habitat for the shiner.

Exhibit 2-15

SUMMARY OF LIVESTOCK INDUSTRY IN COUNTIES CONTAINING ESSENTIAL SHINER HABITAT

State	County	Total Cattle and Calves	Cattle and Calves Sold (Number)	Cattle and Calves Sold ($1,000)	Average Price/Head ($1,000)	Total Hogs and Pigs	Hogs and Pigs Sold (Number)	Hogs and Pigs Sold ($1,000)	Average Price/Head ($1,000)	Total Poultry	Poultry Sold (Number)	Poultry and Eggs Sold ($1,000)	Total Livestock Sold (Number)[2]	Total Livestock Sold ($1,000)[3]
Oklahoma	**State**	**5,324,240**	**4,218,687**	**2,448,916**	**0.58**	**2,246,926**	**7,264,319**	**462,849**	**0.06**	**44,129,713**	**245,499,004**	**508,373**	**256,982,010**	**3,637,326**
	Beaver	92,197	116,770	79,344	0.68	154,517	513,356	32,271	0.06	218			630,126	112,132
	Blaine	93,073	88,088	57,209	0.65	507	807	56	0.07				88,895	58,458
	Caddo	134,363	80,220	44,196	0.55	23,908	176,569	10,289	0.06	742	56		256,845	55,611
	Canadian	100,415	91,883	57,505	0.63	8,772	11,866	1,224	0.10	1,217	126	18	103,875	62,249
	Cleveland	26,522	15,263	6,607	0.43	2,267	4,621	308	0.07	4,262	2,949	65	22,833	9,027
	Custer	75,083	49,340	27,120	0.55					458		47	49,340	29,724
	Dewey	62,057	36,653	18,725	0.51	254	493			757	68	29	37,214	19,366
	Ellis	62,954	51,842	32,050	0.62	12,290	158,049	5,445	0.03	269	24		209,915	38,452
	Grady	130,007	82,115	41,150	0.50	18,639	111,074	5,015	0.05	1,639	908	9	194,097	82,232
	Harper	84,598	133,574							268		2	133,574	138,712
	Hughes	61,307	37,846	18,548	0.49	149,488	948,736	33,265	0.04	1,386	400	9	986,982	52,415
	Kingfisher	123,299	104,850	58,330	0.56					1,140	177	2	105,027	68,192
	Logan	67,012	47,042	28,616	0.61	454	1,466	54	0.04	1,484	674	11	49,182	31,528
	McClain	58,730	40,587	21,263	0.52	5,485				2,291	666		41,253	25,527
	McIntosh	50,534	27,851							354			27,851	15,440
	Major	92,565	70,433	38,791	0.55					1,394	96	14	70,529	62,242
	Pittsburg	87,676	46,635	22,105	0.47	713	1,874			20,133	516		49,025	25,304
	Pontotoc	59,789	29,913	15,199	0.51					2,108	238	18	30,151	23,903
	Pottawatomie	47,023	22,081	10,310	0.47	7,052	54,711	3,820	0.07	3,125	782	22	77,574	17,145
	Roger Mills	65,120	43,910	22,966	0.52	310	320	27	0.08	513	250	5	44,480	24,986
	Seminole	40,580	21,992			20,680	76,542	4,546	0.06	1,776	1,647	19	100,181	16,007
	Texas	232,756	544,772	413,815	0.76	1,073,134	2,081,878	194,439	0.09	752			2,626,650	609,120
	Woods	99,491	78,875	45,678	0.58	297	1,401	58	0.04	214		4	80,276	46,610
	Woodward	79,599	53,528							842	77		53,605	63,587
	Total CHD	**2,026,750**	**1,916,063**	**1,059,527**	**0.56**	**1,478,767**	**4,143,763**	**290,817**	**0.06**	**47,342**	**9,654**	**274**	**6,069,480**	**1,687,969**
Kansas	**State**	**6,321,138**	**8,044,209**	**5,715,204**	**0.71**	**1,520,996**	**3,512,384**	**297,505**	**0.08**	**1,713,046**	**9,031,860**		**20,588,453**	**6,327,797**
	Barton	110,254	166,535	123,056	0.74	6,475	19,996	1,753	0.09	704			186,531	126,203
	Clark	72,583	119,217	92,707	0.78	34	88	10	0.11	129			119,305	92,837
	Comanche	41,183	34,011	19,807	0.58								34,011	
	Cowley	66,299	65,889	35,920	0.55	7,788	23,631	1,602	0.07	2,011	760		90,280	39,571
	Meade	58,432	44,860	26,645	0.59					201			44,860	63,273
	Pawnee	77,685	141,406	108,101	0.76	39	32	3	0.09	170	60		141,498	108,202
	Reno	86,414	67,703	47,205	0.70	9,723	61,209	2,483	0.04	2,054	1,981		130,893	56,384
	Rice	51,165	69,646	49,976	0.72	10,978	22,370[4]	2,911[4]	0.13[4]				92,016	72,292
	Sedgwick	36,802	28,058	16,811	0.60	5,172	8,483	748	0.09	683	810	1,531	37,351	27,283
	Seward	136,532	283,810[4]	197,691[4]	0.70[4]	18,505	38,993	4,536	0.12				322,803	245,106

Exhibit 2-15

SUMMARY OF LIVESTOCK INDUSTRY IN COUNTIES CONTAINING ESSENTIAL SHINER HABITAT

State	County	Total Cattle and Calves	Cattle and Calves Sold (Number)	Cattle and Calves Sold ($1,000)	Average Price/Head ($1,000)	Total Hogs and Pigs	Hogs and Pigs Sold (Number)	Hogs and Pigs Sold ($1,000)	Average Price/Head ($1,000)	Total Poultry	Poultry Sold (Number)	Poultry and Eggs Sold ($1,000)	Total Livestock Sold (Number)[2]	Total Livestock Sold ($1,000)[3]
	Sumner	40,971	31,045	17,222	0.55	7,842	9,315	628	0.07	1,145	300	24	40,660	20,019
	Total CHD	**778,320**	**1,052,180**	**735,141**	**0.66**	**66,556**	**184,117**	**14,674**	**0.09**	**7,097**	**3,911**	**1,555**	**1,240,208**	**851,170**
Texas	**State**	**13,978,987**	**12,603,171**	**8,083,024**	**0.64**	**953,290**	**1,659,834**	**128,231**	**0.08**	**105,396,171**	**583,057,105**		**597,320,110**	**10,402,993**
Kansas	Hemphill	81,829	131,611	91,878	0.70		345						131,956	92,027
	Oldham	62,423	86,387	62,910	0.73	252							86,387	63,619
	Potter	36,142	27,756	17,821	0.64	1,355	1,721	151	0.09	661	698		30,175	18,175
	Total CHD	**180,394**	**245,754**	**172,609**	**0.69**	**1,607**	**2,066**	**151**	**0.09**	**661**	**698**	**0**	**248,518**	**173,821**
New Mexico	**State**	**1,590,769**	**1,064,524**	**533,952**	**0.50**	**3,489**	**5,114**	**381**	**0.07**	**299,684**	**4,119**	**17,468**	**1,073,757**	**1,302,773**
	Quay	59,431	38,818	20,199	0.52	67	227			608		24	39,045	20,401
TOTAL IN CHD		3,044,895	3,252,815	1,987,476	0.61	1,546,997	4,330,173	305,642	0.08	55,708	14,263	1,853	7,597,251	2,733,361

Notes:
(1) Poultry sold (number) includes layers 20 weeks old and older, pullets for laying flock replacement, broilers and other meat-type chickens, and turkeys.
(2) Total livestock sold (number) was calculated by adding values for cattle and calves sold, hogs and pigs sold, and any poultry sold.
(3) Total livestock sold ($1,000) is the livestock sales value in 2002 given in the "2002 Census of Agriculture State/County Profile."
(4) 2002 data not available, thus 1997 data was used.
Source: 2002 Census of Agriculture, USDA.

86. Limited dairy facilities are located in essential habitat, though some are quite large. The only major dairy facility in Oklahoma is the Braums Dairy in Grady county. There is at least one large dairy in Seward county Kansas, and several small to moderate sized dairies in the central region of essential habitat in Kansas.

87. Swine production facilities are widespread across all of the regions in several centers of production. In Oklahoma, swine facilities are concentrated in the eastern region in Hughes county. In the central region swine facilities are located in Grady and Caddo counties and in Kingfisher and surrounding counties. There are numerous moderately-sized swine production units in Kansas in the central region as well. There are also swine facilities in the western region in Harper and Texas counties of Oklahoma, and the Kansas counties along the Cimarron, particularly Seward and Mead counties.

Brief History and Trends in the Region

88. Cattle feeding has a relatively long history in the southern plains, having developed in the 1950s and 1960s following the growth in irrigated crop production. The current cattle feeding industry is relatively mature with little tendency for significant net increases in feeding capacity in the region, though the total capacity will continue to migrate to larger average size operations, with the smaller operations exiting the industry.

89. Dairy production in the region has decreased over time. Most traditional small family dairy operations have exited the industry in the last 15 to 20 years. There has been some interest in relocation of very large California or southwestern dairies to the region, with at least one large scale dairy in essential habitat in southwest Kansas, and several more located in western Kansas just to the north of essential habitat. There is some interest in development of a dairy processing plant in southwest Kansas (again, just north of essential habitat) that would stimulate large-scale dairy production in the region, and could translate into more large-scale dairy production in shiner habitat.

90. Swine production grew rapidly from almost zero to current levels in the last 15 years. The rapid expansion occurred for several reasons including the existence of a base of feed production; the economic feasibility of supplementing local feed production with feeds imported from other regions (based on improved swine production efficiencies); the regulatory climate and decreased likelihood of environmental concerns because of the dry climate, low populations, and depth to ground water; and strategic location decisions based on market potential in Mexico and the western U.S. While local restrictions concerning ownership structure for agricultural businesses currently dictate specific production locations (counties), the swine industry in the western region of essential habitat is poised for continued expansion.

91. In general, cropping agriculture in the region is relatively stable. Crop production flexibility in recent farm legislation permits greater experimentation with alternative crops including increased interest in soybeans farther west than traditionally produced; upland cotton farther north than traditionally produced, and some other minor crops, including, most

recently, canola. Ultimately, the region is best suited to a limited number of crops of which wheat is likely to remain the most important in the dryland regions, and corn and grain sorghum are likely to remain the most important under irrigation. There is currently considerable interest in ethanol production across the region and the ultimate location of large ethanol plants could impact crop production in future years.

92. This section presents potential administrative costs of actions taken under section 7 of the Act associated with the geographic area proposed as essential habitat for the shiner. First, this section defines the types of administrative costs likely to be associated with essential shiner habitat. Next, the analysis presents estimates of the number of technical assistance efforts and consultations likely to result from the designation of critical habitat for the shiner and/or the listing of the species, as well as the per-unit costs of each of these activities. Based on this analysis, estimates of past and future expected administrative costs are derived.

3.1 Categories of Administrative Costs

93. The following section provides an overview of the categories of administrative cost impacts that arise due to the implementation of section 7 in the geographic area proposed as essential shiner habitat.

Technical Assistance

94. 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 shiner. 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 generally occur in instances where a federal nexus does not exist.

Section 7 Consultations

95. 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. In some cases, consultations will involve the Service and another Federal agency only, such as the Army Corps of

Engineers. 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.

96. During a consultation, the Service, the Action agency, and the landowner or manager applying for Federal funding or permitting (if applicable) communicate in an effort to minimize potential adverse effects to the species and/or to essential 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.

97. Section 7 consultations with the Service may be either informal or formal. *Informal consultation*s consist of discussions between the Service, the Action agency, and the applicant concerning an action that may affect a listed species or its designated critical habitat and are 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 its proposed action may or will adversely affect the listed species or designated critical habitat in ways that cannot be resolved through informal consultation. The formal consultation process results in the Service's determination in a biological opinion of whether the action is likely to jeopardize a species or adversely modify critical habitat, and recommendations to minimize those impacts. Regardless of the type of consultation or proposed project, section 7 consultations can require substantial administrative effort on the part of all participants.

3.2 Estimated Costs of Consultations and Technical Assistance

98. Estimates of the cost of an individual consultation and technical assistance request were developed from a review and analysis of historical section 7 files from a number of Service field offices around the country conducted in 2002. These files addressed consultations conducted for both listings and critical habitat designations. Cost figures were based on an average level of effort of low, medium, or high complexity, multiplied by the appropriate labor rates for staff from the Service and other Federal agencies.

99. The administrative cost estimates presented in this section take into consideration the level of effort of the Service, the Action agency, and the applicant, as well as the varying complexity of the consultation or the technical assistance request. 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. Exhibit 3-1 provides a summary of the estimated administrative cost per consultation or technical assistance request.

Exhibit 3-1

ESTIMATED ADMINISTRATIVE COST PER CONSULTATION OR TECHNICAL ASSISTANCE REQUEST[a]

Consultation Type	Service	Action Agency	Third Party	Biological Assessment
Technical Assistance	$260 - $680	N/A	$600 - $1,500	N/A
Informal Consultation	$1,000 - $3,100	$1,300 - $3,900	$1,200 - $2,900	$0 - $4,000
Formal Consultation	$3,100 - $6,100	$3,900 - $6,500	$2,900 - $4,100	$4,000 - $5,600

[a] Low and high estimates primarily reflect variations in staff wages and time involvement by staff.

Sources: IEc analysis based on data from the Federal Government General Schedule Rates, Office of Personnel Management, 2002, and a review of consultation records from several Service field offices across the country.

3.3 Summary of Pre-Designation Administrative Costs

100. Since the listing of the shiner in 1998, there have been four formal consultations on the species: (1) Burlington Northern-Santa Fe (BNSF) railway bridge construction over the Cimarron River in Oklahoma; (2) BNSF proposed railway bridge construction in Hemphill County, Texas; (3) TxDOT bridge replacement on US HWY 385 in Oldham County, Texas; and (4) statewide NPDES permits for CAFOs in Texas. In addition, two formal consultations in Texas and one in Oklahoma related to the shiner are ongoing. The Service has also responded to 51 technical assistance requests and conducted 331 informal consultations on the species in Oklahoma, Kansas, Texas, and New Mexico since the listing of the shiner in 1998. Exhibit 3-2 presents information on past informal consultations and technical assistance requests completed by Service field offices in the states that contain essential shiner habitat.

101. Pre-designation administrative costs associated with Section 7 consultations for Shiner conservation are summarized in Exhibit 3-8. As shown, pre-designation costs are estimated to range from $1.3 million to $3.6 million since 1998 (constant, 2004 dollars), and from $182,000 to 503,000 on an annualized basis using a three percent discount rate, or from $178,000 to $492,000 on an annualized basis using a seven percent discount rate). Pre-designation costs for associated project modifications are discussed in the relevant activity chapters that follow.

Exhibit 3-2 INFORMAL CONSULTATION HISTORY FOR THE SHINER SINCE 1998 LISTING			
Service Field Office	**Types of Activities Consulted On**	**Informal Consultations (%Technical Assistance)**	**Activity Breakdown**
Oklahoma	Oil and gas production; road/bridge/rail construction; utility operations; recreation; construction; power production; grazing; land and water management; military activities; communications infrastructure; gravel mining; dredging.	287 (0%)	Oil and gas production: (35%) Utilities: (20%) Construction: (14%) Wastewater management: (9%) Transportation: (8%) Other: (14%)
Kansas		7 (57%)	Transportation: (29%) Land and water management: (29%) Other (42%)
Texas		100 (46%)	Oil and gas production: (25%) Land and water management: (22%) Utilities: (25%) Other: (28%)
New Mexico		2 (50%)	Research: (50%) Other: (50%)
Source: Service field offices.			

3.4 Projected Future Section 7 Consultations Involving the Shiner

102. This section forecasts costs that may occur over twenty years after the designation is finalized in September 2005. Spatial data is used to assign future consultation costs to watersheds in which the activity requiring consultation is located, where possible. Where spatial data locating the activity is not possible, the analysis distributes consultation costs across all watersheds within the impacted state evenly. Exhibit 3-9 presents the distribution of future consultations and the related administrative costs. As shown, administrative costs related to shiner conservation activities in proposed critical habitat are expected to range from approximately $7 million to $20 million over 20 years (constant, 2004 dollars). In present value terms, this range of potential future costs are estimated to be $5.6 to 15.6 million assuming a three percent discount rate, or $4.1 to $11.6 million assuming a seven percent discount rate. On an annualized basis, the range of potential costs is $375,000 to $1.1 million assuming a three percent discount rate, or $389,000 to $1.1 million assuming a seven percent discount rate. Exhibits 3-3 and 3-4 illustrate the distribution of high annual cost estimates (using a seven percent discount rate) across watersheds that contain essential shiner habitat. Exhibit 3-3 presents the distribution of administrative cost estimates for watersheds proposed for inclusion in the final rule; Exhibit 3-4 presents the distribution of administrative cost estimates for watersheds proposed for exclusion from the final rule.

Exhibit 3-3

ANNUALIZED ADMINISTRATIVE COSTS IN WATERSHEDS PROPOSED FOR INCLUSION (seven percent discount rate)

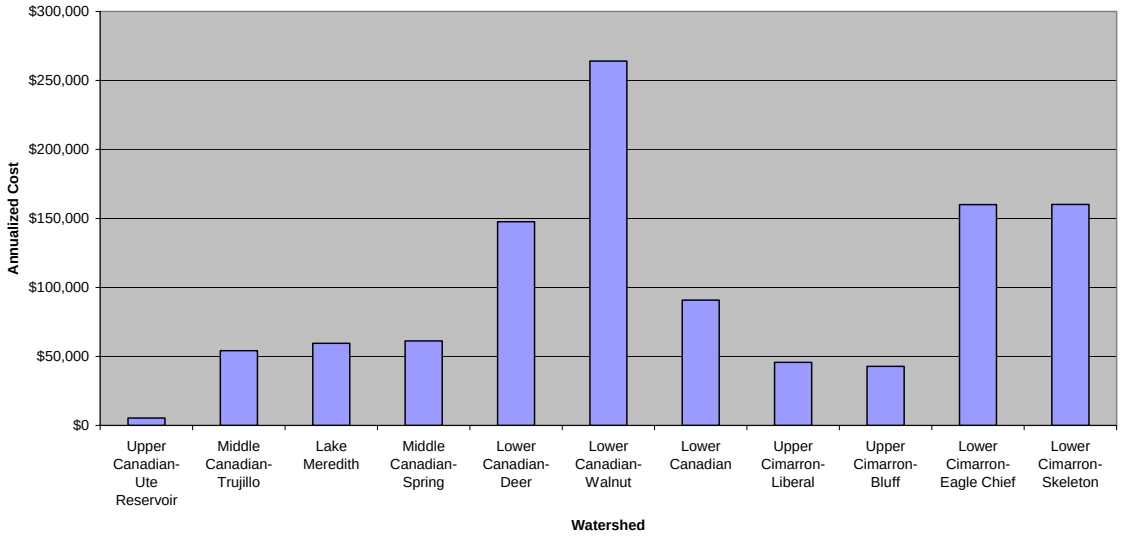
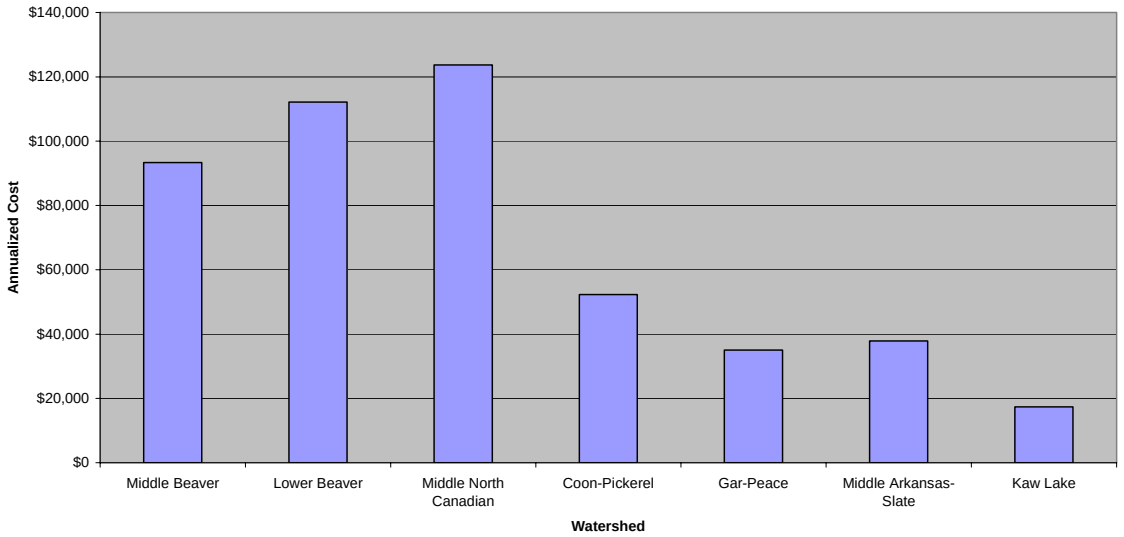


Exhibit 3-4

ANNUALIZED ADMINISTRATIVE COSTS IN WATERSHEDS PROPOSED FOR EXCLUSION (seven percent discount rate)



Projected Future Formal Section 7 Consultations

103. Given the limited formal consultation history for the shiner, the analysis projects future consultations using information provided by Service field offices and regulated entities concerning potential future projects. Exhibit 3-5 summarizes predicted future formal section 7 consultations involving the shiner. As shown, it is predicted that, on average, roughly six formal consultations involving the shiner will occur over the next 20 years.

Exhibit 3-5

PROJECTED FUTURE SECTION 7 FORMAL SHINER CONSULTATIONS

CHD Unit	HUC Number	Watershed Name	Action Agency	Activity Consulted On
1a	11090105	Lake Meredith	Bureau of Reclamation	Potential development of additional groundwater wellfields for CRMWA
	11080006	Upper Canadian-Ute Reservoir	Bureau of Reclamation	Construction of Eastern New Mexico Rural Water System
	11090105	Lake Meredith	Army Corps of Engineers	Natural gas line
	11090106	Middle Canadian-Spring	EPA	Wastewater
1a and 1b	All Texas Watersheds	All Texas Watersheds	Natural Resource Conservation Service	Brush Control Program in Texas
1b	11090202	Lower Canadian-Walnut	FHWA	SH81 over the Canadian River

104. Exhibit 3-5 includes two ongoing formal consultations in Texas: (1) consultation with NRCS on its brush management program (salt cedar control); and (2) consultation with USACE regarding the burying of an existing natural gas line that crosses the Canadian River east of U.S. Highway 287 in Potter County, Texas. The Service has indicated that significant adverse effects to the shiner are not expected in either consultation. Due to their ongoing status, these two formal consultations are reflected in the estimate of future administrative costs related to shiner protection. In addition, an informal consultation with EPA regarding wastewater discharge from an oil refinery in Hutchinson County, Texas, is ongoing and may result in formal consultation. The informal consultation is reflected in past administrative costs while the potential formal consultation is reflected in future administrative costs. Finally, Exhibit 3-5 includes an ongoing formal consultation in Oklahoma regarding State Highway 81 over the Canadian River with the Federal Highway Administration. Potential project modifications associated with this consultation are discussed in Section 8 of this report.

Projected Future Informal Section 7 Consultations

105. To project future informal section 7 consultations for the shiner, the analysis utilizes the methodology summarized in Exhibit 3-6. Projected informal consultations are estimated using average annual consultations for each Service field office from the

consultation history and, where data is available, are supplemented with information gathered from relevant government and regulated entities.

Exhibit 3-6

METHODOLOGY AND INFORMATION SOURCES USED TO PROJECT FUTURE CONSULTATION LEVELS BY ACTIVITY TYPE

Activity	Methodology/Information Sources
CAFOs	Information from CAFO-permitting agencies.
Grazing leases	Record of past shiner consultation activity.
Dam and reservoir operations	Information from USACE, BoR, NRCS, and various water supply agencies on future project plans and potential future consultation needs.
Transportation (road, bridge, and rail projects)	Record of past shiner consultation activity augmented with information on slated projects provided by state Departments of Transportation and Federal Highway Administration personnel.
Oil and gas production (wells and pipelines)	Record of past shiner consultation activity including spatial data of past consultations augmented with U.S. Energy Information Administration regional forecasts for oil and gas production.
Power production	Record of past shiner consultation activity augmented with information provided by various agencies and facilities.
Dredge and fill	Record of past shiner consultation activity.
Pesticide registration use	Record of past shiner consultation activity.
Recreational activity	Information from NPS on future consultation activities.
Utilities (communication lines; electricity transmission lines; water supply pipelines; wastewater facilities.	Record of past shiner consultation activity augmented with information provided by various agencies and facilities.

106. Exhibit 3-7 summarizes the projected distribution of future informal section 7 shiner consultations across watersheds that contain essential shiner habitat. Consultation projections are based on average annual informal and technical assistance consultations in the consultation history (considered the baseline); additional impacts are additional potential consultations (above the baseline annual average) that may be required for oil and gas, transportation, NRCS PL-566 watershed projects, and CAFO activities in the future period (over the next 20 years). These additional impacts are identified through spatial and other information provided by government and regulated entities. Additional consultation requirements for oil and gas, pipeline, and CAFO operations result from changes to Federal regulatory policy that may potentially require a larger volume of consultation for shiner protection while additional impacts to transportation and NRCS watershed projects are identified through project planning information provided by State departments of transportation (DOTs) and NRCS field offices. Subsequent chapters provide more detailed information on each of these activity areas and related future consultation needs.

Exhibit 3-7

PROJECTED FUTURE INFORMAL CONSULTATION ACTIVITY
(20 years)

Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Projected Number of: Informal Consultations	Technical Assistance	Additional Impacts	Total Future Informal Impacts
Proposed for Inclusion							
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	3	3	4	10
	11090101	Middle Canadian-Trujillo	Texas	59	53	28	140
	11090105	Lake Meredith	Texas	59	53	29	141
1b	11090106	Middle Canadian-Spring	Texas	59	53	39	151
	11090201	Lower Canadian-Deer	Oklahoma	114	0	157	271
	11090202	Lower Canadian-Walnut	Oklahoma	114	0	368	482
	11090204	Lower Canadian	Oklahoma	114	0	53	166
3	11040006	Upper Cimarron-Liberal	Kansas	2	2	82	86
	11040008	Upper Cimarron-Bluff	Kansas	2	2	76	80
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	114	0	180	293
	11050002	Lower Cimarron-Skeleton	Oklahoma	114	0	180	294
Subtotal				**752**	**168**	**1,195**	**2,115**
Proposed for Exclusion							
2	11100102	Middle Beaver	Oklahoma	114	0	57	171
	11100201	Lower Beaver	Oklahoma	114	0	92	206
	11100301	Middle North Canadian	Oklahoma	114	0	113	227
4	11030004	Coon-Pickerel	Kansas	2	2	94	98
	11030010	Gar-Peace	Kansas	2	2	62	66
	11030013	Middle Arkansas-Slate	Kansas	2	53	56	111
	11060001	Kaw Lake	Kansas	2	53	19	74
Subtotal				348	111	493	952
Total				**1,100**	**279**	**1,687**	**3,066**

3.5 Caveats

107. The number of consultations and technical assistance efforts to be undertaken in the future for activities within a given unit is highly uncertain. The frequency of such efforts will be related to the level of economic activity, development of HCPs or other regional plans that obviate the need for consultation, and the extent to which economic activity overlaps with essential habitat. To the extent that this analysis over or underestimates the number of these efforts in the future, estimated costs will be over or understated.

Exhibit 3-8

PAST ADMINISTRATIVE COSTS FOR TECHNICAL ASSISTANCE REQUESTS AND CONSULTATIONS FOR THE ARKANSAS RIVER SHINER (1998-2004)

	Number of:			Total Admin Costs (constant dollars)		Annualized Costs (seven percent)		Annualized Costs (three percent)	
Field Office	Technical Assistance Requests	Informal Consultations	Formal Consultations	Low	High	Low	High	Low	High
Oklahoma	0	273	1	$998,191	$2,805,933	$134,831	$379,212	$139,380	$391,890
Kansas	4	3	0	$14,354	$39,561	$1,924	$5,296	$1,998	$5,505
Texas	46	54	3	$277,825	$721,271	$40,581	$105,506	$40,100	$104,180
New Mexico	1	1	0	$4,489	$12,439	$680	$1,884	$659	$1,827
Total	**51**	**331**	**4**	**$1,294,859**	**$3,579,204**	**$178,016**	**$491,899**	**$182,138**	**$503,402**

Exhibit 3-9

ESTIMATED FUTURE ADMINISTRATIVE COSTS FOR THE ARKANSAS RIVER SHINER

Unit	HUC Number	Watershed Name	Primary State Overlaid	Estimated Number of:					Total Admin Costs (constant, 2004 dollars)		Annualized Costs (seven percent)		Annualized Costs (three percent)	
				Technical Assistance Requests	Informal Consultations	Additional Informal Consultations	Formal Consultations	Total	Low	High	Low	High	Low	High
Proposed for Inclusion														
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	3	3	4	1	11	$41,892	$100,104	$2,241	$5,356	$2,157	$5,155
	11090101	Middle Canadian-Trujillo	Texas	53	59	28	0.33	141	$365,762	$1,014,873	$19,568	$54,296	$18,837	$52,266
	11090105	Lake Meredith	Texas	53	59	29	4.33	145	$424,815	$1,111,819	$22,728	$59,482	$21,878	$57,259
1b	11090106	Middle Canadian-Spring	Texas	53	59	39	1.33	152	$417,944	$1,144,950	$22,360	$61,255	$21,524	$58,965
	11090201	Lower Canadian-Deer	Oklahoma	0	114	157	0	271	$975,516	$2,759,318	$52,190	$147,623	$50,239	$142,105
	11090202	Lower Canadian-Walnut	Oklahoma	0	114	368	1	483	$1,751,217	$4,935,919	$93,690	$264,072	$90,188	$254,200
	11090204	Lower Canadian	Oklahoma	0	114	53	0	166	$599,568	$1,695,922	$32,077	$90,732	$30,878	$87,340
3	11040006	Upper Cimarron-Liberal	Kansas	2	2	82	0	86	$302,586	$855,308	$16,188	$45,759	$15,583	$44,048
	11040008	Upper Cimarron-Bluff	Kansas	2	2	76	0	80	$283,411	$801,070	$15,162	$42,857	$14,596	$41,255
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	0	114	180	0	293	$1,057,467	$2,991,122	$56,574	$160,025	$54,460	$154,043
	11050002	Lower Cimarron-Skeleton	Oklahoma	0	114	180	0	294	$1,058,838	$2,994,999	$56,648	$160,232	$54,530	$154,242
SUBTOTAL				**168**	**752**	**1,195**	**8**	**2,123**	**$7,279,016**	**$20,405,403**	**$389,427**	**$1,091,689**	**$374,869**	**$1,050,878**
2	11100102	Middle Beaver	Oklahoma	0	114	57	0	171	$616,726	$1,744,453	$32,995	$93,328	$31,761	$89,839
	11100201	Lower Beaver	Oklahoma	0	114	92	0	206	$741,067	$2,096,161	$39,647	$112,145	$38,165	$107,952
	11100301	Middle North Canadian	Oklahoma	0	114	113	0	227	$817,396	$2,312,064	$43,731	$123,695	$42,096	$119,071
4	11030004	Coon-Pickerel	Kansas	2	2	94	0	98	$345,806	$977,559	$18,501	$52,299	$17,809	$50,344
	11030010	Gar-Peace	Kansas	2	2	62	0	66	$231,419	$654,008	$12,381	$34,989	$11,918	$33,681
	11030013	Middle Arkansas-Slate	Kansas	53	2	56	0	111	$255,057	$707,576	$13,646	$37,855	$13,135	$36,440
	11060001	Kaw Lake	Kansas	53	2	19	0	74	$119,909	$325,299	$6,415	$17,404	$6,175	$16,753
SUBTOTAL				**111**	**348**	**493**	**0**	**952**	**$3,127,380**	**$8,817,120**	**$167,315**	**$471,716**	**$161,060**	**$454,082**
TOTAL				**279**	**1,100**	**1,687**	**8**	**3,074**	**$10,406,396**	**$29,222,522**	**$556,742**	**$1,563,405**	**$535,929**	**$1,504,960**

Note: Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

108. This section provides an analysis of the economic impacts associated with shiner conservation activities related to dam operations within essential habitat. Dams impact downstream environments by reducing instream flow, which in turn can alter the aquatic and riparian habitat. This section reviews dam operations effecting essential habitat, and estimates potential economic impacts to those operations associated with shiner conservation. Dams located within essential habitat as well as dams upstream of essential habitat are both considered. Administrative costs associated with section 7 consultation for water management activities are estimated in Section 3 of the report; all other potential economic impacts are discussed in this section.

4.1 Overview of Methodology and Results

109. The approach followed for projecting future costs associated with water operations and results of the analysis are presented in this section.

110. Three large dams that could potentially impact essential shiner habitat are summarized in Exhibit 4-1. Federal nexuses in essential habitat exist at Sanford and Optima Dams, owned by the Bureau of Reclamation and the Army Corps of Engineers, respectively. A Federal nexus also exists for a future water supply project at Ute Dam for which the Bureau of Reclamation will likely finance a portion of construction costs. Potential impacts to dam operations at Sanford and Ute Dams are (1) required releases to augment downstream flow; and (2) project modifications to future water supply projects. Impacts at Optima Dam are not likely due to a historical lack of water in the conservation pool. For this reason, releases at Optima are not possible unless hydrologic conditions in the area change substantially. In addition, future projects at Optima are not planned.

111. The analysis also considers small watershed structures constructed by NRCS (PL-566 structures) that are located on various tributaries to the rivers identified as essential shiner habitat. Impacts to existing watershed structures are not anticipated; however, future PL-566 watershed projects are likely to require informal consultation with the Service. Overall, these projects are not likely to adversely effect the shiner and as a result will not require project modification.

112. Future costs to dam operations resulting from shiner conservation activities are expected to total up to $32 million over 20 years (constant, 2004 dollars), $18 to $24 million in present value terms (assuming a seven and three percent discount rate, respectively), and $1.6 to $1.7 million on an annualized basis (assuming a three and seven percent discount rate, respectively). One-time expenditures of roughly $76,500 are also anticipated at Ute Dam. Exhibit 4-2 presents the results of the analysis associated with impacts at Sanford and Ute Dams. As mentioned, impacts are not anticipated for Optima Dam and NRCS PL-566 structures in proximity to essential habitat.

Exhibit 4-1

CHARACTERISTICS OF DAM FACILITIES IN ESSENTIAL HABITAT FOR THE SHINER

CHD Unit	Name	Owner/Operator	Construction Date	Reservoir	Maximum Pool Elevation/Capacity	Primary Purpose	Relationship to Essential Habitat
1a	Sanford Dam	Bureau of Reclamation/ Canadian River Municipal Water Authority	Completed in 1965	Lake Meredith	2,936.5 feet/896,458 acre-feet	Flood control	Downstream of Unit 1a; Upstream of Unit 1b*
	Ute Dam	New Mexico Interstate Stream Commission	Completed in 1962	Ute	3,782 feet/200,000 acre-feet**	Municipal water supply	Directly upstream of Unit 1a
2	Optima Dam	USACE	Completed in 1978	Optima	2,815 feet/618,500 acre-feet	Flood control, water supply, recreation, fish and wildlife	Upstream of Unit 2

*Unit 1a extends into the flood pool of Lake Meredith; Lake Meredith is approximately 80 miles upstream of Unit 1b.
**The maximum pool at Ute is limited by the Canadian River Compact and the Stipulated Judgment and Decree in the U.S. Supreme Court's decision in *State of Oklahoma and the State of Texas v. New Mexico* on December 13, 1993. Under these rulings, Ute Reservoir is limited to storing 200,000 acre-feet of water, at which time releases to Texas are carried out.

Exhibit 4-2

POTENTIAL ECONOMIC IMPACTS TO WATER OPERATIONS AT UTE DAM RELATED TO SHINER CONSERVATION

	Total Costs (constant, 2004 dollars)	Annualized Cost (three percent)	Annualized Cost (seven percent)
Seepage provision	$31,740,122	$1,634,616	$1,698,097
Shiner NEPA Work	$67,925	$4,566	$6,412
Public Awareness Campaign	$8,601	$578	$812
Total	**$31,816,647**	**$1,639,760**	**$1,705,320**

Note: Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

Water Releases to Augment Instream Flow

113. The Service has indicated that sufficient instream flow to float shiner eggs for the length of river required to complete hatching and larval development is necessary to support shiner populations; however, the Service has not determined a specific target flow.[39] In the future, dam operations may be required to release water to provide additional instream flow for the shiner, and, as a result, may experience economic impacts to the extent that augmenting flow removes water from other productive purposes (i.e., agricultural, municipal, or industrial use), leading to economic losses in those sectors. Specific modification of dam projects to augment flow is difficult to predict, and the requirements for individual projects will vary. In addition, information does not exist concerning how varying flow requirements, if required, will be implemented throughout the designation. As a result, costs associated with instream flow requirements for the shiner downstream of Sanford Dam are not evaluated. At Ute Dam, however, scientific investigation has determined that seepage from Ute (4 cubic feet per second) contributes to supporting the shiner population downstream. The analysis assumes that, in the absence of this seepage, Ute Dam would be required to provide this equivalent quantity of water annually. Using projected water prices for municipal consumers of Ute water, the analysis estimates the value of seepage related to shiner conservation.

4.2 Background

114. This section presents relevant information associated with water rights and interstate water compacts in the region containing essential habitat. Rules governing water use are potentially important limiting factors to future shiner conservation activities.

115. Critical habitat protection for listed species does not have specific judicially sanctioned water allocation in the river segments proposed as essential shiner habitat. As such, if water is required to provide flow for the shiner, this water may impact those entities that have judicially established water rights in this region. Potential impacts to water rights holders are evaluated in subsequent sections of this analysis.

116. Numerous interstate water compacts govern the use of water on rivers proposed as essential habitat for the shiner and potentially limit the extent to which dam operations may be altered for shiner conservation. A map of water compact areas in the region containing essential habitat is presented in Exhibit 4-3; of these four, the Canadian River and Arkansas River compacts are most relevant to the habitat:

- Canadian River Compact: The Canadian River Commission created this compact in 1950 to govern interstate use of the Canadian and North Canadian Rivers among Oklahoma, Texas, and New Mexico. The Compact allocates quantities of conservation storage to each state, the excess of which is released pursuant to the

[39] Personal communication with Ken Collins, USFWS, on December 14, 2004.

downstream state's request.[40] New Mexico is allocated a conservation storage quantity of 200,000 acre-feet below Conchas Dam. Texas is allocated a conservation storage quantity of 500,000 acre-feet until Oklahoma constructs more than 300,000 acre-feet of conservation storage space west of the 97th meridian, at which time Texas is permitted to store 200,000 acre-feet plus the quantity in storage in Oklahoma, for a quantity not less than 500,000 acre-feet. Oklahoma, located farthest downstream, does not have a conservation storage limitation under the compact.

- Arkansas River Compact (Kansas and Oklahoma): The Arkansas River Compact between the states of Oklahoma and Kansas was signed on March 31, 1965. The Compact divides and apportions waters of the Arkansas River basin between Kansas and Oklahoma. The term "Arkansas River" means that portion of the Arkansas River from a point immediately below the confluence of the Arkansas and Little Arkansas Rivers in the vicinity of Wichita, Kansas, to a point immediately below the confluence of the Arkansas River with the Grand-Neosho river near Muskogee, Oklahoma. All tributaries that empty into the Arkansas River between the upstream and downstream limits are also regulated under this compact.[41]

Exhibit 4-3

INTERSTATE WATER COMPACTS IN THE REGION CONTAINING ESSENTIAL SHINER HABITAT

Source: Oklahoma Water Resources Board, accessed from http://www.owrb.state.ok.us/supply/compacts/compacts.php#map on February 20, 2005.

[40] The Compact defines conservation storage as "… that portion of the capacity of reservoirs available for the storage of water for subsequent release for domestic, municipal, irrigation and industrial uses, or any of them, and it excludes any portion of the capacity of reservoirs allocated solely to flood control, power production and sediment control, or any of them." Canadian River Compact, accessed from Texas Legislature Online at http://www.capitol.state.tx.us/statutes/docs/WA/content/htm/wa.003.00.000043.00.htm on February 19, 2005.

[41] Arkansas River Compact, accessed at http://www.accesskansas.org/kda/dwr/Laws-Rules/KS-OK_Ark_River_Compact.pdf, on March 9, 2005.

4.3 Impacts to Sanford Dam, Lake Meredith

117. Sanford Dam/Lake Meredith is located at the eastern end of Unit 1a in Texas. As noted in Exhibit 4-1, essential habitat for the shiner extends into the flood pool of the reservoir. The consultation history and conversations with Bureau of Reclamation personnel indicate that shiner conservation activities have not impacted operations at Sanford Dam since the listing of the species in 1998. Future potential impacts include (1) required releases from Sanford Dam to augment flow in shiner habitat downstream; and (2) additional requirements on Canadian River Municipal Water Authority (CRMWA) water supply projects related to shiner conservation.

Impacts to Dam Operations

118. The Bureau of Reclamation completed construction on Sanford Dam/Lake Meredith in 1965.[42] Through the Canadian River Municipal Water Authority (CRMWA), Lake Meredith provides municipal and industrial water to eleven cities (500,000 people) in West Texas: Amarillo, Borger, Brownfield, Lamesa, Levelland, Lubbock, O'Donnell, Pampa, Plainview, Slaton, and Tahoka. The CRMWA operates under a 1984 permit from the State of Texas to divert 100,000 acre-feet annually for municipal supply and 51,000 acre-feet annually for industrial supply from Lake Meredith.[43] However, water supply at Lake Meredith has historically been insufficient to fulfill contracts to these cities. During February 2003, Lake Meredith only held 38 percent of its capacity of 500,000 acre-feet, a 12 percent drop from storage in February 2002 (248,600).[44] Exhibit 4-4 presents a graph of historic elevations at Lake Meredith. As shown, peak elevation was reached in April 1973 and has not been attained since. Insufficient water quantity in Lake Meredith, in addition to water salinity issues, have required the CRMWA to augment surface water supplies with groundwater from the Ogallala Aquifer through a permit issued by the Panhandle Groundwater Conservation District for 40,000 acre-feet per year.[45] The CRMWA fulfills its obligations to municipal contractees through a combination of surface and groundwater supply. Total water deliveries to CRMWA member cities in FY01-02 totaled over 88,000 acre-feet at a total cost to the cities of approximately $14 million ($51/1,000 gallon). Moreover, CRMWA supplies the municipalities with roughly 70 percent of their total water needs.[46]

[42] The analysis notes Service comments on operations at Sanford Dam. The Service states that "A few years ago, the Canadian River Municipal Water Authority repaid the Federal interest in the facility. Consequently operation of the reservoir, with the exception of flood control, is no longer a Federal action and is not subject to consultation". Written Service comments, Tulsa Field Office, April 19, 2005.

[43] Texas Water Commission, Certificate of Adjudication 01-3782, June 14, 1985.

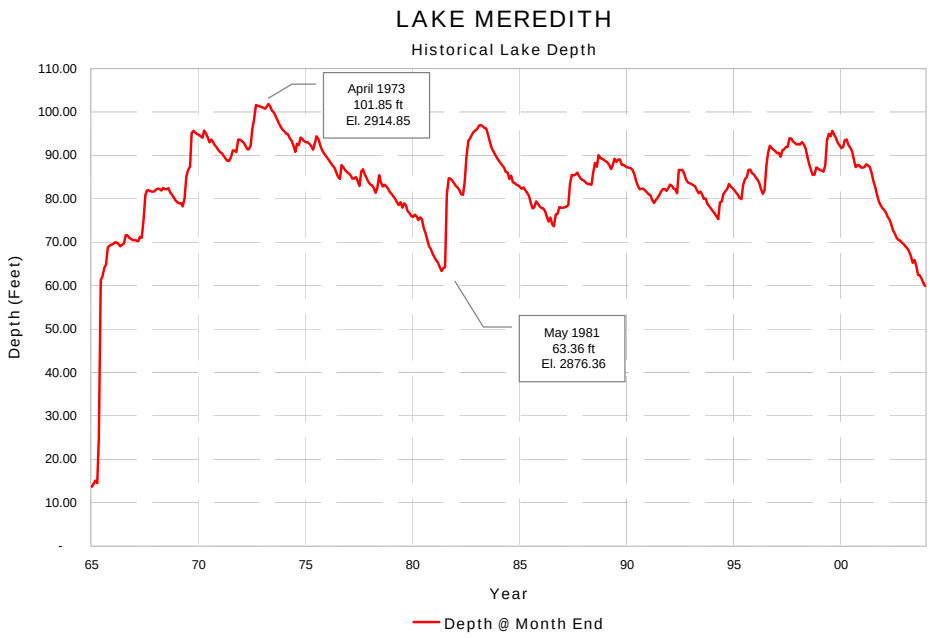
[44] Red River Authority of Texas, Basin Highlights Report, accessed at http://www.rra.dst.tx.us/publications/crp/crp2003/BHRCanWeb.cfm on December 15, 2004.

[45] Following construction of the dam, the CRMWA invested approximately $80 million in groundwater wellfield and aqueduct development to supplement surface water supplies that were insufficient in meeting their obligations under contract with municipalities.

[46] Data provided by John C. Williams, Canadian River Municipal Water Authority.

Exhibit 4-4

LAKE MEREDITH HISTORIC ELEVATION



Source: Canadian River Municipal Water Authority, accessed from http://www.crmwa.com/downloads.htm on February 15, 2005.

119. Estimates of the firm yield of Lake Meredith have declined over successive hydrologic studies, in part due to changing land use practices in the region and the proliferation of salt cedar in the riparian area.[47] In 1959, prior to construction of Ute Dam upstream on the Canadian River, the Bureau of Reclamation estimated capacity of Lake Meredith at 126,000 acre-feet.[48] In 1960, the Bureau revised this estimate downward to 103,000 acre-feet per year as the deliverable quantity to project cities assuming New Mexico's full exercise of water rights under the Canadian River Compact.[49] CRMWA contracts to municipal contractees are based on this figure. However, in 1992, Lee Wilson Associates estimated yield at 75,500, a significant decrease[50] and an ongoing study by the Texas Water Development Board preliminarily

[47] Firm yield is the "estimated amount of water available to meet annual average demand without the need to restrict water use", from www.denverwater.org accessed on March 18, 2005.
[48] Personal Communication with John C. Williams, Canadian River Municipal Water Authority, on February 16, 2005.
[49] US Bureau of Reclamation, Definite Plan Report for the Canadian River Project, November 1960.
[50] Lee Wilson Associates, "Firm Yield at Lake Meredith, Texas", December 1992.

estimates a firm yield of 69,000 acre-feet per year.[51] Estimates of firm yield are based on a number of hydrologic assumptions that vary over time; however, results of these studies suggest that the water supply available for delivery to municipalities is smaller than originally envisaged. As a result, water in Lake Meredith is fully appropriated by the CRMWA. Water releases, if required to provide suitable habitat for downstream shiner populations, would be drawn from the municipal and industrial supply, leading to economic losses in those sectors. However, as noted previously, in the absence of a target minimum flow for the shiner, this analysis does not estimate the value of potential economic losses resulting from a reallocation of water away from economic use. Rather, the analysis notes it as a potential future impact.[52] In addition, the analysis notes that critical habitat is not proposed directly downstream of Sanford Dam. The potential for releases from Sanford to augment flow in Unit 1b, a distance of roughly 80 miles from the dam, is unknown.

Impacts to CRMWA Water Supply Projects

120. The CRMWA anticipates consultation with the Service and potential project modifications related to further development of groundwater wellfields. The CRMWA is considering adding roughly ten to twenty wells to the existing wellfield in the near future.[53] Over the next 20 years, the CRMWA anticipates it will require two section 404 permits and the City of Amarillo will require one for transmission pipelines. While the CRMWA indicates that wellfields are often placed at a greater distance from the river for shiner protection, and that major transmission pipelines generally cost $1 million per mile, data to estimate the incremental cost of pipeline placement related to shiner protection in future groundwater development projects undertaken by the CRMWA and other water supply entities are unavailable.[54]

121. Impacts to flood control operations related to shiner protection may also impact the original flood control benefit estimates derived at the time of dam construction. Unit 1a on the Canadian River extends into the flood control area of Lake Meredith. When Congress authorized the Canadian River Project in 1950, Congress determined that the costs of construction for flood control would be nonreimbursable. This cost was determined to be approximately $2.8 million, and was excluded from the contract obligation of CRMWA. Should consultation in the event of a flood result in a determination that the flood control pool in Lake Meredith could not be used for flood control, these benefits could be lost.[55] Given the uncertainty associated with whether flood control would be halted for shiner protection, or who would bear these costs, the costs are not attributed to shiner conservation activities in this analysis.

[51] Personal communication with John C. Williams, Canadian River Municipal Water Authority, on February 17, 2005.
[52] See footnote 34 for Service comments on potential shiner-related impacts to Sanford Dam operations.
[53] Personal communication with John C. Williams, Canadian River Municipal Water Authority, on March 5, 2005.
[54] Personal communication with John C. Williams, Canadian River Municipal Water Authority, on February 17, 2005.
[55] Written communication from John C. Williams, Canadian River Municipal Water Authority, on April 30, 2005.

4.4 Impacts to Ute Dam and Reservoir

122. Ute Dam and Reservoir are located at the western end of Unit 1a in New Mexico, immediately upstream of essential shiner habitat. The reservoir is owned and operated by the New Mexico Interstate Stream Commission. The primary purpose of water stored in the Ute Reservoir is to provide renewable municipal and industrial water to eastern New Mexican communities who are rapidly depleting their groundwater resources; however, the delivery system to transport potable water to surrounding communities remains in a planning stage as discussed below. Operations at Ute are constrained by the Canadian River Compact and the Stipulated Judgment and Decree in *State of Oklahoma and State of Texas v. State of New Mexico* that established limitations on the amount of water stored on the Canadian River below Conchas Dam. Potential for future impacts to Ute operations due to shiner protection are possible through (1) required releases from Ute to augment flow in shiner habitat downstream; and (2) the Eastern New Mexico Rural Water System project (ENMRWS) (formerly the Ute Pipeline Project) which will potentially require formal consultation and project modifications related to shiner protection.

The Eastern New Mexico Rural Water System[56]

123. Currently in the planning stage under the management of the Eastern New Mexico Rural Water Authority (ENMRA), the System is envisaged to satisfy peak-day demand for ENMRA members and deliver 24,000 acre-feet of water annually.[57] ENMRA members include the communities of Clovis, Elida, Grady, Logan, Melrose, Portales, San Jon, Texico, and Tucumcari, and the counties of Curry, Roosevelt, and Quay in New Mexico. This area of New Mexico is currently experiencing declining groundwater quantity and quality due to depletion of the Ogallala and Entrada Aquifers while water demand rises. The Conceptual Design Report for the ENMRWS project states that "[d]ecline in water availability to the region will constitute a major economic impact. Local officials have consistently ranked water as the most serious long-term development issue facing the area".[58] Total fixed costs for the project are estimated at $244 million while recurring costs (including supply of raw water at $25/acre-foot, representing the cost to the Ute Water Commission (UWC) of purchasing water from the ISC) are estimated at $13 million annually. The cost structure proposed to Congress in June 2004 includes an 80 percent Federal cost-share.[59] Projections of the wholesale water rate range from $0.92 to $18.11 per 1,000 gallons, resulting in an average projection of $1.66 per 1,000 gallons over all communities and counties potentially served. The total estimated population served is 73,000 people. Construction is proposed from November 2006 to October 2013. The primary features of the proposed system are a water intake structure and raw water pump station at Ute Reservoir, central water treatment and finished water

[56] Data and information on the ENMRWS is acquired primarily through Smith Engineering Company et al. Conceptual Design Report, Project Document No. 2, Final Report, August 2003.
[57] This quantity was determined to be the annual yield of Ute Reservoir in all but extreme drought years in a 1994 study by the New Mexico Interstate Streams Commission.
[58] Smith Engineering Company et al. Conceptual Design Report, Project Document No. 2, Final Report, August 2003, page ii.
[59] Personal communication with Scott Verhines, Program Manager, ENMRWS on December 9, 2004.

pumping facilities, booster pumps, 180 miles of pipeline, and ground and elevated storage facilities.

Impacts to Dam Operations

124. The analysis estimates potential future costs associated with dam operations at Ute by assuming that facility managers will be forced to change operations to avoid adverse effects on shiner habitat. Specifically, the analysis estimates future costs associated with maintaining a flow of water in the Canadian River downstream of Ute that is equivalent to the current estimated seepage from the dam.

125. Seepage from Ute Dam, in addition to inflow from Revuelto Creek and several other springs, sustains perennial flow in the Canadian River downstream of Ute during most years.[60] A study correlating seepage and reservoir elevation by the New Mexico Interstate Stream Commission calculated a dam seepage rate of approximately four cubic-feet-per-second (cfs) from Ute Reservoir to the Canadian River downstream.[61] In the absence of a specific minimum streamflow requirement for the shiner, this analysis assumes that ENMRWA will have to maintain this seepage in order to protect the shiner. Annually, maintaining a seepage rate of four cfs is equivalent to 2,896 acre-feet of water per year. This analysis assumes that, in the absence of the current natural seepage rate, this is the amount of water required to sustain the shiner population downstream of Ute, and, consequently, the amount of water Ute would have to "release" on an annual basis for shiner protection, representing a change to operations at the dam.

126. Detailed assessment of the impacts that changes to water operations may have on facilities and end users would require detailed system-wide hydrologic and behavioral models. For example, the analysis would require models that predict change in total water available for municipal use under alternative water management regimes, as well as a model of the behavior of various categories of water users when faced with higher water prices. Such models do not exist for most areas potentially affected by shiner conservation activities. As a result, this analysis utilizes available data and simplifying assumptions to provide estimates that bound the magnitude of potential impacts that could result from alterations to water operations at Ute Dam. The major assumptions of this scenario are as follows:

- The seepage rate from Ute Dam (four cfs) downstream to the Canadian River is equivalent to the quantity of water Ute Dam would be required to release to protect the shiner in the absence of the seepage;

- Ensuring this quantity of seepage flow in the absence of current seepage rates will result in a loss of water storage capacity in Ute Reservoir;

[60] 69 CFR, page 59868.
[61] Smith Engineering Company et al. Conceptual Design Report, Project Document No. 2, Final Report, August 2003, pages 5-4 and 5-5.

- A reduction in storage capacity will limit the ability of municipal customers to obtain water in some years pursuant to implementation of the ENMRWS; and

- The average wholesale water rate projection for municipal water from Ute ($1.66 per 1,000 gallons) pursuant to implementation of the ENMRWS is a reasonable proxy for the value of water in conservation storage, and the value lost when storage is limited.[62]

127. Using these data, the analysis provides a measure of the *value* of water that could be lost from beneficial use, or will need to be replaced, if requirements to protect the shiner result in Ute being forced to release water in sufficient quantities to augment downstream flow. The data source for the wholesale water rate projection, ENMRWA, calculates an average projected water price of $1.66 per 1,000 gallons (constant 2003 dollars). Using this projection, the analysis estimates the average value of seepage from Ute at $1.6 to $1.7 million on an annualized basis (assuming a three and seven percent discount rate, respectively) and up to $32 million over twenty years in constant, 2004 dollars (or $18 to $24 million in present value terms, assuming a seven and three percent discount rate, respectively).[63]

128. In the past, timings of releases from Ute Dam have been scheduled to benefit the shiner. However, while releases from Ute Dam have potential to protect shiner habitat downstream, this analysis notes that the Canadian River Compact legally governs releases from Ute Dam. Procedurally, when New Mexico has reached the conservation storage limitation promulgated in the Compact, the Texas Commission on Environmental Quality (TCEQ) is notified. Then, TCEQ notifies the CRMWA. Finally, the CRMWA coordinates with the Tulsa Service office to determine release schedules that can benefit the shiner. However, releases have not occurred for the past several years due to drought, and prior to that occurred only infrequently.[64] In addition, under agreement with the New Mexico Department of Game and Fish, the Interstate Stream Commission maintains a minimum pool of 3,742 feet for fishing and recreation.[65] This minimum pool may provide sufficient elevation to maintain current seepage without requiring additional releases.

Impacts to the Eastern New Mexico Rural Water System

129. Construction of the Eastern New Mexico Rural Water System (ENMRWS) (formerly the Ute Pipeline Project) will likely require consultation in the future. Through

[62] Average wholesale water rate projection from Eastern New Mexico Rural Water Authority, Conceptual Design Report, Eastern New Mexico Rural Water System, Final Report, August 2003.
[63] Water costs presented in constant 2003 dollars in the Conceptual Design Report are adjusted to 2004 dollars in the analysis. The Conceptual Design Report suggests a range of potential prices from $0.92 to $18.11 per 1,000 gallons (constant 2003 dollars). Using this range, this analysis values seepage from Ute on an annualized basis at $879,546 to $17,313,663. Over 20 years, this value ranges from $17,590,911 to $346,273,256 in constant, 2004 dollars.
[64] Personal communication with Douglas Murray, Interstate Streams Commission on December 8, 2004; Personal communication with John C. Williams, Canadian River Municipal Water Authority, on February 15, 2005.
[65] New Mexico Interstate Stream Commission, Ute Reservoir Planning Issues, April 2000, accessed at www.seo.state.nm.us/publications/ute-news/ute-news-menu.html on February 7, 2005.

informal consultation, the Service has indicated that the ENMRWS is likely to impact the shiner.[66] As a result, formal consultation with the Service on the project related to the shiner is anticipated. The potential construction of the ENMRWS represents a second outlet work at Ute Reservoir (the first being spills over the dam) and has the potential to alter spillage and seepage from the dam to downstream flows in essential shiner habitat. Although additional requirements placed on the ENRMWS related to shiner protection are unknown, the analysis assumes a conservative scenario in which operations at Ute are required to maintain natural seepage levels from the dam. The cost of maintaining seepage has been estimated in the previous section.

130. In addition to potentially recurring water releases required for shiner protection, the ENMRWA is likely to incur various one-time costs related to the shiner under NEPA requirements for the project. In developing the Conceptual Design Report for the project, the ENMRWA estimates it spent approximately $2,000 to $3,000 to hire environmental consultants focused on shiner-related issues. This analysis uses the average of this range, $2,500, for purposes of cost aggregation. In addition, ENMRWA has budgeted $1.2 million for its overall environmental effort, representing 530 days of work. This analysis uses the proportion of total workdays allocated to shiner-specific activities (30 days, or 5.66 percent of total days) to estimate a cost to the ENMRWS of shiner-specific work of $67,925.[67] The ENMRWA also plans a public awareness campaign that will include shiner-related issues. The budget for the total campaign is $150,000. Applying the same workday effort for the shiner (5.66 percent of total workdays), the analysis estimates the shiner-specific cost of the public awareness campaign to the ENMRWA at $8,491.

131. Exhibit 4-5 presents the combined costs to the ENMRWA of ENMRWS-related costs, as well as potential modifications to Ute Dam operations pursuant to implementation of the ENMRWS. Administrative costs associated with operations at Ute Dam are included in Section 3 of this report, and are not represented in Exhibit 4-5. The analysis notes that Exhibit 4-5 and 4-2 are identical, owing to the fact that the analysis only anticipates shiner-related costs at Ute Dam.

[66] Smith Engineering Company et al. Conceptual Design Report, Project Document No. 2, Final Report, August 2003, page 5-4.

[67] Budget from personal communication with Scott Verhines, Eastern New Mexico Rural Water Authority, on March 5, 2005; data concerning work effort from Smith Engineering Company et al. Conceptual Design Report, Project Document No. 2, Final Report, August 2003.

Exhibit 4-5

POTENTIAL ECONOMIC IMPACTS TO WATER OPERATIONS AT UTE DAM RELATED TO SHINER CONSERVATION

	Total Costs (constant, 2004 dollars)	Annualized Cost (three percent)	Annualized Cost (seven percent)
Seepage provision	$31,740,122	$1,634,616	$1,698,097
Shiner NEPA Work	$67,925	$4,566	$6,412
Public Awareness Campaign	$8,491	$578	$812
Total	**$31,816,537**	**$1,639,760**	**$1,705,320**

Note: Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

4.5 Impacts to Optima Dam, Army Corps of Engineers

132. Optima Dam is located on Unit 2, approximately 4.5 miles northeast of Hardesty in Texas County, Oklahoma. The Corps completed construction on the dam in 1978, at which time impoundment commenced.[68] Subsequent to construction, groundwater pumping, center-pivot irrigation, drought, and other factors contributed to lack of water in the reservoir pool.[69] Consequently, the conservation pool at Optima reservoir has not filled since construction; moreover, the Corps has indicated that water releases are not possible given the significant lack of water in the reservoir.[70] As a result, the analysis does not anticipate future impacts to operations at Optima Dam related to shiner protection. Further, in the absence of a target flow for shiner conservation, the analysis is not able to quantify potential impacts to water supply at Optima in the event the reservoir did fill.

4.6 Impacts to NRCS PL-566 Watershed Projects

133. According to the NRCS in Oklahoma, 16 PL-566 dams scheduled for construction in Oklahoma are located upstream of proposed essential habitat.[71] While the NRCS has

[68] Army Corps of Engineers accessed at www.swt.usace.army.mil/projects/pertdata/optima/optima.html on December 8, 2004.

[69] See also Richard Lowitt, "Optima Dam: A Failed Effort to Irrigate the Oklahoma Panhandle" *Agricultural History* 76:2, pages 260-271. On page 270, Lowitt states that "…up to the present day, the conservation pool has yet to fill. The lake was authorized for authorized for flood control, water supply, recreation, and fish and wildlife purposes. Yet the Oklahoma Water Resources Board, in updating its comprehensive water plan in 1995, stated 'There is no dependable water supply yield in Optima at this time'". Further, on pages 270-271, Lowitt states of the Oklahoma Panhandle that "[i]ts generally flat lands, low runoff, and high evaporation made it poorly suited to reservoir construction. Water evaporation, enhanced by strong winds, generally far exceeded the average yearly rainfall. Though lacking in surface water, the region's residents were beginning by 1970 to tap into the tremendous but finite groundwater resources of the Ogallala Aquifer, which, among other things, supports irrigation and feedlot operations. Texas County, where Optima is located, is the largest water-user among Oklahoma's seventy-seven counties".

[70] Personal communication with Stephen L. Nolan, Army Corps of Engineers Tulsa District, on November 24, 2004.

[71] Personal communication with Steven Elsener, Biologist, NRCS Oklahoma, on February 28, 2005.

not consulted with the Service for the shiner historically, these projects may require informal consultation as noted in Section 3 of this report. The NRCS PL-566 Watershed program in Oklahoma anticipates 16 informal consultations on planned projects in watersheds that contain the proposed designation. Two projects are planned for Sandy Creek in Unit 1b; fourteen projects are planned for Campbell Creek (3), Hoyle Creek (1), and Turkey Creek (10) in Unit 3.[72] The NRCS does not anticipate findings of adverse impact from the Service; therefore, future consultations on these projects are assumed to be informal and project modifications are not anticipated. Funding permitting, the NRCS OK office anticipates constructing 1-2 planned projects per year.

134. PL-566 dam structures are located in Texas, New Mexico, and Kansas as well. However, conversations with NRCS field staff in New Mexico and Texas indicate that PL-566 dams do not exist that could impact essential shiner habitat. In Kansas, 19 watersheds are contained in existing approved PL-566 plans of work that could potentially impact the shiner; however, these plans are contingent on funding and the likelihood of plan implementation is unsure. In addition, the Service has not historically objected to NRCS PL-566 dam construction or required project modification. Moreover, in New Mexico, Texas, and Kansas, construction of PL-566 dams in the future is unlikely in areas identified as essential habitat.[73]

[72] E-mail communication with Steven Elsener, Biologist, NRCS, Oklahoma, on February 28, 2005.
[73] Personal communication with Steven Bednarz, ASTC Water Resources, NRCS Texas on March 1, 2005; Personal communication with Roger Ford, NRCS New Mexico on February 28, 2005; Personal communication with Dean Krehbiel, NRCS Kansas, on March 2, 2005.

135. This section describes past impacts of shiner conservation on oil and gas activities and provides information on potential future impacts. Past impacts to oil and gas activities resulting from shiner protection efforts have predominantly been related to section 7 consultation efforts and related project modifications on oil and gas well extraction and pipeline development. Therefore, this analysis focuses on the costs of past and future consultations, including administrative costs, project modifications, and project delays to oil and gas extraction and pipeline activities. Impacts to overall regional production levels and/or significant delays in production are not anticipated. Due to a change to EPA stormwater regulations in 2006, consultation activity related to oil and gas extraction (e.g., drilling activities) in the vicinity of essential habitat is expected to increase. Thus, this chapter forecasts future impacts to oil and gas development activities resulting due to changes in Federal regulations. While pre- and post-designation consultation activities are discussed in this section, related administrative costs are presented in Section 3 of this report.

5.1 Summary of Impacts to Oil and Gas Activities

136. Oil and natural gas extraction and transmission (pipelines) occurring in the vicinity of essential habitat may impact the shiner through disturbance and contamination of the surface waters on which the species depends. Past section 7 consultation regarding oil and gas development activities have primarily consisted of oil and gas production (e.g., well drilling) and pipeline activities (e.g., construction, maintenance, repair, and abandonment). These activities have generated approximately 26 informal consultations in Texas and 100 in Oklahoma between 1998 and 2004.

137. Pre-designation project modification costs incurred by private entities related to oil and gas production and transmission activities are estimated to range from $1.8 million to $3.7 million since 1998 (constant, 2004 dollars), and from $648,000 to $842,000 on an annualized basis (high-end estimate annualized using discount rates of three and seven percent, respectively).

138. Post-designation project modification impacts to these activities in watersheds that contain proposed critical habitat are estimated to range from $29 to $61 million over 20 years

(constant, 2004 dollars), and from $1.5 to $3 million on an annualized basis (assuming discount rates of three and seven percent, respectively).

139. Approximately 823 oil and natural gas well development projects and 334 pipeline projects within and adjacent to essential habitat may engage in section 7 consultation with the Service regarding impacts to the shiner. Project modifications may increase drilling costs by up to 7 percent per well and pipeline construction costs by up to $22,000 per pipeline project.

140. Exhibits 5-1 and 5-2 present combined impacts (oil and gas production and transmission impacts) by watershed for watersheds that are proposed for inclusion (Exhibit 5-1) and watersheds that are proposed for exclusion (Exhibit 5-2) from the final rule. As shown, the Lower Canadian-Walnut, Lower Cimarron-Eagle Chief, and Lower Canadian-Deer watersheds may experience the greatest economic impact in terms of oil and gas well development in watersheds proposed for inclusion in the final rule.

Exhibit 5-1

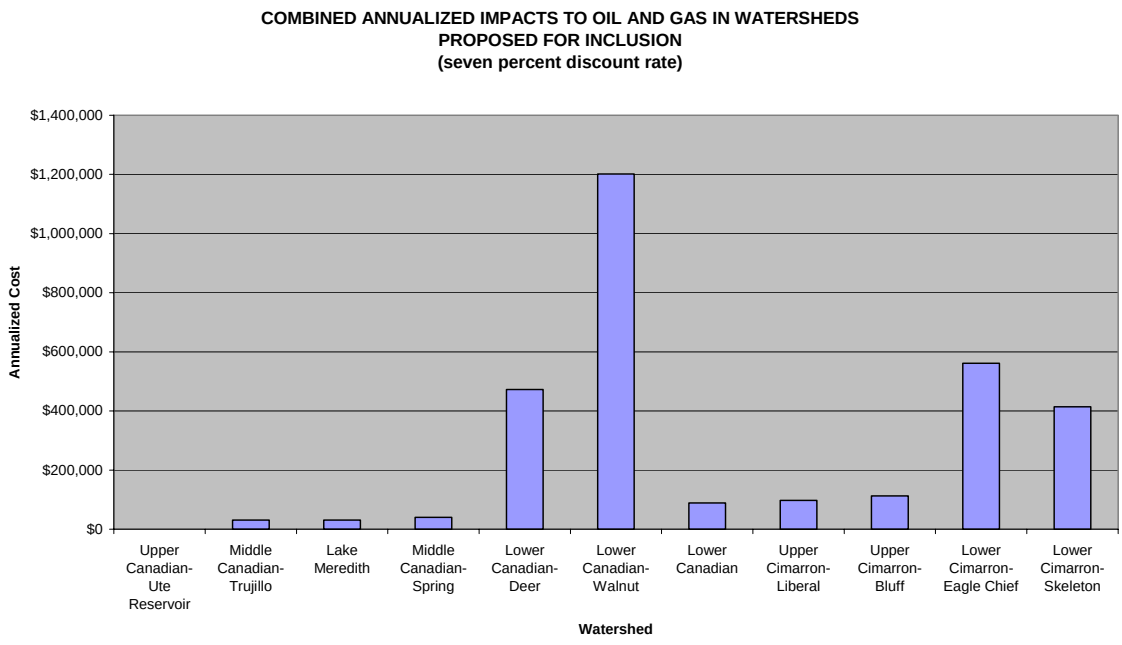
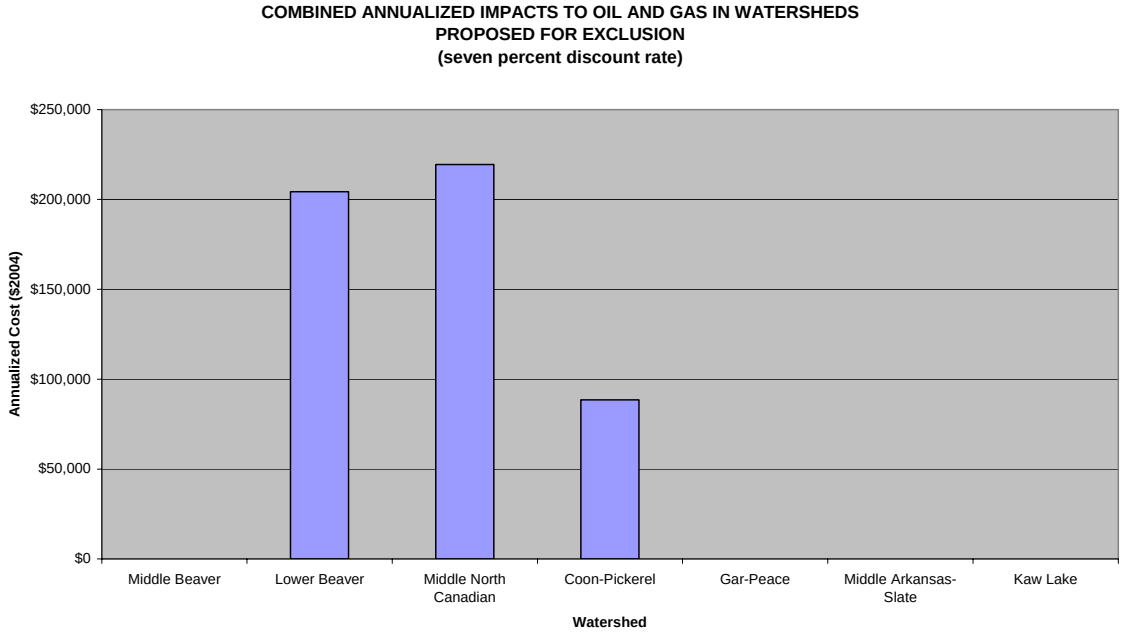


Exhibit 5-2



141. The remainder of this chapter describes in detail past and projected impacts to oil and gas activities within essential habitat.

5.2 Profile of Regional Oil and Gas Industry

142. Oil and natural gas production and transmission are important industries within the four states that contain essential shiner habitat. For example, Texas ranks first in the nation for both crude oil and natural gas production. New Mexico ranks fifth in the nation for crude oil production and second in natural gas production; Oklahoma ranks sixth for crude oil production and third for natural gas production; and Kansas ranks eighth in the U.S. for both crude oil and natural gas production.[74] Exhibit 5-3 presents information on recently permitted oil and gas well activity and production data within the counties containing essential habitat.

[74] Energy Information Administration, "Top 10" Lists & Rankings, accessed at http://www.eia.doe.gov/neic/rankings/rankindex.htm.

Exhibit 5-3

RECENT ANNUAL OIL AND GAS WELL ACTIVITY AND PRODUCTION, STATE AND COUNTY LEVELS

State	County	Most Recent 12 Months Well Activity[1]	Oil Production 2003 (BBL)	Gas Production 2003 (MCF)
Oklahoma	**State**	**2,243**	**64,676,767**	**1,566,663,548**
	Beaver	79	1,451,335	58,764,656
	Blaine	43	462,113	43,898,764
	Caddo	64	2,094,486	96,512,010
	Canadian	43	1,033,541	45,018,837
	Cleveland	1	642,645	1,794,178
	Custer	60	725,635	72,771,752
	Dewey	52	755,773	35,339,408
	Ellis	63	560,053	32,111,382
	Grady	54	3,910,215	93,110,396
	Harper	38	200,210	24,356,636
	Hughes	30	383,213	7,826,938
	Kingfisher	21	1,187,769	26,276,141
	Logan	41	908,593	22,839,755
	McClain	13	1,185,160	15,256,664
	McIntosh	34	2,108	4,741,872
	Major	42	1,753,378	47,558,161
	Pittsburg	156	0	71,470,734
	Pontotoc	46	2,537,956	1,494,070
	Pottawatomie	15	1,497,754	2,460,405
	Roger Mills	101	580,065	123,003,264
	Seminole	22	1,895,866	4,353,207
	Texas	137	3,254,390	90,352,683
	Woods	55	468,522	23,666,529
	Woodward	102	241,746	35,820,241
Kansas	**State**	**1,584**	**33,961,910**	**423,030,488**
	Barton	35	1,477,189	530,910
	Clark	18	106,713	2,431,105
	Comanche	28	604,795	9,148,550
	Cowley	14	461,370	68,775
	Meade	22	337,385	6,224,725
	Pawnee	8	130,560	978,338
	Reno	7	472,644	1,432,625
	Rice	11	693,666	540,038
	Sedgwick	3	135,960	23,999
	Seward	40	520,781	25,359,528
	Sumner	15	673,734	816,096
Texas	**State**	**16,875**	**359,915,137**	**5,812,034,655**
	Hemphill	411	204,737	77,346,804
	Oldham	8	109,907	204,159
	Potter	78	138,208	19,247,817
New Mexico	**State**	**1,036**	**66,560,840**	**1,710,366,204**
	Quay	0	0	0
Total Counties Encompassing Designation		**2,010**	**33,800,175**	**1,125,152,152**

Exhibit 5-3

RECENT ANNUAL OIL AND GAS WELL ACTIVITY AND PRODUCTION, STATE AND COUNTY LEVELS

State	County	Most Recent 12 Months Well Activity[1]	Oil Production 2003 (BBL)	Gas Production 2003 (MCF)

Notes: [1]The drilling activity for the most current 12 months consists of the following well data: New Mexico oil and gas well completions for July 2003 through June 2004, Texas drilling permits for December 2003 through November 2004, Kansas oil, gas, dry & abandoned, water, temporarily abandoned, saltwater disposal, cathodic protection well, junked & abandoned, and enhanced oil recovery well completions for December 2003 through November 2004, and Oklahoma oil, gas, and dry well completions for January 2003 through December 2003.

Sources:
Oklahoma: 2003 Report on Crude Oil and Natural Gas Activity Within the State of Oklahoma, http://www.occ.state.ok.us/Divisions/OG/annualreports.htm.
Kansas: Master List of Oil and Gas Wells in Kansas, http://www.kgs.ku.edu/Magellan/Qualified/index.html, and Oil and Gas Production in Kansas, http://www.kgs.ku.edu/PRS/petro/interactive.html
Texas: Drilling Permits Issued, http://www.rrc.state.tx.us/divisions/og/information-data/wkly-qtry-monthly-reports/prod-drill/ogidrli.html and Oil & Gas Production Data Query, http://webapps.rrc.state.tx.us/PDQ/generalReportAction.do
New Mexico: Well Activity Data Search, http://octane.nmt.edu/data/wellactivity/ and General Production Data Search, http://octane.nmt.edu/data/ongard/general.asp.

5.3 Impacts to Oil and Gas Well Development Activities

143. This section describes efficiency effects, including both administrative costs related to consultation efforts, and project modifications costs associated with potential shiner conservation efforts to future permitted oil and gas extraction activities (e.g. well drilling operations) occurring in areas adjacent to and within essential habitat. Based upon a review of the Service section 7 consultation administrative record for the shiner, 23 informal consultations have occurred in Oklahoma and 14 informal consultations in Texas related to oil and gas well development activities between 1998 and 2005.

144. No consultation regarding well activities has occurred within the Kansas and New Mexico portions of essential habitat, although future consultation within Kansas may occur given changes in Federal regulations governing stormwater discharge. No oil or gas production impacts are anticipated in Hemphill, Oldham, and Potter Counties, Texas or within Quay County, New Mexico. According to the Railroad Commission of Texas, these regions are experiencing depletion in reserves and there is minimal if any new well development adjacent to essential habitat. Of the three counties, Hemphill County is likely to experience more oil and gas development-related activity over twenty years but in areas away from essential habitat.[75] According to the New Mexico Oil Conservation Division, Quay County experiences minimal oil and gas production activity.[76] Moreover, state oil and natural data indicate limited, if any, completion records for Quay County.

[75] Personal communication with Robert Doss, Railroad Commission of Texas, February 28, 2005.
[76] Personal communication with Jane Prouty, New Mexico Oil Conservation Division, December 17, 2005.

145. Federal Agencies engaging in section 7 consultation regarding oil and gas extraction activities and the shiner have included EPA, BLM, FERC, and NPS. New oil and gas wells on private lands require a National Pollutant Discharge Elimination System (NPDES) stormwater construction general permit if the location of the well disturbs more than five acres.[77] In the past, proposed oil and gas well drilling operations have triggered section 7 consultation with the Service via the NPDES permitting process based on the location of the proposed project (e.g., proximity to or within essential habitat). Well development projects on Federal lands have triggered section 7 consultation with the Service via NPS and BLM permitting processes.

146. EPA regulations governing stormwater permits are scheduled to change in June 2006, at which time the threshold for location disturbance will decrease to one acre or more. As most oil and gas locations disturb between one and five acres, new oil and gas wells in Texas, Oklahoma, and New Mexico currently exempt from Federal NPDES permitting will require a NPDES construction general permit.[78] While Kansas has primacy over the NPDES program, the state permit must be at least as stringent as the Federal permit. Thus, new oil and gas wells in Kansas that disturb one to five acres will likely require a similar state issued stormwater permit.[79]

147. Impacts to oil and gas extraction activities from past consultation regarding the shiner have been manifest primarily as additional costs to oil and gas operators in complying with Service recommended project modifications. Exhibit 5-4 summarizes potential project modifications to oil and gas activities resulting from conservation measures recommended for the shiner.[80] Of these project modifications, utilizing directional rather than vertical drilling can result in the greatest economic impact. The cost of directional drilling ranges from twice to as much as three times the cost of drilling a typical vertical well.[81]

Exhibit 5-4

EXAMPLE PROJECT MODIFICATIONS FROM PAST INFORMAL CONSULTATIONS ON OIL AND GAS EXTRACTION ACTIVITIES AND THE SHINER

- Relocate pad outside of essential habitat.
- Place all weather surface road, and all permanent structures one foot above the 100-year floodplain.
- Install drainages or sloping on the pad to direct spilled materials and runoff to sumps.
- Install erosion control structures (silt fences and hay bales) on all sides of the pad along the outside of the berm to prevent runoff and increased sedimentation of the river.
- All ungraveled areas should be revegetated with seed or sod.
- Directionally drill the well.

Sources**:** Written communication with Ken Collins, USFWS, Tulsa Service Office, February 25, 2005; FWS/R2/OKES/02-0499 2-14-02-1-0581 re: Schroeder Federal #1-23D.

[77] "Location" includes the well pad surface and the surrounding area (i.e., mud pit) constructed to drill the well.
[78] Personal communication with Casey Luckett Snyder, EPA Region 6, Environmental Engineer, Enforcement and Compliance Assurance Division, on February 22, 2005.
[79] Personal communication with Denise Hamilton, EPA Region 6, NPDES Permit Section, November 17, 2004.
[80] Written communication with Ken Collins, Fish and Wildlife Biologist, Tulsa Office, U.S. Fish and Wildlife Service, February 25, 2004.
[81] Personal communication with Angie Burkhalter, Regulatory Affairs Director, Oklahoma Independent Petroleum Association, February 22, 2005.

148. Future project modifications to oil and gas extraction activities within essential habitat are anticipated to be similar to past project modifications. However, under the new NPDES permit regulations, EPA anticipates consulting with the Service on oil and gas drilling activities that propose to develop more than one acre within or adjacent to critical habitat. Thus, a greater number of oil and gas well development projects will be subject to additional administrative costs, increased drilling and operating costs, and potential production delays.

149. In December of 2004, the Department of Energy (DOE)/Office of Fossil Energy published a report on the estimated impacts of proposed storm water discharge requirements on the oil and gas industry nationwide. The report includes cost information related to ESA-specific requirements of the NPDES permit, including section 7 consultation and associated project modifications (e.g., installing soil erosion control structures) and potential costs associated with project delays. Exhibit 5-5 summarizes cost information from the DOE study. This analysis derives administrative, project modification, and project delay costs related to past and future section 7 consultation on the shiner from this study. Discussions with industry representatives confirm that these estimates represent a reasonable range of potential impacts to drilling operators engaging in section 7 consultation on the shiner.[82]

Exhibit 5-5

SUMMARY OF U.S. DEPARTMENT OF ENERGY/OFFICE OF FOSSIL ENERGY REPORT ON THE ESTIMATED IMPACTS OF PROPOSED STORM WATER DISCHARGE REQUIREMENTS ON THE OIL AND GAS INDUSTRY

Category	Cost
Obtaining ESA Clearance	$3,000 at 36 person-hours per well (ESA review) to $13,333 at 160 person-hours per site (ESA consultation).
Implementing BMPs	$2,560 to establish soil erosion control for a two-acre site.
Drilling day rates associated with idle rigs waiting for approval from ESA and/or NHPA review	Average drilling day rate of $2,800 per day. Assume 7 days of "unscheduled" delay for review, 21 days of "unscheduled delay for consultation (due to large increase in staffing levels).

Source**:** U.S. Department of Energy/Office of Fossil Energy, Estimated Economic Impacts of Proposed Storm Water Discharge Requirements on the Oil and Natural Gas Industry (Final), Memorandum from Advanced Resources International, Inc., December 7, 2004, available at http://www.fe.doe.gov/programs/oilgas/environment/publications/storm_water_summ120704.pdf.

150. Based upon a review of past consultation records and discussions with Federal Agencies and industry representatives, future regional economic impacts to oil and gas well development activities in the form of reductions in overall regional production or significant delays in production are not anticipated as a result of shiner conservation. In the past, oil and gas well operators engaging in section 7 consultation have not been required to cease drilling operation plans, but rather have incurred increased drilling and operation costs. However, in

[82] Ibid.

some instances, operators may decide not to pursue drilling in essential habitat. The decision not to drill is a function of the potential yield of each well, the financial condition of the operator, availability of other leases, and other operating decisions in addition to costs associated with section 7 consultation. Detailed data to indicate whether decisions not to drill are related to the shiner or other operational factors are not available.

5.4 Forecasting Future Oil and Gas Development Adjacent to and Within Essential Habitat

151. To estimate the potential number of future consultations regarding the shiner, this analysis examined recent permitting and well construction trends within essential habitat. Oil and gas well location data were obtained from relevant State agencies, including the Oklahoma Corporation Commission, Kansas Corporation Commission, Railroad Commission of Texas, and the New Mexico State Land Office Go-Tech website.

152. Utilizing spatial data, this analysis mapped well locations within and adjacent to essential habitat and determined the number of oil and natural gas wells constructed over the past five years in each watershed. To capture the maximum potential oil and gas well activity on an annual basis, this analysis assumes that the greatest number of wells constructed in any one of the past five years represents baseline well activity at the beginning of the period of analysis (2005). For example, records indicate that six wells were completed in Seminole County, Oklahoma in 2002, but that no wells were constructed in 2003 or 2004. In this case, this analysis assumes that six wells would be constructed on average per year within Seminole County at the beginning of the period of analysis.

153. Forecasting the rate of future well development is difficult given that oil and gas development activity is sensitive to the market price of the final product, as well as to other factors. While oil and gas are currently experiencing high prices reflected in increased drilling activity, prices may drop in the future. Therefore, using recent trends in regional annual activity to project future oil and gas development would likely overstate total well development over the twenty-year period of analysis.

154. The *Annual Energy Outlook 2005 (AEO2005)* prepared by the Energy Information Administration (EIA) presents forecasts and analysis of U.S. energy supply, demand, and prices through 2025 based on results from the EIA National Energy Modeling System.[83] Future trends in the oil and gas natural production industry are presented on a regional basis throughout the U.S. Regional oil and gas industry experts indicate that well production activity will likely follow national trends highlighted in the AEO2005 report.[84]

155. According to the AEO2005 report, natural gas production within the Southwest region (encompassing Texas and New Mexico) is projected to increase on average by one percent per year between 2003 and 2025. The Midcontinent region, which encompasses Oklahoma and

[83] Energy Information Administration, *Annual Energy Outlook 2005*, accessed at http://www.eia.doe.gov/oiaf/aeo/.
[84] Personal communication with Angie Burkhalter, Regulatory Affairs Directory, Oklahoma Independent Petroleum Association, February 22, 2005.

Kansas, is forecast to experience a decline in natural gas production by one percent per year from 2003 to 2025.[85] Oil production within the Southwest region is forecast to decline by 0.6 percent per year while the Midcontinent region is forecast to experience a 1.3 percent decline in oil production between 2003 and 2025.[86]

156. With the exception of natural gas production within the Southwest region, EIA projections indicate a slight decline in oil and natural gas production within the two regions. To capture the maximum potential development within the region, however, this analysis assumes that both oil and natural gas well development within essential habitat areas in Oklahoma, Kansas, Texas, and New Mexico will experience on average a one-percent increase in production annually.[87] This one-percent increase represents an upper-bound estimate of potential oil and gas well development within essential habitat, based upon EIA forecasts. Detailed information on forecast drilling activity within essential shiner habitat is provided in Exhibit 5-7.

157. Projecting an annual increase in oil and natural gas well development activity within essential habitat may overstate the actual level of activity in these areas. EPA has noted that in the past, operators have tended to avoid developing in areas proximal to river bodies, for a variety of reasons, including proximity to the floodplain and general operational practicality.[88]

5.5 Pre-designation Impacts to Oil and Gas Production Activities

158. Exhibit 5-6 presents a summary of past section 7 consultation regarding oil and gas production activities within the counties containing essential habitat. No formal consultations have occurred regarding oil and natural gas drilling operations and potential impacts to the shiner.

159. Past consultation has been related to oil and gas operations on private, State, and Federal lands. The Service has also consulted with BLM and NPS on the management of oil and gas extraction activities on Federal lands. While all consultation has remained informal, project modifications have been recommended to protect the shiner. In at least two instances, the Service requested that operators directionally-drill the well to minimize impacts to the shiner. Project modifications recommended by the Service for past oil and gas well development projects have incurred costs ranging from $25,000 to $64,000 per project (2004 dollars). Directional drilling has resulted in additional costs of up to $200,000 per project (2004 dollars).

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[85] Energy Information Administration, *Annual Energy Outlook 2005,* accessed at http://www.eia.doe.gov/oiaf/aeo/ Table 101. Lower 48 Crude Oil Production and Wellhead Prices by Supply Region.
[86] Energy Information Administration, *Annual Energy Outlook 2005,* accessed at http://www.eia.doe.gov/oiaf/aeo/ Table 102. Lower 48 Natural Gas Production and Wellhead Prices by Supply Region.
[87] Personal communication with Angie Burkhalter, Regulatory Affairs Directory, Oklahoma Independent Petroleum Association (OPA), February 22, 2005.
[88] Personal communication with Casey Luckett Snyder, EPA Region 6, Environmental Engineer, Enforcement and Compliance Assurance Division, February 22, 2005.

160. As shown in Exhibit 5-6, pre-designation project modification costs incurred by private, Federal, and State agencies related to oil and gas well development activities are estimated to range from $1.3 million to $2.8 million (constant, 2004 dollars). In annualized terms, this range of total constant costs is $234,000 to $489,000 assuming a three percent discount rate, or $305,000 to $638,000 assuming a seven percent discount rate.

Exhibit 5-6

SUMMARY OF PAST CONSULTATIONS INVOLVING OIL AND GAS WELL DEVELOPMENT ACTIVITIES (1998 – 2004)

State	Consultations		Project Modification Costs (constant, 2004 dollars)	
	# Informal	# Formal	Low	High
Oklahoma	23	0	$979,000	$1,880,000
Kansas	0	0	$0	$0
Texas	14	0	$352,000	$901,000
New Mexico	0	0	$0	$0
Total	**37**	**0**	**$1,331,000**	**$2,781,000**
Average per year	**6**	**0**		

Notes: Includes well drilling, extraction-related construction, abandoning activities. Typical project modifications costs range from $25,000 to $64,000 per project. In two instances, directional drilling has been recommended (at a cost of $200,000 per well).
Source: OK: U.S. Fish and Wildlife Service; TX: U.S. Fish and Wildlife Service, Arlington, Texas, Field Office, December 2004

5.6 Post-designation Impacts to Oil and Gas Production Activities

161. Based on spatial data and the U.S. Energy Information Administrative regional forecasts, this analysis projects that at the upper bound, oil and gas well construction will increase on average one percent per year over the next 20 years within essential habitat. Exhibit 5-7 presents information on the number of oil and gas wells within essential habitat in Oklahoma, Kansas, Texas, and New Mexico and forecast oil and gas well development over the twenty-year period of analysis. No oil or gas production impacts are anticipated in Hemphill, Oldham, and Potter Counties, Texas or within Quay County, New Mexico. According to the Railroad Commission of Texas, there is minimal if any well development adjacent to the essential habitat. Of the three counties, Hemphill County is likely to experience more oil and gas development-related activity over twenty years but in areas away from essential habitat.[89] According to the New Mexico Oil Conservation Division, the region experiences minimal oil and gas production activity. Moreover, state oil and natural gas data indicate limited, if any, completion records for Quay County.[90]

[89] Personal communication with Robert Doss, Railroad Commission of Texas, February 28, 2005.
[90] Personal communication with Jane Prouty, New Mexico Oil Conservation Division, December 17, 2005. IEc analysis of Go-Tech well location records.

162. This analysis assumes that approximately 801 oil and gas wells on private lands within watersheds that contain essential shiner habitat (711 oil and gas wells within watersheds that contain habitat proposed for designation) could be impacted by shiner conservation activities via engaging in section 7 consultation on the shiner and implementing project modifications to minimize impact, to the species and its habitat, or on average 40 wells per year over twenty years. Costs related to these modifications range from $25,000 to $64,000 (2004 dollars) per project depending on the level of conservation efforts required at a particular site. The low-end estimate represents minimal efforts to implement BMPs, while the high-end estimate incorporates additional costs related to a range of conservation efforts. In addition, this analysis assumes that five percent of future wells developed within essential habitat in each watershed may be required to utilize directional drilling, resulting in additional costs of $200,000 per project.[91] Total future potential project modification costs to oil and gas well development activities in watersheds that contain proposed shiner habitat over the next twenty years are expected to range from $25 million to $53 million over twenty years (constant, 2004 dollars). In present value terms, total costs are estimated to be $19 to $40 million assuming a three percent discount rate, or $14 to $30 million assuming a seven percent discount rate. On an annualized basis, the range of potential future costs is $1.3 to $2.7 million assuming a three percent discount rate, or $1.3 to $2.8 million, assuming a seven percent discount rate.

[91] In the past the Service has recommended that developers utilize directional drilling twice out of approximately 40 consultations on oil and gas well development activities. The cost of these pre-designation directional drilling costs are subtracted from the post-designation costs to prevent double-counting. The Service has indicated that the same well would not incur both pre- and post-designation modification costs related to directional drilling. Written Service comments, Tulsa Field Office, April 19, 2005.

Exhibit 5-7

CURRENT AND PROJECTED OIL AND GAS WELL DEVELOPMENT WITHIN WATERSHEDS CONTAINING ESSENTIAL SHINER HABITAT

CHD Unit Number	HUC Number	Watershed Name	State	Total Oil and Gas Wells in Watershed Portion of CHD	Maximum Annual Wells Constructed (2000-2004)	Total Potential Wells in CHD (20 years)
Proposed for Inclusion						
1a	11080006	Upper Canadian-Ute Reservoir	NM	0	0	0
	11090101	Middle Canadian-Trujillo	TX	0	0	7
	11090105	Lake Meredith	TX	0	0	7
1b	11090106	Middle Canadian-Spring	TX	0	0	7
	11090201	Lower Canadian-Deer	OK	34	5	111
	11090202	Lower Canadian-Walnut	OK	166	13	289
	11090204	Lower Canadian	OK	2	1	22
3	11040006	Upper Cimarron-Liberal	KS	12	1	22
	11040008	Upper Cimarron-Bluff	KS	29	1	22
	11050001	Lower Cimarron-Eagle Chief	OK	30	6	133
	11050002	Lower Cimarron-Skeleton	OK	32	4	89
Subtotal				**305**	**31**	**711**
Proposed for Exclusion						
2	11100102	Middle Beaver	OK	18	0	0
	11100201	Lower Beaver	OK	22	2	44
	11100301	Middle North Canadian	OK	7	2	44
4	11030004	Coon-Pickerel	KS	76	1	22
	11030010	Gar-Peace	KS	24	0	0
	11030013	Middle Arkansas-Slate	KS	85	0	0
	11060001	Kaw Lake	KS	2	0	0
Subtotal				**234**	**5**	**111**
Total				**539**	**36**	**823[(a)]**

Notes: (a) This estimate includes 22 oil and gas wells anticipated on essential habitat in Federal lands in Texas. The 22 potential impacts are spread evenly across Texas watersheds.
Sources:
OK: Oklahoma Corporation Commission, http://www.occ.state.ok.us/Divisions/OG/ogdatafiles.htm.
KS: Kansas Corporation Commission, http://www.kgs.ku.edu/Magellan/Qualified/index.html.
TX: http://www.rrc.state.tx.us/divisions/og/information-data/stats/oggwlct.pdf.
NM: http://octane.nmt.edu/data/info/.

5.7 Impacts to Oil and Gas Activities on Federal Lands

163. Within Texas, the National Park Service (NPS) manages oil and gas operations associated with the exercise of nonfederal oil and gas interests underlying the Lake Meredith National Recreation Area. Under Executive Order (E.O.) 11990: "Protection of Wetlands" and an NPS Special Directive 93-4, NPS does not permit new operations and well pad construction in areas within the 500-year flood plain surrounding Lake Meredith. NPS does,

however, permit the activity on *existing* well pads within the 500-year floodplain provided that operators incorporate appropriate mitigation measures.[92]

164. According to the NPS 2002 Final Oil and Gas Management Plan Environmental Impact Statement, drilling and production of up to 85 new wells could occur on up to 150 acres on NPS lands.[93] Of these 85 wells, 20 wells could utilize 52 acres in previously undisturbed areas and 65 wells could utilize existing production sites.[94] Of these 65 wells, only two occur within essential habitat on NPS lands.[95] Thus, any future plans to redevelop these two existing sites may require consultation with the Service regarding the shiner and implementation of appropriate modifications to protect the species.[96] These modifications are likely to result in adverse impacts to operators, including increased drilling and operating costs, delays, and potentially deferred production opportunities.

165. The BLM manages helium gas well development and processing activities on Federal lands within and adjacent to essential habitat in Texas. In the past, approximately five helium gas well development projects have occurred adjacent to or within essential habitat, with only two projects with well pads located within essential habitat. BLM indicates that there have been minimal impacts in the past of helium gas well development to the Canadian River and the Agency anticipates minimal well development activity adjacent to essential habitat in the future.[97] At a maximum, BLM estimates that two wells per year could be impacted by conservation activities for the shiner over twenty years.[98]

166. In summary, approximately 801 oil and natural gas wells on private lands and 22 wells on Federal lands within and adjacent to essential habitat may be impacted by shiner conservation activities over the 20-year period of analysis. Exhibit 5-8 summarizes potential future project modification costs for oil and natural gas wells by watersheds that contain essential shiner habitat. As shown in Exhibit 5-8, 711 oil and natural gas wells may be impacted in watersheds that contain shiner habitat proposed for designation.

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[92] Personal communication with Linda Dansby, National Park Service, Office of Minerals/Oil and Gas Support, Intermountain Region, Santa Fe, New Mexico, February 23, 2005.

[93] Information for impacts to oil and gas operations at Lake Meredith obtained from personal communication with Linda Dansby, National Park Service, Office of Minerals/Oil and Gas Support, Intermountain Region, Santa Fe, New Mexico, February 23, 2005; Final Oil and Gas Management Plan Environmental Impact Statement, Texas April 2002.

[94] Personal communication with Paul Eubank, Meredith NPS, November 29, 2004.

[95] Ibid.

[96] Executive Order (E.O.) 11990: "Protection of Wetlands" (42 Fed. Reg. 26961); Director's Order #77-1: Wetland Protection, Effective Date October 30, 2002, accessed at http://www.nps.gov/policy/DOrders/DO77-1-Reissue.htm; Director's Order #77-2: Floodplain Management, Effective Date, September 8, 2003, http://www.nps.gov/policy/DOrders/DO77-2--Floodplains.pdf

[97] Personal communication with Joe Peterson, Texas BLM, Assistance Field Manager, Helium Resources, December 14, 2004.

[98] Ibid.

Exhibit 5-8

FUTURE OIL AND NATURAL GAS WELL PRODUCTION COSTS IN ESSENTIAL SHINER HABITAT

Unit Number	HUC	Watershed Name	State	Total Pot. Wells in CHD (20 years)	Total Project Modification Costs (constant, 2004 dollars)		Annualized Costs (seven percent)		Annualized Costs (three percent)	
					Low	High	Low	High	Low	High
Proposed for Inclusion										
1a	11080006	Upper Canadian-Ute Reservoir	NM	0	$0	$0	$0	$0	$0	$0
	11090101	Middle Canadian-Trujillo	TX	7	$184,507	$471,974	$9,871	$25,251	$9,502	$24,307
	11090105	Lake Meredith	TX	7	$184,507	$471,974	$9,871	$25,251	$9,502	$24,307
1b	11090106	Middle Canadian-Spring	TX	7	$184,507	$471,974	$9,871	$25,251	$9,502	$24,307
	11090201	Lower Canadian-Deer	OK	111	$3,909,650	$8,268,532	$209,166	$442,366	$201,347	$425,829
	11090202	Lower Canadian-Walnut	OK	289	$10,165,091	$21,498,184	$543,832	$1,150,153	$523,502	$1,107,156
	11090204	Lower Canadian	OK	22	$781,930	$1,653,706	$41,833	$88,473	$40,269	$85,166
3	11040006	Upper Cimarron-Liberal	KS	22	$781,930	$1,653,706	$41,833	$88,473	$40,269	$85,166
	11040008	Upper Cimarron-Bluff	KS	22	$781,930	$1,653,706	$41,833	$88,473	$40,269	$85,166
	11050001	Lower Cimarron-Eagle Chief	OK	133	$4,691,580	$9,922,239	$251,000	$530,840	$241,616	$510,995
	11050002	Lower Cimarron-Skeleton	OK	89	$3,127,720	$6,614,826	$167,333	$353,893	$161,078	$340,664
SUBTOTAL				**711**	**$24,793,353**	**$52,680,822**	**$1,326,444**	**$2,818,424**	**$1,276,858**	**$2,713,062**
Proposed for Exclusion										
2	11100102	Middle Beaver	OK	0	$0	$0	$0	$0	$0	$0
	11100201	Lower Beaver	OK	44	$1,563,860	$3,307,413	$83,667	$176,947	$80,539	$170,332
	11100301	Middle North Canadian	OK	44	$1,563,860	$3,307,413	$83,667	$176,947	$80,539	$170,332
4	11030004	Coon-Pickerel	KS	22	$781,930	$1,653,706	$41,833	$88,473	$40,269	$85,166
	11030010	Gar-Peace	KS	0	$0	$0	$0	$0	$0	$0
	11030013	Middle Arkansas-Slate	KS	0	$0	$0	$0	$0	$0	$0
	11060001	Kaw Lake	KS	0	$0	$0	$0	$0	$0	$0
SUBTOTAL				**111**	**$3,909,650**	**$8,268,532**	**$209,166**	**$442,366**	**$201,347**	**$425,829**
TOTAL				**823**	**$28,303,003**	**$60,949,354**	**$1,535,611**	**$3,260,790**	**$1,478,205**	**$3,138,892**

Note: Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

5.8 Impacts to Oil and Gas Pipeline Activities

167. The majority of past oil and gas-related consultations have resulted from the maintenance of existing pipelines and construction of new pipelines (approximately 89 informal consultations between 1998 and 2004. To date, there have been no formal consultations regarding pipeline projects and the shiner. Pipelines that either cross or bore under essential habitat in waters of the United States typically require an Army Corps of Engineers (USACE) section 404 permit. Other permitting Agencies for pipeline activities include FERC, BIA, and EPA. To assess the impact of shiner protection efforts on pipeline-related activities, this analysis quantifies the direct impacts, defined as the cost of modifying pipeline projects for the shiner. Direct costs may include the costs associated with restrictions on activity periods (outside of the shiner's spawning season); restrictions on the use of in-stream equipment and the number of cuts along a pipeline; methods for removing the pipeline from the river; directional drilling; and implementing Best Management Practices (BMPs) to protect riparian areas. Future pipeline projects are expected to continue to take place, but at higher costs to the private developer.

168. Exhibit 5-9 summarizes potential project modifications to oil and gas pipeline activities resulting from shiner conservation measures based upon a review of the administrative record for the shiner.

Exhibit 5-9

EXAMPLE PROJECT MODIFICATIONS FROM PAST INFORMAL CONSULTATIONS ON OIL AND GAS PIPELINES ACTIVITIES AND THE SHINER

- Do not conduct project activities at river crossings within 300 feet of each side of river's wetted perimeter.
- Remove drilling fluids and/or other potentially contaminated products of drilling offsite and dispose at approved location.
- Store petroleum based compounds outside of the critical habitat area.
- Directionally bore the proposed crossing.
- Utilize a closed system concept with the portable directional drilling rig to prevent any possible migration of drilling fluids (produced or waste) into soils or groundwater.
- Cross during low water period.
- Restrict use of in-stream equipment; surface disturbing activities or construction equipment should not be allowed between the borehole and the river.
- Restrict the number of cuts along a pipeline.
- Implement Best Management Practice (BMPs) to protect the riparian area.
- Revegetate pipeline right-of-ways with native vegetation.
- Prepare spill contingency plan that addresses shiner needs.

Source:
Beaver River Pipeline project recommendations.
Written communication with Ken Collins, USFWS, Tulsa Field Office, February 2005.

169. Industry representatives indicate that the requirement to avoid impacts to areas within 300 feet of each side of river will result in the most significant additional costs to pipeline

projects, in terms of additional materials and equipment required.[99] Pipeline companies also note that delays from engaging in section 7 consultation may result in the loss of a project. Once construction plans are finalized, pipeline projects are typically scheduled to be completed rapidly in order to facilitate the transmission of oil and gas produced by drilling operators. Any unanticipated delays related to section 7 consultation on the shiner may result in lost opportunities for pipeline companies. One pipeline company noted that delays caused by section 7 consultation on the endangered American burying beetle resulted in a well not being connected to the company and the project being granted to another company.[100]

170. As costs are primarily related to implementing project modifications, regional economic impacts to pipeline activities in the form of significant delays in the transmission of oil and natural gas from wells to markets are not anticipated as a result of essential shiner habitat. However there is some indication that in the past, section 7 consultation on other species has resulted in temporary halts to production and transmission and therefore significant economic losses.[101] Exhibit 5-10 summarizes cost information provided by pipeline companies on administrative, project modification, and project delay costs related to past section 7 consultation on the shiner.[102]

Exhibit 5-10

SUMMARY OF PROJECT MODIFICATION AND DELAY COSTS ASSOCIATED WITH ESTIMATED IMPACTS OF PROPOSED STORM WATER DISCHARGE REQUIREMENTS ON THE OIL AND GAS INDUSTRY

Category	Cost
Directionally boring	$20/foot (incremental) or on average, $5,000-$10,000 per pipeline project.
Avoiding 300 feet of the river	$40-50/ft (incremental) or $12,000 per pipeline project.
Project delays	Potential loss of project to other pipeline companies.
Source: Personal communication with Enogex, Inc., March 1, 2005.	

5.9 Forecasting Future Oil and Gas Pipeline Development Adjacent to and Within Essential Habitat

171. Existing pipelines within essential habitat have been identified using spatial data obtained from the Tulsa District of the USACE. USACE does not have information on

[99] Personal communication with Enogex, Inc., March 1, 2005.

[100] In this consultation on the American burying beetle, the revenue loss was estimated to amount to $1 million over the life of the well, Enogex, Inc., March 1, 2005.

[101] Testimony of Patricia D. Horn on behalf of Enogex Inc. Hearing on the Consulting Process Required by Section 7 of the Endangered Species Act, Fisheries, Wildlife and Water Subcommittee, Senate Environment and Public Works Committee, United States Senate, Washington, D.C., June 25, 2003, accessed at http://epw.senate.gov/108th/Horn_062503.htm.

[102] The Service notes that out of thousands of oil and gas consultations conducted over the past seven years for all listed species, there was only one instance of a project being granted to another company (this consultation did not involve the shiner). That company, in turn, did not consult with the Service. Written Service comments, Tulsa Field Office, April 19, 2005.

projected pipeline activity and has stated that past pipeline activities do not necessarily indicate the potential locations of future projects. Industry representatives note, however, that past project locations provide a reasonable proxy of future pipeline development.[103] For example, one pipeline company states that many of its future projects will likely occur across the Canadian River within essential habitat.[104] In the absence of detailed information on the location of future permitted pipelines, this analysis assumes that future pipeline projects will occur in the same areas and at the same frequency as past pipeline projects within essential habitat. The number of pipeline projects per year are forecast to increase on average by one-percent per year to reflect forecasted trends in oil and gas well development activity. Detailed information on projected pipeline activity within essential habitat is presented in Exhibit 5-12.

5.10 Pre-designation Impacts to Oil and Gas Pipeline Activities

172. Exhibit 5-11 presents a summary of past section 7 consultation regarding oil and gas pipeline projects within watersheds that contain essential habitat. To date, no formal consultations have occurred regarding pipeline activities operations and potential effects to the shiner.

Exhibit 5-11

SUMMARY OF PAST CONSULTATIONS INVOLVING OIL AND GAS PIPELINE ACTIVITIES (1998 – 2004)

State	Number of Consultations		Total Project Modification Costs (constant, 2004 dollars)	
	Informal	Formal	Low	High
Oklahoma	77	0	$385,000	$770,000
Kansas	0	0	$0	$0
Texas	12	0	$60,000	$120,000
New Mexico	0	0	$0	$0
Total	**89**	**0**	**$445,000**	**$890,000**
Average per year	**15**	**0**		

Notes: Includes well drilling, extraction-related construction, abandoning activities. Typical project modification costs range from $5,000 to $10,000 per project according to information provided by pipeline companies.
Source: OK: U.S. Fish and Wildlife Service; TX: U.S. Fish and Wildlife Service, Arlington, Texas, Field Office, December 2004.

173. Past consultations have been related to pipelines that either cross or bore under areas within essential habitat and require Federal permits, such as section 404 permits distributed by USACE. While past consultation on pipeline projects has remained informal, project modifications have been recommended for past activities to protect the shiner. Project

[103] Personal communication with Enogex, Inc., March 1, 2005.
[104] Ibid.

modifications have incurred costs ranging from $5,000 to $10,000 (2004 dollars) per project. Total pre-designation costs incurred by private entities related to implementing project modifications to oil and gas pipeline development are estimated to range from $445,000 to $890,000 (constant, 2004 dollars). In annualized terms, this range is $102,000 to $204,000 assuming a seven percent discount rate, or $80,000 to $159,000 assuming a three percent discount rate.

5.11 Post-designation Impacts to Oil and Gas Pipeline Activities

174. As described above, this analysis utilizes spatial data on Federally permitted pipeline projects within and adjacent to essential habitat to determine the location of future pipeline projects in these areas. Four categories of pipelines constructed between 1998 and 2004 were analyzed. These categories include pipelines that intersect the river segment within essential habitat, pipelines that intersect the buffer areas, pipelines constructed within a quarter mile of essential habitat, and pipelines occurring within a half-mile of essential habitat.[105]

175. As data regarding the frequency of future consultations are not available, this analysis relies upon the consultation history for the shiner on pipeline projects to forecast the level of future pipeline development within and adjacent to essential habitat. Based upon a review of the administrative record for the shiner, this analysis assumes that in the baseline, 15 consultations on pipeline projects will occur annually in essential habitat. The number of pipeline projects per year are forecast to increase on average by one-percent per year to reflect trends in oil and gas well development activity, for a total of 334 pipeline projects over twenty years in watersheds that contain essential shiner habitat. Exhibit 5-12 presents information on projected pipeline projects within essential habitat in Oklahoma, Kansas, Texas, and New Mexico. Pipeline activities within the New Mexico portion of the designation are not anticipated, as oil and well development within the county are anticipated to be minimal.[106] Of the total pipeline projects in essential habitat (334), 257 are anticipated within watersheds that contain shiner habitat proposed for designation.

176. Based upon an analysis of USACE pipeline data, this analysis assumes that 334 future pipeline activities may engage in informal section 7 consultation and be required to implement modifications to avoid impacts to the shiner and its habitat over 20 years. Costs related to these modifications range from $17,000 to $22,000 (2004 dollars) per project depending on the level of conservation efforts required at a particular site.[107] These estimates incorporate additional costs related to a range of conservation efforts such as utilizing directional drilling and avoiding 300 feet of the riparian area as shown in Exhibit 5-13.

[105] These distances are measured from the river, not from the 300-foot buffer surrounding the river.
[106] Personal communication with Jane Prouty, New Mexico Oil Conservation Division, DATE, IEc analysis of Go-Tech well location records.
[107] Project modifications include costs for directional drilling ($5,000 to $10,000) and costs associated with avoiding 300 feet of river perimeter ($12,000 per project).

177. Of the total future pipeline projects within watersheds that contain essential shiner habitat, 257 are anticipated within watersheds that contain habitat proposed for designation. Project modifications to these oil and gas pipelines over the next twenty years are estimated to cost from $3.9 to $4.4 million (constant, 2004 dollars). Total present value costs are $3 to $3.3 million assuming a three percent discount rate, or $2.2 to $2.5 million assuming a seven percent discount rate. In annualized terms, the range of potential costs is $199,000 to $225,000 assuming a three percent discount rate, or $206,000 to $234,000 assuming a seven percent discount rate.

Exhibit 5-12

HISTORICAL AND FORECAST PIPELINE PROJECTS WITHIN AND ADJACENT TO ESSENTIAL SHINER HABITAT

CHD Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Total Pipelines Constructed (1998-2004)	% Total	Forecast Pipeline Projects / Consultations
Proposed for Inclusion						
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	0	0%	0
	11090101	Middle Canadian-Trujillo	Texas	2	2%	7
	11090105	Lake Meredith	Texas	2	2%	7
1b	11090106	Middle Canadian-Spring	Texas	5	5%	17
	11090201	Lower Canadian-Deer	Oklahoma	10	10%	33
	11090202	Lower Canadian-Walnut	Oklahoma	17	17%	57
	11090204	Lower Canadian	Oklahoma	0	0%	0
3	11040006	Upper Cimarron-Liberal	Kansas	3	3%	10
	11040008	Upper Cimarron-Bluff	Kansas	8	8%	27
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	10	10%	33
	11050002	Lower Cimarron-Skeleton	Oklahoma	20	20%	67
Subtotal				**77**	**77%**	**257**
Proposed for Exclusion						
2	11100102	Middle Beaver	Oklahoma	0	0%	0
	11100201	Lower Beaver	Oklahoma	9	9%	30
	11100301	Middle North Canadian	Oklahoma	14	14%	47
4	11030004	Coon-Pickerel	Kansas	0	0%	0
	11030010	Gar-Peace	Kansas	0	0%	0
	11030013	Middle Arkansas-Slate	Kansas	0	0%	0
	11060001	Kaw Lake	Kansas	0	0%	0
Subtotal				**23**	**23%**	**77**
Total				**100**	**100%**	**334**

Exhibit 5-13

FUTURE COSTS ASSOCIATED WITH OIL AND GAS PIPELINE PROJECTS IN ESSENTIAL SHINER HABITAT (20 years)

Unit Number	HUC	Watershed Name	State Overlaid	Forecast Pipeline Projects/ Consultations (20 years)	Total Project Modification Costs (constant, 2004 dollars)		Annualized Project Modification Costs (seven percent)		Annualized Project Modification Costs (three percent)	
					Low	High	Low	High	Low	High
Proposed for Inclusion										
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	0	$0	$0	$0	$0	$0	$0
	11090101	Middle Canadian-Trujillo	Texas	7	$100,076	$113,420	$5,354	$6,068	$5,154	$5,841
	11090105	Lake Meredith	Texas	7	$100,076	$113,420	$5,354	$6,068	$5,154	$5,841
1b	11090106	Middle Canadian-Spring	Texas	17	$250,191	$283,550	$13,385	$15,170	$12,885	$14,603
	11090201	Lower Canadian-Deer	Oklahoma	33	$500,382	$567,099	$26,770	$30,340	$25,770	$29,206
	11090202	Lower Canadian-Walnut	Oklahoma	57	$850,649	$964,069	$45,510	$51,578	$43,808	$49,650
	11090204	Lower Canadian	Oklahoma	0	$0	$0	$0	$0	$0	$0
3	11040006	Upper Cimarron-Liberal	Kansas	10	$150,115	$170,130	$8,031	$9,102	$7,731	$8,762
	11040008	Upper Cimarron-Bluff	Kansas	27	$400,305	$453,680	$21,416	$24,272	$20,616	$23,364
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	33	$500,382	$567,099	$26,770	$30,340	$25,770	$29,206
	11050002	Lower Cimarron-Skeleton	Oklahoma	67	$1,000,764	$1,134,199	$53,541	$60,680	$51,539	$58,411
Subtotal				**257**	**$3,852,940**	**$4,366,666**	**$206,132**	**$233,617**	**$198,426**	**$224,883**
Proposed for Exclusion										
2	11100102	Middle Beaver	Oklahoma	0	$0	$0	$0	$0	$0	$0
	11100201	Lower Beaver	Oklahoma	30	$450,344	$510,390	$24,093	$27,306	$23,193	$26,285
	11100301	Middle North Canadian	Oklahoma	47	$700,535	$793,939	$37,479	$42,476	$36,078	$40,888
4	11030004	Coon-Pickerel	Kansas	0	$0	$0	$0	$0	$0	$0
	11030010	Gar-Peace	Kansas	0	$0	$0	$0	$0	$0	$0
	11030013	Middle Arkansas-Slate	Kansas	0	$0	$0	$0	$0	$0	$0
	11060001	Kaw Lake	Kansas	0	$0	$0	$0	$0	$0	$0
Subtotal				**77**	**$1,150,878**	**$1,304,329**	**$61,572**	**$69,782**	**$59,270**	**$67,173**
Total				**334**	**$5,003,819**	**$5,670,994**	**$267,704**	**$303,398**	**$257,697**	**$292,056**

Note: Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

5.12 Impacts to Oil and Gas Pipeline Activities on Federal Lands

178. NPS has indicated that there is a possibility of new pipelines being constructed in existing right-of-ways (ROWs) within or adjacent to essential habitat within Lake Meredith National Recreation Area in Texas. At present, NPS does not have information to indicate the number of potential future pipeline projects within these existing ROWs.[108] In addition, BLM does not anticipate construction or pipeline maintenance activities within or adjacent to essential habitat.[109] Thus, future impacts to new pipeline construction or maintenance activities on BLM lands within Texas are not expected.

[108] Personal communication with Karen Brown, NPS Superintendent, November 11, 2004.
[109] Personal communication with John Hamack, BLM, Texas.

179. As noted in Section 2, CAFOs are common in the region containing essential habitat for the shiner. EPA regulates CAFOs through National Pollutant Discharge Elimination System (NPDES) permits, which govern wastewater retention and discharge standards. As a result, CAFOs are subject to significant Federal regulatory oversight. This section evaluates how conservation activities to protect the shiner and its habitat affect the CAFO industry. The section begins with a summary of results, including an overview of the methodology. Then, detailed background information on CAFO regulation in the four states that contain essential shiner habitat is presented to provide context for the analysis. Finally, the section details the methodology employed to estimate potential impacts and presents results for each watershed that contains essential habitat. It is important to note that, due to the significant regulatory and other uncertainty associated with potential impacts of shiner conservation activities to CAFOs in states that contain essential shiner habitat, the methodology employed by the analysis is deliberately conservative and is intended to overstate potential costs.

6.1 Summary of Methodology and Results

Pre-designation Costs

180. Pre-designation costs associated with shiner conservation measures are limited to administrative costs related to one biological opinion covering NPDES permits in Texas in 1999 and as such are captured in Section 3 of this report. Although reasonable and prudent measures were included for the shiner, state delegation of NPDES permitting by EPA Region 6 to Texas rendered compliance with the measures discretionary for CAFOs. The analysis therefore assumes that the reasonable and prudent measures identified were not implemented by CAFOs in essential shiner habitat in Texas.

Post-designation Costs

181. Because significant regulatory uncertainty surrounds potential future economic impacts to CAFOs related to shiner conservation, post-designation costs for CAFOs are estimated under a number of simplifying assumptions intended to overstate, rather than understate, potential costs. First, all CAFOs within watersheds that contain essential

habitat are assumed to incur costs related to shiner conservation. Second, these CAFOs are assumed to incur 100 percent of the costs of compliance with draft requirements from the Service related to shiner protection.[109] The requirements include larger wastewater retention structures and a number of water quality-related requisites. Finally, due to regulatory uncertainty regarding CAFO permitting in delegated states, the analysis assumes that all CAFOs (in watersheds that contain essential habitat) in Texas, Kansas, and Oklahoma incur these costs of compliance.[110,111] Exhibit 6-1 presents the results of the analysis by essential habitat unit. As shown, if all of the simplifying assumptions are true, potential compliance costs for CAFOs in watersheds that contain essential shiner habitat are approximately $68.7 million over 20 years for units proposed for inclusion, and approximately $105 million over 20 years for units proposed for exclusion from the final rule (constant, 2004 dollars). In annualized terms, nominal costs within watersheds that contain units proposed for inclusion may reach $3.7 million assuming a three percent discount rate, or $4.5 million assuming a seven percent discount rate.

Exhibit 6-1

POTENTIAL COMPLIANCE COSTS FOR CAFOS IN WATERSHEDS THAT CONTAIN ESSENTIAL SHINER HABITAT

CHD Unit Number	Total Costs (constant, 2004 dollars)	Annualized Costs (seven percent)	Annualized Costs (three percent)
Proposed for Inclusion			
1a	$3,273,980	$219,211	$172,591
1b	$19,965,897	$1,271,319	$1,017,906
3	$45,434,372	$2,982,391	$2,493,498
Subtotal	**$68,674,250**	**$4,472,921**	**$3,683,995**
Proposed for Exclusion			
2	$48,772,590	$3,236,474	$2,555,711
4	$56,206,448	$3,502,398	$2,825,090
Subtotal	**$104,979,038**	**$6,738,872**	**$5,380,801**
Total	**$173,653,287**	**$11,211,792**	**$9,064,796**

Note: Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

[109] Draft requirements from the Service field office in Oklahoma were utilized for the analysis in the absence of consultation history that could indicate potential future CAFO requirements related to shiner conservation.

[110] The analysis did not locate CAFOs in Quay County, New Mexico. As a result, impacts in Quay County are not anticipated.

[111] While the Service generally concurs that additional shiner-related mitigation measures are likely to be required of CAFOs that fall within some distance of essential habitat, the Service questions the conservative assumptions made in the analysis. Specifically, the Service does not anticipate that all CAFOs within EPA Region 6 watersheds that contain essential shiner habitat will be required to implement all suggested mitigation measures. A portion of the CAFOs located within these watersheds may already have in place some or all of the measures included in this analysis. In addition, the Service questions the likelihood of Kansas and Texas (delegated states) adopting these proposed (EPA Region 6) mitigation measures for shiner protection. (Written Service comments, Tulsa Field Office, April 19, 2005.) As a result of the simplifying assumptions applied in this analysis, costs are likely overstated. However, more detailed information that would be necessary to refine this analysis is not available at this time.

6.2 Background

182. Animal feeding operations "congregate animals, feed, manure and urine, dead animals, and production operations on a small land area. Feed is brought to the animals rather than the animals grazing or otherwise seeking feed in pastures, fields, or on rangeland."[112] The primary impact of CAFOs on the shiner and its habitat include the potential runoff of animal waste and wastewater into streams from breaks or spills of waste storage structures and non-agricultural application of manure to cropland.

183. CAFOs are a subset of animal feeding operations (AFOs) that meet the regulatory definition of a CAFO or that are designated as CAFOs by a permitting authority.[113] The Clean Water Act designates CAFOs as point sources for pollution to waters of the United States under the National Pollutant Discharge Elimination System (NPDES) program. While Kansas and Texas have primacy over CAFO permitting and regulation, EPA Region 6 issues CAFO-related NPDES permits for New Mexico and Oklahoma.[114]

184. On February 12, 2003, the EPA issued a final Federal rule regulating wastewater disposal and operations for CAFOs in all states, entitled *National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations, Final Rule*. The 2003 rule revises the 1976 CAFO regulations to improve water quality protection. Three additional requirements are placed on CAFOs under the 2003 rule:

- A mandatory duty for all animal feeding operations that meet the regulatory definition of a CAFO (explained in the following paragraph) to apply for a NPDES permit, even where the CAFO discharges only during a large storm event;
- Large poultry operations are covered irrespective of the type of waste disposal system used (e.g., dry or liquid waste);
- All CAFOs covered by a NPDES permit are required to develop and implement a comprehensive nutrient management plan.[115]

185. Exhibit 6-2 presents size and criteria thresholds that define CAFOs under the February 2003 Final Rule. AFOs that meet or exceed size ranges under the "large" category are defined as CAFOs; however medium-size operations are only defined as CAFOs if they (1) discharge pollutants into waters of the United States through a man-

[112] U.S. Environmental Protection Agency, National Pollutant Discharge Elimination System, Animal Feeding Operations, accessed from http://cfpub.epa.gov/npdes/faqs.cfm on February 24, 2005.
[113] U.S. Environmental Protection Agency, *National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations (CAFOs); Final Rule*, Federal Register, Vol. 68, No. 29, February 12, 2003.
[114] Section 2 of this report provides a description of the livestock industry in Kansas, Oklahoma, Texas, and New Mexico.
[115] Ibid, page 71823.

made ditch, flushing system, or other similar man-made device; and/or (2) discharge pollutants directly into waters of the United States that originate outside of the facility and pass over, across, or through the facility or otherwise come into direct contact with confined animals. Small AFOs are designated CAFOs by a permitting authority on a case-by-case basis, and are never CAFOs by regulatory definition.[116] The regulatory parameters for CAFOs presented in Exhibit 6-2 will be adopted by New Mexico and Oklahoma through EPA Region 6 and have been adopted by Texas; however, Kansas maintains separate regulatory definitions of CAFO operations that are unlikely to change as the state adapts standards enumerated in the 2003 rule.[117]

Exhibit 6-2

SUMMARY OF CAFO SIZE THRESHOLDS FOR ALL FACILITIES

Sector	Large	Medium [a]	Small [b]
Cattle or cow/calf pairs	1,000 or more	300-999	Less than 300
Mature dairy cattle	700 or more	200-699	Less than 200
Veal Calves	1,000 or more	300-999	Less than 300
Swine (weighing over 55 pounds)	2,500 or more	750-2,499	Less than 750
Swine (weighing less than 55 pounds)	10,000 or more	3,000-9,999	Less than 3,000
Horses	500 or more	150-499	Less than 150
Sheep or lambs	10,000 or more	3,000-9,999	Less than 3,000
Turkeys	55,000 or more	16,500-54,999	Less than 16,500
Laying hens or broilers (liquid manure handling system)	30,000 or more	9,000-29,999	Less than 9,000
Chickens other than laying hens (other than a liquid manure handling system)	125,000 or more	37,500-124,999	Less than 37,500
Laying hens (other than a liquid manure handling system)	82,000 or more	25,000-81,999	Less than 25,000
Ducks (other than a liquid manure handling system)	30,000 or more	10,000-29,999	Less than 10,000
Ducks (liquid manure handling system)	5,000 or more	1,500-4,999	Less than 1,500

Notes: (a) Must also meet one of two "method of discharge" criteria to be defined as a CAFO or must be designated; (b) Never a CAFO by regulatory definition, but may be designated as a CAFO on a case-by-case basis.

Source: Environmental Protection Agency, *National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations (CAFOs); Final Rule*, Federal Register, Vol. 68, No. 29, February 12, 2003, Table 4.1, page 7191.

186. Permits for delegated states (those with primacy) in essential habitat are issued by the Texas Department of Environmental Quality (TCEQ) in Texas and the Kansas Department of Health and Environment (KDHE) in Kansas. As such, CAFO permitting activities are state actions in Texas and Kansas. Kansas issues permits on an individual basis to all CAFO operations; Texas issues permits under a general permit and on an individual basis in those cases where applicants do not meet the requirements of the general permit. The Service and EPA receive copies of all individual permits in both

[116] Ibid.

[117] Although regulatory definitions for CAFO operations are unlikely to change, Kansas expects to update its regulations to address new requirements for dry poultry operations under the 2003 rule. Personal communication with David Freise, Kansas Department of Health and Environment, on March 1, 2005.

states, and are able to review applications and submit comments to the state permitting authority.

187. EPA Region 6 is currently proposing to reissue general NPDES permits for discharges from CAFOs in Oklahoma and New Mexico.[118] The previous permit was issued in the Federal Register at 58 FR 7610 with an effective date of March 10, 1993 and an expiration date of March 10, 1998 (currently all CAFOs under the previous permit continue to operate under the expired permit).[119] The proposal for the reissue permit maintains requirements detailed in the 1993 general permit but also adds additional requirements contained in the 2003 Federal rule. With respect to endangered and threatened species, the proposed general NPDES permit for Oklahoma and New Mexico allows general coverage to existing CAFOs that are in compliance with at least one of the following requirements:

1. The CAFO does not have a listed species or critical habitat in its county or in proximity to its discharge locations; or

2. has completed an ESA section 7 consultation that considered all currently listed species and critical habitat and which resulted in either a "no jeopardy" opinion by the Service or Service concurrence that the CAFO's permit-related activities are "unlikely to adversely affect" listed species or critical habitat; or

3. has an ESA section 10 permit which considers all currently listed species and critical habitat; or

4. can document that the permit-related activities are "not likely to adversely affect" listed species or critical habitat, or has reached agreement with the Service on measures to avoid or eliminate adverse effects.[120]

CAFOs that do not meet these requirements are not eligible for coverage under the general permit and must apply for an individual permit.

188. EPA Region 6 is working with the Service as part of its section 7 consultation for the general permit on alternatives to screen eligibility for CAFOs. The current proposed alternative would designate geographic areas of concern for endangered species and critical habitat; eligibility would be met where authorized discharges were external to the area designated. Where a CAFO and/or point of discharge fell within the area of concern, permit eligibility would require the CAFO to undertake mitigation measures to avoid adverse effects on endangered species and critical habitat.[121] The proposed draft rule states that

[118] U.S. Environmental Protection Agency, *Notice of Proposed NPDES General Permit for Discharges from Concentrated Animal Feeding Operations (CAFOs) in New Mexico, Oklahoma, and on Indian Lands in New Mexico and Oklahoma (NMG01000 and OKG010000)*, Federal Register, Vol. 69, No. 234, December 7, 2004.
[119] Ibid, page 70685.
[120] Ibid, page 70686.
[121] Ibid.

Where a CAFO, or the point(s) where authorized discharges reach waters of the U.S., is located within a designated area of concern, the eligibility requirement (4) would require the CAFO to meet conditions and measures to avoid or eliminate adverse effects to listed species or critical habitat that were caused by authorized discharges.[122]

189. Service personnel indicate that areas of concern will be delineated based on the location of federally-listed endangered species and/or critical habitat, and that the Service will work with EPA and industry groups to establish appropriate buffers around the areas of concern. At this time, the appropriate buffer length has not been established, but may range from 1,000 feet to five miles.[123] CAFOs located within the buffer may be required to meet additional conditions for eligibility under the general permit as presented in Exhibit 6-3; CAFOs falling outside the buffer but within the watershed may be required to meet a subset (not yet determined) of the additional conditions.

Exhibit 6-3

POTENTIAL SHINER-RELATED REQUIREMENTS FOR CAFOS WITHIN AREAS OF CONCERN

Regulation	Potential Requirements[124]
Waste Retention Structure	• Increased storage capacity of waste retention structures to a minimum of 270 days and additional freeboard for at least a 100-year, 24-hour precipitation event. • No waste retention structures allowed within the 100-year floodplain. • Wastewater transportation systems should be pressure tested for leaks.
Vegetated Buffer	• Increased buffers for land application near streams, drainages, or other conveyance devices to 300 feet. • All buffers should be vegetated and no land waste application shall be allowed on buffers.
Water Quality Monitoring	• Groundwater monitoring wells should be placed appropriately to detect potential groundwater contamination at retention structures. • Streams/rivers upstream and downstream of the facility must be monitored for chlorophyll A using artificial or natural substrates.
Land Application Procedures	Land applied sludge and solid waste from CAFO retention structures should be tested for metals prior to application. including arsenic, cadmium, copper, chromium, mercury, lead, nickel, selenium, and zinc. These metals are used as feed supplements and can accumulate in waste retention structures.
Spill Remediation Procedures	A spill plan must be provided with the application describing proposed actions to minimize or avoid potential impacts to designated sensitive areas.

6.3 Methodology

190. Potential economic impacts to CAFO operations in Kansas, Oklahoma, Texas,

[122] Ibid.
[123] Written Service comments, Tulsa Field Office, April 19, 2005 and May 19, 2005.
[124] Written communication with Daniel Fenner, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Tulsa, Oklahoma, February 11, 2005. As noted previously, recommendations suggested by the Oklahoma Field Office are used in lieu of information contained in the consultation history, which is limited and does not provide information regarding additional CAFO requirements related to shiner conservation.

and New Mexico pursuant to critical habitat designation for the shiner are dependant on a number of factors that are in turn subject to significant regulatory and other uncertainties. These factors are:

- Potential changes to CAFO operations related to the proposed designation are uncertain. Requirements summarized in Exhibit 6-3 are currently in draft form and eventual adoption by EPA of these requirements in part or whole is unknown. Further, the extent to which these requirements will apply to Kansas and Texas is unclear.[125]

- The geographic extent of potentially affected CAFOs is unknown, i.e., whether only those CAFOs within the buffer will be impacted, or whether all CAFOs in the watershed draining into essential habitat will be impacted. Moreover, the degree to which operational changes will vary as a function of distance from essential habitat is unknown.

- The degree to which CAFOs in states that contain essential habitat already comply with some or all of the requirements summarized in Exhibit 6-3 is unknown. Potential future costs associated with meeting requirements recommended by the Service at existing CAFOs will vary according to the extent to which potentially impacted CAFOs already meet some or all of the requirements. It is likely that some operations will require minimal changes to facility operations after critical habitat for the shiner is designated, while others will require extensive changes. Costs are also likely to vary in proportion to the size of the facility and type of facility (e.g., swine, cattle). Therefore, real compliance costs across CAFOs are not uniform and are in many cases unknown.

191. Because these uncertainties exist regarding potential future costs that may be associated with shiner conservation, this analysis utilizes available data and simplifying assumptions to provide estimates that bound the magnitude of potential impacts that could result from alterations to CAFOs in the states that contain essential habitat. The major assumptions of this scenario are as follows:

[125] Potential economic impacts resulting from recommended CAFO requirements are uncertain due to regulatory flux that currently characterizes CAFO regulation. On February 28, 2005 the United States Court of Appeals determined that several components of the February 2003 CAFO rule violate terms of the Clean Water Act or are arbitrary under the Administrative Procedure Act. The Court found that "… the Clean Water Act, on its face, prevents the EPA from imposing, upon CAFOs, the obligation to seek an NPDES permit or otherwise demonstrate that they have no potential to discharge". On this point, the Court states that "… unless there is a 'discharge of any pollutant,' there is no violation of the Act, and point sources are, accordingly, neither statutorily obligated to comply with EPA regulations for point source discharges, nor are they statutorily obligated to seek or obtain an NPDES permit." *Waterkeeper Alliance, Inc., American Farm Bureau Federation, National Chicken Council, National Pork Producers Council, American Littoral Society, Sierra Club Inc., Natural Resources Defense Council, Inc. V. United States Environmental Protection Agency*, United States Court of Appeals, Second Circuit, February 28, 2005, pages 31 and 29. This decision calls into question EPA's regulatory authority over CAFOs that do not discharge; however, it is unclear to what degree this will impact the Region 6 permitting process, and, by extension, CAFO regulation in delegated states. For this reason, the analysis makes the conservative assumption that all CAFOs within areas of concern in Oklahoma, Kansas, and Texas will have to comply with recommended requirements as outlined in Exhibit 6-3.

- As a result of shiner protection, all CAFOs falling within watersheds containing essential habitat are subject to all regulatory requirements summarized in Exhibit 6-3.

- CAFOs within watersheds containing essential habitat are assumed *not* to be in compliance with any of these requirements, thereby incurring a 100 percent cost of compliance.

- These CAFOs are assumed to consult informally with the Service regarding shiner-related requirements at least once during the 20-year time horizon of the analysis. Associated administrative costs are captured in Section 3 of this report.

- Although Kansas and Texas have primacy over CAFO permitting, the analysis assumes that CAFOs in these states will require the same modifications as operations in Oklahoma, and will also consult informally with the Service at least once during the 20-year time horizon of the analysis. To the extent that CAFOs in Kansas and Texas are unaffected by shiner conservation, the analysis will overstate projected costs.

- Costs of compliance for CAFOs in New Mexico are not modeled; EPA Region 6 has indicated that NPDES-permitted CAFO facilities are not located within Quay County.[126]

192. In order to locate CAFOs within the watersheds that contain essential habitat in Oklahoma, Texas, and Kansas, this analysis relies on spatial data provided by State regulatory agencies.[127] Locating potentially impacted CAFOs using spatial data results in necessary caveats to the analysis. First, spatial data locates CAFOs as points in space, representing in most cases the center of the legal boundary of the CAFO; however, CAFO properties are comprised of retention control structures, confined facilities and/or feedlots, as well as land application areas for manure disposal. As such, spatial data locating CAFOs using point geometry do not represent the total land area of the CAFO and may not represent the location of the confined facility and/or point of discharge. Therefore, a CAFO whose legal center is located in one watershed will be captured in that watershed, even if the land area and/or point of wastewater discharge of the CAFO extends into an adjoining watershed. Although this leads to imprecision of cost estimates at the watershed level, aggregation to the unit level generally corrects the problem.[128]

[126] Personal communication with Denise Hamilton, U.S. EPA Region 6, on February 11, 2005.

[127] Oklahoma data was obtained from the Oklahoma Department of Agriculture, Food, and Forestry; Kansas data was obtained from the Kansas Department of Health and Environment; Texas data was obtained from the Texas Commission on Environmental Quality.

[128] Oklahoma also represents multiple CAFO operations operating under the same license as multiple points. The distribution of animals across these points is not identified in the data. This analysis removes multiple entries for each license within watersheds in order to assign the license to one location, but retains duplicate license entries in different watersheds. In doing so, the analysis may overestimate costs for watersheds that contain the designation if animals are actually located outside of that watershed. Where one license number has locations in multiple watersheds that contain the designation, the analysis counts the number of animals under each license for both watersheds, and may overstate costs for one of the watersheds if animals are actually confined within another.

193. In order to model unit costs of compliance with shiner-related CAFO requirements, this analysis relies primarily on two cost studies completed by the EPA and USDA for the 2003 NPDES rule governing CAFO operations.[129] This analysis utilizes several components of these studies to estimate costs to CAFOs in Oklahoma, Kansas, and Texas, including certain unit costs and "model farm" data used to structure the analyses. Estimated unit costs are presented in Exhibit 6-4. A detailed methodology of cost estimation for each requirement summarized in Exhibit 6-4 is provided in Appendix D of this report.

[129] US EPA, Office of Science and Technology, Engineering and Analysis Division. "Economic Analysis of the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations", December 2002; USDA/NRCS, "Costs Associated with Development and Implementation of Comprehensive Nutrient Management Plans", June 2003.

Exhibit 6-4

POTENTIAL SHINER-RELATED REQUIREMENTS AND ESTIMATED UNIT COMPLIANCE COSTS FOR CAFOS WITHIN AREAS OF CONCERN
(constant, 2003 dollars)

Regulatory Focus	Potential Requirement[130]	Estimated Unit Capital Costs	Estimated Unit Annual Costs
Waste Retention Structure	Increased storage capacity of waste retention structures to a minimum of 270 days and additional freeboard for at least a 100-year, 24-hour precipitation event.	Per Type of Retention Structure: Earthen Settling Basins: $413 - $35,992 Concrete Separators/Basins: $3,605 - $130,713 Naturally-Lined Ponds: $11,264 - $116,765 Synthetically-Lined Ponds: $25,448 - $346,952 Naturally-Lined Lagoons: $27,447 - $233,917 Synthetically-Lined Lagoons: $48,142 - $363,000	Per Type of Retention Structure: Earthen Settling Basins: $21 - $1,800 Concrete Separators/Basins: $72 - $2,614 Naturally-Lined Ponds: $563 - $5,838 Synthetically-Lined Ponds: $1,272 - $17,343 Naturally-Lined Lagoons: $1,372 - $11,696 Synthetically-Lined Lagoons: $2,407 - $18,150
	No waste retention structures allowed within the 100-year floodplain		
	Wastewater transportation systems should be pressure tested for leaks.	$20,750 per transportation segment	
Vegetated Buffer	Increased buffers for land application near streams, drainages, or other conveyance devices to 300 feet. All buffers should be vegetated and no land waste application shall be allowed on buffers.	$50 - $3,125 per facility	$30 - $1,876 per facility
Water Quality Monitoring	Groundwater monitoring wells should be placed appropriately to detect potential groundwater contamination at retention structures.	$9,465 per facility	$1,949 per facility
	Streams/rivers upstream and downstream of the facility must be monitored for chlorophyll A using artificial or natural substrates	$392 per facility	$6,252 per facility
Land Application Procedures	Land applied sludge and solid waste from CAFO retention structures should be tested for metals prior to application including arsenic, cadmium, copper, chromium, mercury, lead, nickel, selenium, and zinc.	$30 per facility	$200 per beef and dairy facility $103 per poultry facility $100 per other facilities
Spill Remediation Procedures	A spill plan must be provided with the application describing proposed actions to minimize or avoid potential impacts to designated sensitive areas	$160 - $2,530 per facility	---

Source: See Appendix D for a description of the methodology and sources for each unit cost estimate.

[130] Written communication with Daniel Fenner, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Tulsa, Oklahoma, February 11, 2005. As noted previously, recommendations suggested by the Oklahoma Field Office are used in lieu of information contained in the consultation history, which is limited and does not provide information regarding additional CAFO requirements related to shiner conservation.

6.4 Pre-designation Costs

194. Since the listing of the shiner in 1998, the Service has not consulted on NPDES permits for CAFOs related to the species in Oklahoma, Kansas, or New Mexico. As discussed in Section 3, the Service completed formal consultation on NPDES permitting in Texas, in which a finding of "no jeopardy/adverse modification" to the shiner was found. As discussed, costs of this consultation are limited to past administrative costs associated with shiner protection.

6.5 Post-Designation Costs

Impacts to Existing CAFOs

195. The analysis estimates post-designation costs by applying estimated unit costs of requirements summarized in Exhibit 6-4 to the number of CAFOs in watersheds that contain essential shiner habitat. Using spatial data provided by state regulatory agencies, the analysis identifies 372 CAFOs located in watersheds containing essential shiner habitat. Exhibit 6-5 presents estimated compliance costs for these CAFOs by watershed. As shown, total compliance costs for CAFOs in watersheds that contain proposed shiner habitat may reach $69 million (constant, 2004 dollars). In present value terms, this estimate is $53 million using a three percent discount rate, or $47 million using a seven percent discount rate. In annualized terms, this estimate is $3.7 million assuming a three percent discount rate, or $4.5 million assuming a seven percent discount rate. Exhibits 6-6 and 6-7 highlight impacts by watershed for those watersheds that are proposed for inclusion and those proposed for exclusion from the final rule. As shown, the largest impacts are likely to be felt in the Upper Cimarron-Liberal (proposed for inclusion) and Middle Beaver (proposed for exclusion) watersheds. Detailed information on methods employed to calculate unit costs of compliance are provided in Appendix D.

Exhibit 6-5

ESTIMATED COMPLIANCE COSTS FOR CAFOS WITHIN WATERSHEDS THAT CONTAIN ESSENTIAL SHINER HABITAT

Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Number of CAFOs in Watershed	Total Animals	Average Animals	Predominant Type of Animal	Total Costs (constant, 2004 dollars)	Annualized Costs (seven percent)	Annualized Costs (three percent)
Proposed for Inclusion										
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	0	0	0	N/A	$0	$0	$0
	11090101	Middle Canadian-Trujillo	Texas	0	0	0	N/A	$0	$0	$0
	11090105	Lake Meredith	Texas	4	67,800	16,950	Cattle/Swine	$3,273,980	$219,211	$172,591
1b	11090106	Middle Canadian-Spring	Texas	4	103,400	25,850	Cattle/Swine	$3,037,578	$201,915	$159,354
	11090201	Lower Canadian-Deer	Oklahoma	6	11,116	1,853	Cattle/Swine	$2,571,442	$163,126	$130,776
	11090202	Lower Canadian-Walnut	Oklahoma	16	31,730	1,983	Cattle/Swine	$6,172,931	$398,623	$317,650
	11090204	Lower Canadian	Oklahoma	24	1,059,204	44,134	Swine/Chickens	$8,183,947	$507,655	$410,126
3	11040006	Upper Cimarron-Liberal	Kansas	39	422,449	10,832	Cattle/Swine	$25,577,041	$1,699,761	$1,341,577
	11040008	Upper Cimarron-Bluff	Kansas	17	60,914	3,583	Cattle	$6,381,965	$398,721	$451,246
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	6	101,171	16,862	Cattle	$3,246,160	$206,563	$165,425
	11050002	Lower Cimarron-Skeleton	Oklahoma	18	80,257	4,459	Swine	$10,229,207	$677,345	$535,250
Subtotal				**134**	**1,938,041**			**$68,674,250**	**$4,472,921**	**$3,683,995**
Proposed for Exclusion										
2	11100102	Middle Beaver	Oklahoma	51	514,388	10,086	Cattle/Swine	$34,751,638	$2,311,030	$1,823,629
	11100201	Lower Beaver	Oklahoma	11	315,199	28,654	Swine	$7,299,062	$486,279	$383,492
	11100301	Middle North Canadian	Oklahoma	12	255,028	21,252	Swine	$6,721,889	$439,164	$348,590
4	11030004	Coon-Pickerel	Kansas	58	326,397	5,628	Cattle	$22,842,012	$1,420,409	$1,146,545
	11030010	Gar-Peace	Kansas	52	15,915	306	Cattle/Dairy	$16,684,558	$1,044,251	$841,034
	11030013	Middle Arkansas-Slate	Kansas	46	10,846	236	Cattle/Dairy	$14,229,159	$885,432	$714,546
	11060001	Kaw Lake	Kansas	8	3,174	397	Cattle/Swine	$2,450,719	$152,306	$122,965
Subtotal				**238**	**1,440,947**			**$104,979,038**	**$6,738,872**	**$5,380,801**
Total				**372**	**3,378,988**			**$173,653,287**	**$11,211,792**	**$9,064,796**

Note: Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

Exhibit 6-6

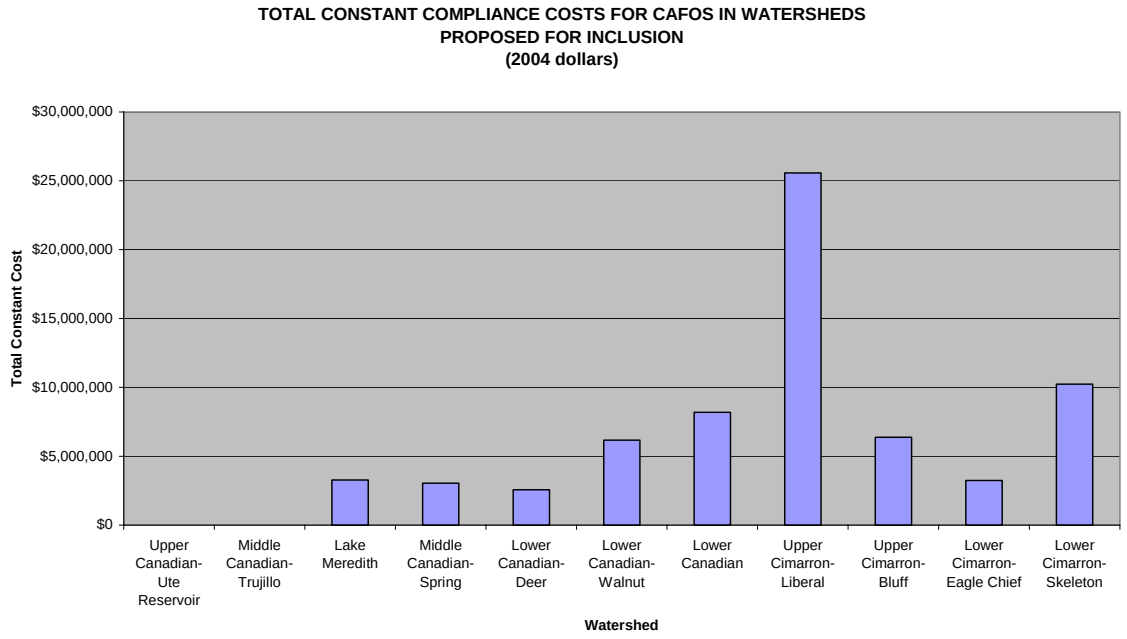
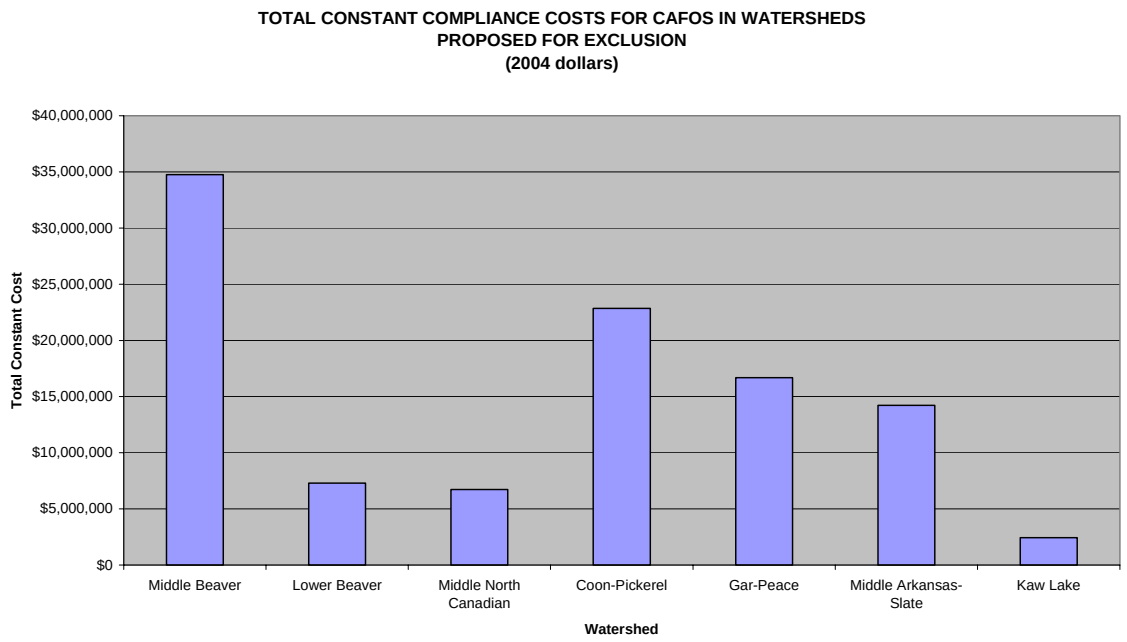


Exhibit 6-7



Impacts to New Source CAFOs

196. Impacts to new source CAFOs (large CAFOs for which construction commenced after April 13, 2003) in the post-designation period are likely to be limited in Oklahoma. According to the proposed draft rule for New Mexico and Oklahoma, EPA Region 6 "anticipates that relatively few CAFOs seeking coverage under the general permit will be such 'new sources.'"[131] In addition, under the 2003 CAFO rule and proposed general permit for Oklahoma and New Mexico, the design standard for new source swine, poultry, and veal calf CAFOs is containment of a 100-year, 24-hour rainfall event.[132] As a result, swine, poultry, and veal calf operations that do qualify as new-source CAFOs are unlikely to incur additional costs of wastewater retention structures to protect the shiner. Assuming that new source CAFOs will mimic existing CAFO patterns, the majority of new source CAFOs in the watersheds that contain the proposed designation in Oklahoma are likely to be swine facilities and therefore already in compliance with some of the shiner-related wastewater retention requirements.

197. In addition to presently licensed CAFO operations in Oklahoma, EPA Region 6 and ODAFF estimate that regulation changes under the 2003 rule will move roughly 500 AFO operations in Oklahoma under the regulatory definition of a CAFO; these operations will be required to obtain NPDES permits from EPA. Spatial data locating these CAFOs is not available; the analysis therefore does not model costs to these operations. In addition, the recent Appellate Court Decision calls into question EPAs ability to regulate these CAFOs in those cases where they do not discharge.

198. New source CAFOs are likely to be limited in Kansas and Texas as well. The 2003 Final NPDES Rule released by EPA notes the trend in animal production industries towards "fewer but larger operations".[133] Moreover, conversations with the Kansas Department of Health and Environment and EPA Region 7 have confirmed this trend in Kansas.[134]

199. Exhibit 6-8 presents caveats to the economic analysis on CAFO activities.

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[131] U.S. Environmental Protection Agency, *Notice of Proposed NPDES General Permit for Discharges from Concentrated Animal Feeding Operations (CAFOs) in New Mexico, Oklahoma, and on Indian Lands in New Mexico and Oklahoma (NMG01000 and OKG010000)*, Federal Register, Vol. 69, No. 234, December 7, 2004, page 70686.

[132] See U.S. Environmental Protection Agency, Proposed National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges and Concentrated Animal Feeding Operations (CAFOs) in New Mexico, Oklahoma, and on Indian lands in New Mexico and Oklahoma (NMG010000 and OKG010000) accessed at http://www.epa.gov/region6/6wq/npdes/genpermt/cafoguidance.pdf on February 11, 2005, page 10.

[133] Environmental Protection Agency, *National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations (CAFOs); Final Rule*, Federal Register, Vol. 68, No. 29, February 12, 2003, Table 4.1, page 7180.

[134] Personal communication with Mike Tate, Kansas Department of Health and Environment, on March 1, 2005; Personal communication with Mark Matthews, EPA Region 7, on March 1, 2005.

Exhibit 6-8

CAVEATS TO THE ECONOMIC ANALYSIS ON CAFO ACTIVITIES

Key Assumption	Effect on Impact Estimate
Recommendations detailed in Exhibit 6-3 accurately capture future CAFO requirements pursuant to critical habitat designation for the shiner.	+/-
All CAFOs within watersheds that contain essential shiner habitat will be required to implement recommendations as detailed in Exhibit 6-3.	+
All CAFOs within watersheds that contain essential shiner habitat will incur 100 percent of the costs of compliance of these recommendations.	+
USDA and EPA data is a reasonable approximation of potential compliance costs for CAFOs in essential shiner habitat.	+/-
Spatial data locating CAFOs as points in space accurately locates the point of discharge to which NPDES regulation applies.	+/-

- : This assumption may result in an underestimate of real costs.
+ : This assumption may result in an overestimate of real costs.
+/- : This assumption has an unknown effect on the magnitude of cost estimates.

200. This section evaluates how conservation activities to protect the shiner and its habitat affect the agricultural industry, including crop cultivation, livestock grazing, and groundwater pumping. Agricultural activity within essential shiner habitat poses risks to the species in terms of degraded water quality, riparian habitat, and water diversion. Additionally, impoundments and groundwater pumps installed for agricultural use or flood control may impact the species through resulting changes in the stream hydrology. While these impacts are possible within essential shiner habitat, the analysis does not assume that all areas of the designation will be impacted similarly by shiner conservation activities. For this reason, as discussed previously, the analysis presents impact estimates by watershed, identifying those portions of essential habitat where shiner-related impacts are likely to be relatively large, and those areas where impacts are unlikely to be incurred. Overall, however, it is important to note that the shiner has not impacted private agricultural activities since the listing of the species in 1998. Therefore, although the analysis estimates upper-bound impacts on private agricultural activities based on conservative assumptions, the expected likelihood of these scenarios is low given the noticeable absence of similar impacts since the listing of the species.

201. This section begins with a summary of results, including an overview of the methodology. The main body of the chapter presents details of the analysis, organized by activity.

7.1 Overview of Methodology and Results

202. The vast majority of the lands bordering the immediate essential habitat area are privately owned and devoted to agriculture, principally row cropping and livestock grazing. As stated, such activities on private land generally do not involve a Federal nexus and have not been impacted by the shiner since the listing of the species in 1998 (i.e., pre-designation project modification costs do not exist). In some instances, however, agricultural activities on private lands may be supported by voluntary landowner participation in any of a number of programs sponsored by Federal agencies including the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA). These agencies provide funding or technical assistance for agriculture-related initiatives. For these reasons, the analysis considers potential future impacts to private agricultural activities in essential habitat, but notes that considerable uncertainty

exists regarding the extent to which shiner conservation will impact these activities and where these impacts may occur.

Row Crop Activities

203. The consultation history indicates that the shiner has not impacted crop activities in the region containing essential shiner habitat since the listing of the species in 1998. However, given the uncertainty surrounding future economic impacts of shiner conservation activities on private agricultural activity, future costs associated with row crop activities within essential habitat for the shiner are estimated under three scenarios. The scenarios consider potential farmer responses to critical habitat designation; farmers are expected to choose scenario one, or one and two, but not three with either one or two. Accordingly, farmers are anticipated to either (1) retire agricultural land in essential habitat from crop production in order to avoid section 9 take of the shiner; and/or (2) discontinue participation in Federal farm assistance programs in order to avoid a Federal nexus for critical habitat requirements related to shiner protection; or (3) complete HCPs in order to obtain ITPs to avoid section 9 take of the shiner.[135,136] To estimate potential regional impacts of reduced crop production simulated in the first scenario, a regional economic impact analysis is also conducted.

204. Exhibit 7-1 presents the results of scenario one by unit; results by watershed (including regional impacts) are presented later in this section. As shown, potential direct effects to crop production are approximately $952,000 (in perpetuity) in units proposed for inclusion and approximately $822,000 (in perpetuity) in units proposed for exclusion from the final designation. In present value terms, these potential direct effects are $729,000 or $539,000 in units proposed for inclusion (using three and seven percent discount rates, respectively) and 630,000 or $466,000 in units proposed for exclusion (using three and seven percent discount rates, respectively). In annualized terms, these potential direct effects are $49,000 or $51,000 in units proposed for inclusion (using three and seven percent discount rates, respectively) and $42,000 or $44,000 in units proposed for exclusion (using three and seven percent discount rates, respectively). The largest impact is likely to be felt in unit 1b (approximately $717,000 in perpetuity) of the units proposed for inclusion, and in unit 4 (approximately $735,000 in perpetuity) of the units proposed for exclusion. It is important to note that these numbers represent the value of crop production in these areas as capitalized into land values.

[135] The Service notes that scenario one is highly unlikely, given the absence of impacts to crop activities since the shiner was listed in 1998. In addition, where section 9 take may be an issue, take is difficult to attribute to individual row crop activities. The Service also notes that scenario two is highly speculative: the nationwide consultation record does not demonstrate a history of consultation over the Federal nexus presented by these farm assistance programs. In addition, the Service generally encourages landowners to participate in NRCS programs. Finally, the Service also notes that scenario three is very remote, based as it is on the probability that take would occur in violation of section 9, which is unlikely. Written Service comments, April 19, 2005.

[136] Federal farm assistance programs considered in the analysis are the Environmental Quality Incentives Program (EQIP), the Wildlife Habitat Incentives Program (WHIP), and the Conservation Reserve Program (CRP).

Exhibit 7-1

ESTIMATED FUTURE DIRECT EFFECT OF REDUCTIONS IN CROP PRODUCTION DUE TO SHINER PROTECTION[1]

CHD Unit Number	Estimated Crop Reduction (acres, annually)	Value of Crop Production (per acre, constant 2004 dollars)	Total Crop Production Loss (perpetuity)	Annualized Loss (three percent)	Annualized Loss (seven percent)
Proposed for Inclusion					
1a	0.65	$321	$209	$11	$11
1b	3,243.60	$984	$717,263	$36,939	$38,374
3	965.16	$1,172	$234,342	$12,069	$12,537
Subtotal	**4,209.41**	**$2,477**	**$951,813**	**$49,018**	**$50,922**
Proposed for Exclusion					
2	391.81	$663	$86,534	$4,456	$4,630
4	2,015.61	$1,460	$735,698	$37,888	$39,360
Subtotal	**2,407.42**	**$2,123**	**$822,231**	**$42,345**	**$43,989**
Total	**6,616.83**	**$4,599**	**$1,774,044**	**$91,363**	**$94,911**

[1] Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

205. Exhibit 7-2 presents the results of scenario two by unit. As shown, losses to farm income in units proposed for inclusion may be as high as $3.6 million (constant, 2004 dollars). In annualized terms, this potential loss is $191,000 assuming a seven percent discount rate and $184,000 assuming a three percent discount rate.

Exhibit 7-2

ESTIMATED VALUE OF FEDERAL FARM ASSISTANCE IN ESSENTIAL SHINER HABITAT[1]

CHD Unit Number	Total EQIP in CHD	Total WHIP in CHD	Total CRP in CHD	Total Federal Funding in CHD (annually, $2004)	Total Constant Funding (2004-2025, $2004)	Annualized Funding (seven percent)	Annualized Funding (three percent)
Proposed for Inclusion							
1a	$11,924	$0	$13,763	$25,687	$513,742	$27,485	$26,458
1b	35,273	$1,083	$49,985	$86,341	$1,726,818	$92,385	$88,931
3	$21,439	$2,123	$43,381	$66,942	$1,338,844	$71,628	$68,950
Subtotal	**$68,636**	**$3,206**	**$107,128**	**$178,970**	**$3,579,404**	**$191,498**	**$184,339**
Proposed for Exclusion							
2	$9,375	$321	$13,948	$23,644	$472,887	$25,299	$24,354
4	$18,335	$3,013	$47,005	$68,353	$1,367,055	$73,137	$70,403
Subtotal	**$27,710**	**$3,334**	**$60,953**	**$91,997**	**$1,839,942**	**$98,437**	**$94,757**
Total	**$96,346**	**$6,540**	**$168,082**	**$270,967**	**$5,419,346**	**$289,935**	**$279,096**

[1] Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

Livestock Grazing

Pre-designation Costs

206. Livestock grazing in essential shiner habitat occurs primarily on private lands. The consultation history shows limited impacts of the shiner on grazing parcels on BLM and BIA lands with no shiner-related project modifications. As a result, the analysis assumes any future impacts to be administrative and to remain fairly constant in the future given the minimal Federal grazing area. Therefore, past impacts of grazing activity are captured in Section 3 of this report and are based on past consultation activity levels.

Post-designation Costs[137]

207. While the shiner has not impacted private grazing activity since the listing of the species in 1998, the analysis considers a scenario in which private ranchers take grazing lands out of production. The analysis uses spatial data locating rangeland in essential shiner habitat and applies private grazing fees to estimate the value of grazing land in the habitat. This estimate is considered an upper bound of potential impacts to private

[137] It is worth noting that no consultations or HCPs currently exist that affect private grazing in essential shiner habitat. In addition, the consultation history does not demonstrate impacts to private grazing in the past. The Service questions the assumption that critical habitat designation will affect private grazing efforts in the future, and notes that grazing may be modified only where section 9 take of the species is an issue. Service comments, Tulsa Field Office, April 19, 2005.

grazing, as the shiner has not impacted private grazing since the listing of the species in 1998. To estimate potential regional impacts of reduced livestock production, a regional economic impact analysis is also conducted. Exhibit 7-3 presents the results of the analysis by unit; results by watershed (including regional impacts) are presented later in this section. As shown, potential impacts to the grazing industry are approximately $5.9 million (constant, 2004 dollars) in units proposed for inclusion and approximately $2.6 million (constant, 2004 dollars) in units proposed for exclusion from the final rule. The largest impact may be felt in unit 1b (approximately $2.6 million over twenty years in constant, 2004 dollars) of the units proposed for inclusion in the final rule. This impact is larger than impacts to both units proposed for exclusion from the final rule. However, as noted, to the extent that this scenario does not occur, these costs will not be incurred by private ranchers.

Exhibit 7-3

ESTIMATED LIVESTOCK VALUE LOSSES DUE TO GRAZING REDUCTIONS IN ESSENTIAL SHINER HABITAT[1]

CHD Unit Number	Estimated AUM Reduction (annually)	Total Constant Loss (2005-2024, $2004)	Annualized Loss (seven percent)	Annualized Loss (three percent)
Proposed for Inclusion				
1a	7,723	$1,334,166	$58,244	$68,710
1b	18,091	$2,622,831	$114,503	$135,076
3	9,201	$1,945,889	$84,950	$100,213
Subtotal	**35,015**	**$5,902,886**	**$257,697**	**$303,999**
Proposed for Exclusion				
2	8,550	$1,212,638	$52,939	$62,451
4	5,204	$1,423,406	$62,140	$73,305
Subtotal	**13,753**	**$2,636,043**	**$115,079**	**$135,756**
Total	**48,769**	**$8,538,929**	**$372,776**	**$439,755**

[1] Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

Groundwater Pumping

208. Although groundwater pumping is significant in the western region of essential shiner habitat and may contribute to dewatering of streams, shiner conservation activities have not impacted groundwater use since the species was listed in 1998. However, given potential connections between groundwater pumping and surface water flow, groundwater users may be impacted in the future through reductions in allowable pumping to augment surface flows. For this reason, the analysis considers a scenario in which farmers discontinue groundwater pumping and convert irrigated cropland to dryland cropland. To the extent that this scenario does not occur, costs of reduction in groundwater pumping estimated in this section will not occur.

209. To estimate future economic impacts to groundwater users, this analysis follows three methodological steps: (1) first, the analysis identifies those watersheds that contain essential habitat and overlap the High Plains/Ogallala Aquifer; (2) next, the analysis

identifies acres of irrigated land in these watersheds; (3) lastly, the analysis applies the difference between irrigated and non-irrigated land values to estimate the implied value of groundwater as capitalized in land values in these watersheds. This estimate is the implied value of groundwater in the region, and, as such, likely overstates potential impacts to groundwater users.

210. Exhibit 7-4 presents the results of the analysis by unit; results by watershed are presented later in this section. These values represents the potential loss to farmers in land value should they have to transition their land from groundwater-irrigated to dryland production.[138]

Exhibit 7-4

IMPLIED VALUE OF GROUNDWATER IN ESSENTIAL SHINER HABITAT[1]

CHD Unit Number	Acres Irrigated by Groundwater	Total Loss in Constant Dollars (2004$) 2005 - 2024	Annualized Value of Groundwater (three percent)	Annualized Value of Groundwater (seven percent)
Proposed for Inclusion				
1a	43,857	$3,554,543	$183,059	$190,168
1b	86,408	$8,285,358	$426,696	$443,267
3	199,766	$116,380,843	$5,993,613	$6,226,375
Subtotal	**330,032**	**$128,220,745**	**$6,603,368**	**$6,859,810**
Proposed for Exclusion				
2	272,699	$44,203,413	$2,276,476	$2,364,883
4	190,962	$112,189,910	$5,777,780	$6,002,160
Subtotal	**463,661**	**$156,393,323**	**$8,054,256**	**$8,367,043**
Total	**793,692**	**$284,614,068**	**$14,657,624**	**$15,226,853**

[1] Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

7.2 Impacts to Row Crop Activities

211. The approach followed for projecting future costs associated with row crop activities in essential shiner habitat is presented in this section.

Analytical Framework

212. Crop activities can adversely impact the shiner in terms of water quality and available riparian habitat. In order to model potential impacts on crop production in essential habitat under the regulatory uncertainty associated with shiner conservation activities on private agricultural land, this analysis presents three scenarios representing potential farmer responses to critical habitat designation for the shiner. Farmers are assumed to choose either scenario one, or scenario one and two, but not scenario three in

[138] The Service notes that the consultation record does not demonstrate any actual or potential conservation activities that would restrict groundwater use to a level that would require a farmer to convert from irrigated to dryland agriculture. Written Service comments, Tulsa Field Office, April 19, 2005.

combination with the others. The three scenarios are as follows:

Scenario 1: To avoid section 9 take of the shiner, this scenario assumes that farmers retire agricultural land in essential habitat from production. This scenario utilizes spatial data of land use in the 300-foot lateral extent of essential habitat to identify acres of land devoted to row crop and small grain production. Then, the difference in land value across cropland and pastureland is applied to estimate the total implied value of agricultural activity as capitalized into land values in essential habitat for each watershed. This value represents the value of foregone production in each watershed under this scenario. A regional economic analysis is also conducted to estimate regional impacts of this reduction in crop production within essential habitat.

Scenario 2: To avoid a Federal nexus on farm operations, farmers under this scenario discontinue participation in Federal farm assistance programs in their respective counties. To estimate costs of farmer non-participation, the analysis completes the following three steps:

> **Step One**: First, the quantity and value of predominant Federal farm assistance program contracts are obtained for FY04 for each county containing essential habitat. Conversations with NRCS personnel indicate that cost-share agreements are most frequently accepted for the EQIP, WHIP, and CRP in these counties. Assuming money is not transferred elsewhere in the county, this scenario estimates the loss of Federal assistance to farms in counties that contain essential shiner habitat.[139]
>
> **Step Two**: Next, the value of Federal funding per acre and the percentage of total county acres obtaining Federal funding in FY04 (for the EQIP, WHIP, and CRP) in each county containing essential habitat are calculated. These estimates are used in Step Three to simulate the value of Federal farm assistance in shiner habitat from county-level data.
>
> **Step Three**: Finally, the estimates calculated in Step Two are multiplied by the number of acres in essential habitat to estimate the implied value of Federal farm assistance programs in essential habitat.

Scenario 3: The third scenario assumes that farmers obtain an ITP by preparing an HCP to avoid take of the shiner. Although the analysis presents this scenario as a potential future impact of critical habitat designation for the shiner, data limitations and lack of shiner-related HCPs since the listing of the species prevent quantification of economic impact. Therefore, the analysis does not quantify the potential future costs of this scenario.

[139] This is a reasonable assumption to make considering NRCS funding practices. In the past, NRCS has allocated money to priority programs as opposed to earmarking sums for distribution within particular counties. Personal communication with Stephen Tulley, NRCS, Oklahoma, on February 17, 2005.

Results

213. This section discusses results obtained in scenarios one and two associated with impacts to row crop activities. Due to regulatory uncertainty concerning how the shiner may impact private agricultural activities, impacts are assumed to range from zero (no impact) to the upper-bound estimates presented in this section. As stated, to the extent that these scenarios do not occur, the costs estimated in this section will not be incurred.

Scenario 1: Impacts to Row Crops in Essential Shiner Habitat

214. To estimate cropland acreage within essential shiner habitat, this analysis relies on geographic land cover data, the National Land Cover Data (NLCD), maintained by the USGS. This data was developed using satellite imagery for the purpose of generating a generalized and nationally consistent land cover data set. The NLCD classification consists of 21 different land cover categories. The analysis identifies croplands by combining two of these categories, "row crops" and "small grains". Using this methodology, spatial analysis of NLCD land use data identifies 6,617 acres of cropland in essential habitat.

215. Then, to generate the value of cropland in essential habitat, the analysis relies on crop and pastureland values in the states that contain essential habitat. Exhibit 7-5 presents these data. Kansas land value data is available at a finer scale than data for Oklahoma and Texas. Therefore, this analysis uses the average of land values in regions of Kansas that contain essential habitat for the shiner. Using these data, the value of crop activity in essential habitat is estimated at approximately $1.8 million in perpetuity, as presented in Exhibit 7-6. On an annualized basis, this loss is $91,000 assuming a three percent discount rate, or $95,000 assuming a seven percent discount rate. Of the watersheds proposed for inclusion, Lower Canadian-Walnut contains the highest value of crop production ($525,000 in perpetuity) as capitalized into land values.

Exhibit 7-5

CROP AND PASTURE LAND VALUES USED TO CALCULATE VALUE OF CROPS IN ESSENTIAL HABITAT

State	Cropland ($2003)	Pastureland ($2003)	Difference ($2003)	Difference ($2004)
Kansas ($2004)				
Southwest	$556	$230	$326	$326
South Central	$734	$330	$404	$404
Average	$645	$280	$365	$365
Oklahoma	$668	$450	$218	$221
Texas	$937	$620	$317	$321

Sources: KS: Kansas Agricultural Land Values, 2004, Kansas Agricultural Statistics Service. OK and TX: USDA NASS, Agricultural Land Values and Cash Rents, Final Estimates 1999-2003, March 2004, Statistical Bulletin Number 993

Exhibit 7-6

CALCULATION OF FUTURE DIRECT EFFECT OF REDUCTIONS IN CROP PRODUCTION (20 years)[1]

CHD Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Estimated Crop Reduction (acres, annually)	Value of Crop Production (per acre, $2004)	Total Loss in Constant Dollars (2004$) 2005 - 2024	Annualized Loss (three percent)	Annualized Loss (seven percent)
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	0	$0	$0	$0	$0
	11090101	Middle Canadian-Trujillo	Texas	0	$0	$0	$0	$0
	11090105	Lake Meredith	Texas	0.65	$321	$209	$11	$11
1b	11090106	Middle Canadian-Spring	Texas	9	$321	$2,865	$148	$153
	11090201	Lower Canadian-Deer	Oklahoma	686	$221	$151,578	$7,806	$8,109
	11090202	Lower Canadian-Walnut	Oklahoma	2,378	$221	$525,138	$27,045	$28,095
	11090204	Lower Canadian	Oklahoma	171	$221	$37,682	$1,941	$2,016
3	11040006	Upper Cimarron-Liberal	Kansas	93	$365	$33,985	$1,750	$1,818
	11040008	Upper Cimarron-Bluff	Kansas	54	$365	$19,648	$1,012	$1,051
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	178	$221	$39,326	$2,025	$2,104
	11050002	Lower Cimarron-Skeleton	Oklahoma	640	$221	$141,383	$7,281	$7,564
Subtotal				**4,209**	**$2,477**	**$951,813**	**$49,018**	**$50,922**
2	11100102	Middle Beaver	Oklahoma	61	$221	$13,388	$689	$716
	11100201	Lower Beaver	Oklahoma	96	$221	$21,103	$1,087	$1,129
	11100301	Middle North Canadian	Oklahoma	236	$221	$52,042	$2,680	$2,784
4	11030004	Coon-Pickerel	Kansas	1,018	$365	$371,727	$19,144	$19,887
	11030010	Gar-Peace	Kansas	500	$365	$182,595	$9,404	$9,769
	11030013	Middle Arkansas-Slate	Kansas	460	$365	$167,973	$8,651	$8,987
	11060001	Kaw Lake	Kansas	37	$365	$13,403	$690	$717
Subtotal				**2,407**	**$2,123**	**$822,231**	**$42,345**	**$43,989**
TOTAL:				**6,617**		**$1,774,044**	**$91,363**	**$94,911**

[1] Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

Regional Economic Impacts

216. This section presents the regional economic impacts expected to result from reductions in crop production within essential habitat as a result of shiner conservation activities. The above analysis estimates approximately $1.8 million (in perpetuity) in reduced crop production in essential habitat as a result of farmers retiring agricultural land in the lateral extent of essential habitat. The constant value of this loss is $89,700 (constant, 2004 dollars). This section estimates the regional implications of this reduction ($89,700).

217. Decreases in crop production due to shiner conservation activities will only occur if farmers do not have alternate land on which to move crop production currently located in essential habitat. Therefore, implicit in this analysis is the assumption that farmers do

not shift crop production from inside to outside essential habitat. Rather, farmers incur the loss of crop production in shiner habitat in this scenario.

Running the IMPLAN Model

218. For purposes of this regional economic impact analysis, the study area includes 39 counties in Kansas, Oklahoma, New Mexico, and Texas. The study area includes only the counties containing habitat essential for the shiner. Restrictions in crop production activity will primarily affect the crop-related sectors of the economy. Decreased operations in these industries would also result in secondary effects on related sectors in the study area. Some of these related sectors may be closely associated with crop production, such as fertilizer and pesticide; while others may be less closely associated with the industry, such as the insurance sector.

219. This analysis relies on regional economic modeling to estimate the economic impacts of these initial and secondary effects. In particular, it utilizes a software package called IMPLAN to estimate the total economic effects of the reduction in economic activity in the crop-related industries in the study area. IMPLAN is commonly used by State and Federal agencies for policy planning and evaluation purposes. The model draws upon data from several Federal and State agencies, including the Bureau of Economic Analysis and the Bureau of Labor Statistics.

220. IMPLAN translates initial changes in expenditures into changes in demand for inputs to affected industries. These effects can be described as direct, indirect, or induced, depending on the nature of the change:

- *Direct effects* represent changes in output attributable to a change in demand or a supply shock. These are specified initially by the modeler (e.g., the change in recreation expenditures on goods and services, by sector);

- *Indirect effects* are changes in output industries that supply goods and services to those that are directly affected by the initial change in expenditures; and

- *Induced effects* reflect changes in household consumption, arising from changes in employment (which in turn are the result of direct and indirect effects). For example, changes in employment in a region may affect the consumption of certain goods and services.

221. These categories are calculated for all industries to determine the regional economic impact of crop reductions resulting from shiner conservation activities.

Caveats to the IMPLAN Model

222. There are two important caveats relevant to the interpretation of IMPLAN model

estimates, generally, and within the context of this analysis. The first is that the model is static in nature and measures only those effects resulting from a specific policy change (or the functional equivalent specified by the modeler) at a single point in time. Thus, IMPLAN does not account for posterior adjustments that may occur, such as the subsequent re-employment of workers displaced by the original policy change. In the present analysis, this caveat suggests that the long-run net output and employment effects resulting from crop reductions are likely to be smaller than those estimated in the model, which implies an upward bias in the estimates. A second caveat to the IMPLAN analysis is related to the model data. The IMPLAN analysis relies upon input/output relationships derived from 1998 data. Thus, this analysis assumes that this historical characterization of the affected counties' economies is a reasonable approximation of current conditions. If significant changes have occurred since 1998 in the structure of the economies of the counties in the study area, the results may be sensitive to this assumption. The magnitude and direction of any such biases are unknown.

223. Exhibit 7-7 presents the results of the IMPLAN analysis. The future reduction of crop production is shown to result in an annual economic loss of approximately $142,000 ($2004) in regional output and approximately 3.1 jobs across all sectors. This impact represents approximately 0.015 percent of total output from the crop industry in this region.[140]

[140] This data is from IMPLAN for the Cotton, Food Grains, Feed Grains, Hay and Pasture, Grass Seeds, Tree Nuts, Vegetables, Oil Bearing Crops and Misc. Crops sectors.

Exhibit 7-7

FUTURE REGIONAL ECONOMIC IMPACT OF REDUCTIONS IN CROP PRODUCTION 2005-2024 (ANNUAL)*

CHD Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Direct Effect (Output)	Indirect Effect (Output)	Induced Effect (Output)	Total Impact (Output)
Proposed for Inclusion							
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	$0	$0	$0	$0
	11090101	Middle Canadian-Trujillo	Texas	$0	$0	$0	$0
	11090105	Lake Meredith	Texas	$9	$3	$2	$14
1b	11090106	Middle Canadian-Spring	Texas	$120	$44	$28	$192
	11090201	Lower Canadian-Deer	Oklahoma	$9,200	$3,397	$2,150	$14,748
	11090202	Lower Canadian-Walnut	Oklahoma	$31,875	$11,768	$7,450	$51,093
	11090204	Lower Canadian	Oklahoma	$2,287	$844	$535	$3,666
3	11040006	Upper Cimarron-Liberal	Kansas	$1,248	$461	$292	$2,001
	11040008	Upper Cimarron-Bluff	Kansas	$722	$266	$169	$1,157
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	$2,387	$881	$558	$3,826
	11050002	Lower Cimarron-Skeleton	Oklahoma	$8,582	$3,168	$2,006	$13,756
Subtotal				**$56,429**	**$20,833**	**$13,190**	**$90,452**
Proposed for Exclusion							
2	11100102	Middle Beaver	Oklahoma	$813	$300	$190	$1,303
	11100201	Lower Beaver	Oklahoma	$1,281	$473	$299	$2,053
	11100301	Middle North Canadian	Oklahoma	$3,159	$1,166	$738	$5,063
4	11030004	Coon-Pickerel	Kansas	$13,653	$5,040	$3,191	$21,884
	11030010	Gar-Peace	Kansas	$6,706	$2,476	$1,568	$10,750
	11030013	Middle Arkansas-Slate	Kansas	$6,169	$2,278	$1,442	$9,889
	11060001	Kaw Lake	Kansas	$492	$182	$115	$789
Subtotal				**$32,273**	**$11,914**	**$7,543**	**$51,730**
Total Output				**$88,702**	**$32,747**	**$20,733**	**$142,182**
Total Employment				**2.2**	**0.5**	**0.3**	**3.1**

*Regional economic impact measures represent one-time changes in economic activity (i.e., not present values); thus, these estimates represent annual losses.

Scenario 2: Federal Farm Assistance Activities in Essential Shiner Habitat

224. The second scenario considers that in addition to retiring crop production in essential habitat to prevent section 9 take, farmers may also choose to discontinue participation in Federal farm assistance programs to avoid shiner-related requirements. In the region containing essential shiner habitat, the Natural Resources Conservation Service (NRCS) and the Farm Service Agency (FSA) of the U.S. Department of Agriculture provide cost-share and other Federal assistance to private ranchers and farmers for the establishment of environmentally sustainable land use practices. Typical conservation activities in the essential habitat area include wetland restoration and enhancement, animal feeding operations and waste management, and construction and

maintenance of impoundments. The NRCS may provide funding through voluntary partnership with private landowners under conservation programs such as:

- Environmental Quality Incentives Program (EQIP) - Provides technical and financial assistance for the installation or implementation of structural and management conservation practices on agricultural land to farmers and ranchers who face particular land and water quality threats.

- Wildlife Habitat Incentives Program (WHIP) - Provides technical and financial assistance to landowners to develop upland, wetland, riparian, and aquatic habitat areas on their property.

- Conservation Reserve Enhancement Program (CREP) - Safeguards environmentally sensitive land through the use of Federal and State resources and the Conservation Reserve Program. The goal is to improve water quality, soil, and wildlife habitat by removing private lands from agricultural production and planting native grasses, trees, and other vegetation. Qualifying conservation practices include erosion control structures, filter strips, riparian buffers, and wetland restorations. In exchange for these activities, private landowners are eligible to receive annual rental payments, a one-time signing incentive payment, a practice incentive payment, and cost-share assistance for implementing conservation practices on retired land.

225. In addition, the FSA provides technical and financial assistance to farmers under the Farm Bill. Initiatives typically involve agricultural operation improvements to assist in conserving land and water resources, providing credit to new or disadvantaged farmers and ranchers, helping farmers and ranchers recover from disasters, or stabilizing farm income. The largest such initiative is the Conservation Reserve Program (CRP), in which cost sharing is provided to encourage landowners to convert highly-erodible cropland to vegetative cover, such as native grasses, wildlife plantings, trees, filterstrips, or riparian buffers.

226. Exhibit 7-8 summarizes EQIP, WHIP, and CRP funding (FY04) in the counties that contain essential shiner habitat.

Exhibit 7-8

FY 2004 EQIP, WHIP, AND CRP FUNDING IN COUNTIES ENCOMPASSING ESSENTIAL SHINER HABITAT
($2004)

County	EQIP			WHIP			CRP		
	Contracts Funded	Acres Accepted	Cost Share Funded	Contracts Funded	Acres Accepted	Cost Share Funded	Contracts Funded	Acres Accepted	Cost Share Funded
Kansas									
Barton	4	754	$122,469	0	0	$0	463	21,392	$789,575
Clark	3	23,406	$121,978	0	0	$0	380	52,296	$1,754,541
Comanche	4	1,352	$38,159	3	2774	$69,400	358	43,256	$1,285,571
Cowley	42	5,222	$210,226	0	0	$0	169	5,613	$221,152
Meade	2	630	$227,197	0	0	$0	577	63,844	$2,314,331
Pawnee	23	5,868	$532,412	2	131	$9,141	446	32,830	$1,159,552
Reno	23	5,285	$351,936	0	0	$0	1,344	89,423	$3,578,720
Rice	6	1,322	$259,998	0	0	$0	304	14,112	$550,917
Sedgwick	7	788	$149,595	2	373	$13,516	134	4,527	$174,301
Seward	9	2,791	$156,871	1	4	$9,995	506	53,794	$1,855,369
Sumner	9	1,745	$176,365	2	113	$4,918	306	6,944	$279,970
CHD Total	**132**	**49,163**	**$2,347,206**	**10**	**3,395**	**$106,970**	**4,987**	**388,031**	**$13,963,999**
Oklahoma									
Beaver	13	12,317	$325,171	0	0	$0	1,027	134,820	$5,189,210
Blaine	51	11,582	$288,242	0	0	$0	83	7,053	$220,179
Caddo	36	20,275	$727,932	7	972	$66,582	110	7,695	$270,707
Canadian	80	19,937	$349,949	4	917	$34,202	22	1,773	$58,280
Cleveland	19	1,875	$142,196	2	110	$11,341	0	0	$0
Custer	51	8,232	$601,827	0	0	$0	72	4,936	$166,685
Dewey	20	8,294	$207,184	1	800	$22,928	224	17,834	$635,076
Ellis	13	9,239	$193,582	2	558	$9,645	663	63,757	$2,119,276
Grady	6	5,133	$169,964	1	80	$5,182	26	2,257	$65,402
Harper	34	17,745	$401,807	0	0	$0	524	62,628	$2,044,814
Hughes	9	5,961	$160,961	3	960	$25,572	7	184	$7,238
Kingfisher	35	6,661	$192,232	0	0	$0	60	5,572	$181,578
Logan	11	3,590	$196,306	3	560	$50,752	39	2,489	$91,439
Major	34	12,564	$165,873	1	66	$1,155	208	18,539	$654,626
McClain	15	4,259	$139,616	2	898	$62,238	1	73	$2,763
McIntosh	55	11,917	$325,665	0	0	$0	0	0	$0
Pittsburg	23	8,743	$172,541	0	0	$0	0	0	$0
Pontotoc	10	4,617	$125,860	2	803	$44,861	2	64	$1,813
Pottawatomie	12	6,251	$330,169	5	793	$27,761	11	401	$14,893

Exhibit 7-8

FY 2004 EQIP, WHIP, AND CRP FUNDING IN COUNTIES ENCOMPASSING ESSENTIAL SHINER HABITAT
($2004)

	EQIP			WHIP			CRP		
County	**Contracts Funded**	**Acres Accepted**	**Cost Share Funded**	**Contracts Funded**	**Acres Accepted**	**Cost Share Funded**	**Contracts Funded**	**Acres Accepted**	**Cost Share Funded**
Roger Mills	20	23,584	$259,096	0	0	$0	185	22,478	$685,570
Seminole	27	8,064	$328,826	2	600	$24,335	4	230	$6,918
Texas	27	69,744	$777,110	0	0	$0	1,336	217,620	$7,403,446
Woods	60	39,804	$321,890	0	0	$0	334	27,090	$917,548
Woodward	10	14,797	$165,539	1	200	$5,564	232	19,700	$631,388
CHD Total	**671**	**335,186**	**$7,069,538**	**36**	**8,317**	**$392,118**	**5,170**	**617,191**	**$21,368,849**
Texas									
Hemphill	9	9,204	$573,257	N/A	N/A	N/A	95	14,211	$465,410
Oldham	23	60,499	$775,965	N/A	N/A	N/A	88	30,115	$976,636
Potter	6	5,733	$173,836	N/A	N/A	N/A	51	10,800	$389,974
CHD Total	**38**	**75,436**	**$1,523,058**	**N/A**	**N/A**	**N/A**	**234**	**55,126**	**$1,832,020**
New Mexico									
Quay*	39	25,181	$1,184,123	N/A	N/A	N/A	444	115,020	$3,414,944

Note: WHIP activities were not funded in FY04 in Texas and New Mexico counties that contain essential habitat.
*Quay County CRP estimate as of 8/31/2004.
Sources: Kansas State NRCS website; NRCS state and district offices.

227. Because voluntary Federal farm assistance programs are intended to provide opportunities to improve or minimize impacts to natural resources, negative impacts to endangered species are deliberately avoided. Accordingly, adverse impacts to the shiner or habitat are not usually anticipated and the Action agency may not find it necessary to initiate consultation with the Service. At times, the NRCS does consult on projects on private lands that may result in negative impacts, such a construction of livestock feedlots and impoundments; however, these consultations occur infrequently. Potential for impacts to NRCS funding can, however, exist outside of consultation requirements. For example, this analysis considers that farmers within essential habitat may discontinue participation in NRCS and FSA Federal programs to avoid costs associated with requirements for the shiner. Where NRCS and FSA money is not redistributed from these farmers within the affected county, a loss in farm income is generated in the county. Potential economic impacts associated with this scenario are evaluated following the three steps detailed in the methodology section above. Exhibit 7-9 details the calculations used to estimate annual Federal funding in essential shiner habitat in FY04. Exhibit 7-10 summarizes the potential total and annualized costs based on annual Federal funding calculated in Exhibit 7-9.

228. As summarized in Exhibit 7-10, total constant funding (2004 dollars) that may be impacted by shiner conservation activities is $3.6 million for watersheds that contain proposed shiner habitat. In annualized terms, this potential loss in Federal funding is $184,000 assuming a three percent discount rate, or $191,000 assuming a seven percent discount rate.

Exhibit 7-9

CALCULATION OF FEDERAL FARM ASSISTANCE IN ESSENTIAL SHINER HABITAT IN FY 2004
($2004)

CHD Unit Number	HUC Number	Watershed Name	Primary State Overlaid	HUC Area (acres)	Area of CHD in HUC (acres)	EQIP Total $	Average % of Acres in CHD in State	EQIP $ in CHD	WHIP Total $	Average % of Acres in CHD in State	WHIP $ in CHD	CRP Total $	Average % of Acres in CHD in State	CRP $ in CHD	Total Annual Federal Funding in CHD
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	1,540,434	3,129	$147,143	1.37%	$2,009	$0	0.00%	$0	$92,902	6.24%	$5,794	$7,803
	11090101	Middle Canadian-Trujillo	Texas	1,073,677	4,894	$171,985	2.95%	$5,070	$0	0.00%	$0	$165,230	2.47%	$4,075	$9,145
	11090105	Lake Meredith	Texas	1,322,606	4,676	$164,346	2.95%	$4,845	$0	0.00%	$0	$157,890	2.47%	$3,894	$8,739
1b	11090106	Middle Canadian-Spring	Texas	1,788,469	3,521	$123,735	2.95%	$3,648	$0	0.00%	$0	$118,874	2.47%	$2,932	$6,580
	11090201	Lower Canadian-Deer	Oklahoma	1,308,854	22,745	$683,516	1.81%	$12,339	$647,234	0.07%	$423	$673,066	2.73%	$18,358	$31,120
	11090202	Lower Canadian-Walnut	Oklahoma	1,163,772	31,388	$943,241	1.81%	$17,028	$893,173	0.07%	$583	$928,820	2.73%	$25,334	$42,945
	11090204	Lower Canadian	Oklahoma	1,273,614	4,163	$125,117	1.81%	$2,259	$118,475	0.07%	$77	$123,204	2.73%	$3,360	$5,696
3	11040006	Upper Cimarron-Liberal	Kansas	1,136,545	5,688	$671,075	0.74%	$4,968	$1,382,268	0.06%	$816	$208,645	6.10%	$12,736	$18,520
	11040008	Upper Cimarron-Bluff	Kansas	1,168,649	6,533	$770,856	0.74%	$5,706	$1,587,796	0.06%	$938	$239,669	6.10%	$14,630	$21,274
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	1,613,618	10,213	$306,924	1.81%	$5,541	$290,632	0.07%	$190	$302,231	2.73%	$8,244	$13,974
	11050002	Lower Cimarron-Skeleton	Oklahoma	2,062,321	9,629	$289,359	1.81%	$5,224	$273,999	0.07%	$179	$284,935	2.73%	$7,772	$13,174
Subtotal				**15,452,557**	**106,580**	**$4,397,296**		**$68,636**	**$5,193,578**		**$3,206**	**$3,295,465**		**$107,128**	**$178,970**
2	11100102	Middle Beaver	Oklahoma	817,144	4,214	$126,631	1.81%	$2,286	$119,909	0.07%	$78	$124,695	2.73%	$3,401	$5,765
	11100201	Lower Beaver	Oklahoma	1,142,433	7,404	$222,503	1.81%	$4,017	$210,693	0.07%	$138	$219,101	2.73%	$5,976	$10,130
	11100301	Middle North Canadian	Oklahoma	1,150,891	5,663	$170,189	1.81%	$3,072	$161,155	0.07%	$105	$167,587	2.73%	$4,571	$7,749
4	11030004	Coon-Pickerel	Kansas	1,035,951	5,475	$645,987	0.74%	$4,782	$1,330,593	0.06%	$786	$200,845	6.10%	$12,260	$17,828
	11030010	Gar-Peace	Kansas	376,732	7,712	$909,962	0.74%	$6,736	$1,874,324	0.06%	$1,107	$282,918	6.10%	$17,270	$25,113
	11030013	Middle Arkansas-Slate	Kansas	634,706	7,083	$835,660	0.74%	$6,186	$1,721,277	0.06%	$1,017	$259,817	6.10%	$15,860	$23,062
	11060001	Kaw Lake	Kansas	606,595	722	$85,147	0.74%	$630	$175,384	0.06%	$104	$26,473	6.10%	$1,616	$2,350
Subtotal				**5,764,452**	**38,273**	**$2,996,079**		**$27,710**	**$5,593,334**		**$3,334**	**$1,281,437**		**$60,953**	**$91,997**
Total								**$96,346**			**$6,540**			**$168,082**	**$270,967**

EXHIBIT 7-10

CALCULATION OF FUTURE DIRECT EFFECT OF FARMER NON-PARTICIPATION IN FEDERAL FARM ASSISTANCE PROGRAMS (ANNUAL)[1]

CHD Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Total Annual Federal Funding in CHD (2004$) (Exhibit 7-9)	Total Funding (2005 - 2024) (constant 2004$)	Annualized Funding (seven percent)	Annualized Funding (three percent)
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	$7,803	$156,053	$8,349	$8,037
	11090101	Middle Canadian-Trujillo	Texas	$9,145	$182,907	$9,786	$9,420
	11090105	Lake Meredith	Texas	$8,739	$174,782	$9,351	$9,001
1b	11090106	Middle Canadian-Spring	Texas	$6,580	$131,592	$7,040	$6,777
	11090201	Lower Canadian-Deer	Oklahoma	$31,120	$622,398	$33,298	$32,053
	11090202	Lower Canadian-Walnut	Oklahoma	$42,945	$858,899	$45,951	$44,233
	11090204	Lower Canadian	Oklahoma	$5,696	$113,929	$6,095	$5,867
3	11040006	Upper Cimarron-Liberal	Kansas	$18,520	$370,402	$19,817	$19,076
	11040008	Upper Cimarron-Bluff	Kansas	$21,274	$425,477	$22,763	$21,912
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	$13,974	$279,480	$14,952	$14,393
	11050002	Lower Cimarron-Skeleton	Oklahoma	$13,174	$263,485	$14,096	$13,569
Subtotal				**178,970**	**$3,579,404**	**$191,498**	**$184,339**
2	11100102	Middle Beaver	Oklahoma	$5,765	$115,308	$6,169	$5,938
	11100201	Lower Beaver	Oklahoma	$10,130	$202,608	$10,840	$10,434
	11100301	Middle North Canadian	Oklahoma	$7,749	$154,971	$8,291	$7,981
4	11030004	Coon-Pickerel	Kansas	$17,828	$356,555	$19,076	$18,363
	11030010	Gar-Peace	Kansas	$25,113	$502,257	$26,871	$25,866
	11030013	Middle Arkansas-Slate	Kansas	$23,062	$461,246	$24,677	$23,754
	11060001	Kaw Lake	Kansas	$2,350	$46,997	$2,514	$2,420
Subtotal				**91,997**	**$1,839,942**	**$98,437**	**$94,757**
Total				**$270,967**	**$5,419,346**	**$289,935**	**$279,096**

[1] Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

229. Exhibit 7-11 summarizes the key assumptions of the analysis of economic impacts on crop activities, as well as the potential direction and relative scale of bias introduced by these assumptions.

Exhibit 7-11

CAVEATS TO THE ECONOMIC ANALYSIS ON CROP ACTIVITIES

Key Assumption	Effect on Impact Estimate
While there is no history of crop restriction on private lands for the shiner, this analysis incorporates scenarios that assume restrictions are likely in the future to reflect the possibility that private landowners may modify their cropping practices (including activities conducted under cost-share assistance from the Federal government) to avoid incidental take under section 9 or to avoid shiner-related costs to their operations.	+/-
In estimating costs on private cropland, this analysis assumes that farmers will choose to retire all agricultural land in essential habitat from production.	+
USGS spatial data accurately locates row crops cultivated in essential habitat.	+/-
The difference between crop and pastureland values represents a reasonable approximation of the value of cropland in essential habitat.	+/-
State-level crop and pastureland values approximate local variations in these land values.	+/-
Farmers will choose not to participate in Federal farm assistance programs to avoid shiner-related requirements to their operations even where they retire agricultural land from production in essential habitat.	+
Federal farm assistance at the county level represents a reasonable approximation of farm assistance to the area encompassing essential habitat when adjusted for the overall proportion of federal assistance to the area on a per-acre basis.	+/-
The IMPLAN model used to estimate regional economic impacts is a static model and does not account for the fact that the economy will adjust. IMPLAN measures the effects of a specific policy change at one point in time. Over the long-run, the economic losses predicted by the model may be overstated as adjustments such as re-employment of displaced employees occurs.	+/-
The IMPLAN model used to estimate regional economic impacts relies on 1998 data. If significant changes have occurred in the structure of the affected counties' economies, the results may be sensitive to this assumption. The direction of any bias is unknown.	+/-

- : This assumption may result in an underestimate of real costs.
+ : This assumption may result in an overestimate of real costs.
+/- : This assumption has an unknown effect on the magnitude of cost estimates.

7.3 Impacts to Livestock Grazing Activities

230. This section describes past and potential future economic impacts to livestock grazing activities in areas proposed as essential shiner habitat. Specifically, this analysis estimates direct and indirect impacts on grazing due to shiner conservation activities. This section is divided into three parts. The first part provides an overview of grazing in essential habitat. Next is a description of the methods used to estimate the economic impacts of grazing restrictions implemented to protect the shiner and its habitat. The final section provides a summary of the past and expected future impacts to grazing.

Background

231. Grazing in essential shiner habitat occurs chiefly on private land. Although

private grazing lands have not been impacted by shiner protection to date, grazing activities are potentially detrimental to shiner populations. Grazing at high densities can damage the riparian area in shiner habitat through trampling; in addition, animal manure can lead to high nutrient concentrations in the stream.[141] Among other benefits to the species, a healthy riparian area provides additional habitat for the shiner during high water periods, and maintains stream hydraulics by preventing erosion of sandy soils into the stream.[142]

232. The consultation history related to grazing for the shiner is limited. The Service has completed seven informal consultations with the BIA regarding grazing land held in trust and under individual tribal ownership in Oklahoma, which is scattered across essential habitat. The Service has also consulted once with the BLM on grazing. The BLM holds four grazing licenses in Oklahoma, only one of which is located within essential habitat (in Blaine County). The leasee, however, does not graze cattle on the allotment, which is 35 acres. The BLM indicates that even if the lease were cancelled, impacts would be minimal and associated with only one head of cattle.[143] BLM and other Federal grazing lands are not located within essential habitat in Texas or Kansas. Further, spatial analysis of land ownership data available for New Mexico does not indicate an overlap of Federal land ownership with essential habitat in Quay County.

233. Based on the consultation history and analysis of Federal land locations, this analysis does not anticipate economic impacts to Federal grazing related to shiner protection. However, shiner conservation activities may impact non-Federal grazing activities to the extent that private landowners modify grazing practices in order to avoid incidental take under section 9. Determining the economic impact to non-Federal grazing activities requires an estimate of the number of acres of non-Federal grazing lands in proposed essential shiner habitat, a measure of the number of cattle that could be supported by these lands (e.g., AUMs), and the value per AUM of private grazing lands. The following section describes the methodology used to calculate these estimates and quantifies the potential economic impact of shiner conservation on non-Federal grazing activities.

Methodology

234. The greatest economic impact of shiner conservation on grazing activity may occur if restrictions on the use of riparian areas for livestock grazing are implemented, or if farmers choose to alter grazing practices and retire potential grazing land from livestock use. Exclusion of riparian areas from grazing can result in a reduction in the number of AUMs (animal unit months: forage for one cow and calf for one month) available for grazing on private property. The analysis estimates the value of potential AUM reductions in essential habitat following three methodological steps:

[141] US Fish & Wildlife Service, Biological Opinion on Burlington Northern and Santa Fe Railway Company's proposed railway bridge construction over the Cimarron River, August 4, 2004.
[142] PR page 59867.
[143] Personal communication with Phil Keasling, BLM Oklahoma, on March 1, 2005.

Identifying Non-federal Grazing Lands

235. Accurate geographic data on the number of acres of non-Federal lands used for livestock grazing activities in essential shiner habitat are not available.[144] To estimate shiner-related grazing impacts for the four states that contain essential shiner habitat, this analysis relies on geographic land cover (NLCD) data identifying rangeland vegetation to estimate the acres of non-Federal land grazed in essential habitat. The analysis identifies rangelands by combining three land categories in the NLCD, "grasslands/herbaceous", "shrubland", and "pasture/hay".[145] Using this classification method, the analysis identifies 77,410 acres of potential rangeland within essential habitat, as shown in Exhibit 7-12. On average, this area represents approximately 0.4 percent of the total area of watersheds that contain essential habitat.

[144] The 2002 Census of Agriculture reports the number of acres of farmland by county and state and the National Agricultural Statistics Service reports the number of livestock operations by state. However, neither source provides accurate spatial data locating the acreage of non-federal lands used for livestock grazing.

[145] Grasslands/herbaceous are areas dominated by upland grasses and forbs. Shrublands are areas characterized by natural or semi-woody vegetation with aerial stems, generally less than 6 meters tall, with individuals or clumps not touching or interlocking. Pasture/hay areas are areas of grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops. From: http://landcover.usgs.gov/classes.asp, accessed February 27, 2005.

Exhibit 7-12

ESTIMATED RANGELAND AREA IN ESSENTIAL SHINER HABITAT

Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Watershed Area (acres)	Rangeland Area in Buffer (acres)	Rangeland as % of Buffer	Rangeland as % of Total Watershed Area
Proposed for Inclusion							
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	1,540,434	3,115	99.6%	0.2%
	11090101	Middle Canadian-Trujillo	Texas	1,073,677	4,876	99.6%	0.5%
	11090105	Lake Meredith	Texas	1,322,606	4,269	91.3%	0.3%
1b	11090106	Middle Canadian-Spring	Texas	1,788,469	2,975	84.5%	0.2%
	11090201	Lower Canadian-Deer	Oklahoma	1,308,854	15,288	67.2%	1.2%
	11090202	Lower Canadian-Walnut	Oklahoma	1,163,772	9,839	31.3%	0.8%
	11090204	Lower Canadian	Oklahoma	1,273,614	613	14.7%	0.0%
3	11040006	Upper Cimarron-Liberal	Kansas	1,136,545	3,629	63.8%	0.3%
	11040008	Upper Cimarron-Bluff	Kansas	1,168,649	4,095	62.7%	0.4%
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	1,613,618	4,031	39.5%	0.2%
	11050002	Lower Cimarron-Skeleton	Oklahoma	2,062,321	2,850	29.6%	0.1%
Subtotal				**15,452,559**	**55,580**		
Proposed for Exclusion							
2	11100102	Middle Beaver	Oklahoma	817,144	3,863	91.7%	0.5%
	11100201	Lower Beaver	Oklahoma	1,142,433	6,072	82.0%	0.5%
	11100301	Middle North Canadian	Oklahoma	1,150,891	3,636	64.2%	0.3%
4	11030004	Coon-Pickerel	Kansas	1,035,951	2,641	48.2%	0.3%
	11030010	Gar-Peace	Kansas	376,732	2,918	37.8%	0.8%
	11030013	Middle Arkansas-Slate	Kansas	634,706	2,562	36.2%	0.4%
	11060001	Kaw Lake	Kansas	606,595	138	19.1%	0.0%
Subtotal				**5,764,452**	**21,830**		
Total				**21,217,008**	**77,410**		
Average				**1,178,723**	**4,301**		

Estimating Shiner-related AUM Reductions on Non-federal Grazing Lands

236. In the absence of previous consultation history, to estimate the private grazing effort that may be reduced due to shiner conservation activities this analysis relies on an AUM per acre value reported by Kansas State University for normal, non-drought conditions on rangeland vegetation in Central and Western Kansas. On average, initial stocking rates (AUMs per acre) for these regions range from 0.5 to 0.8 AUMs per acre. To estimate the number of AUMs lost on non-federal grazing lands in essential habitat, this analysis utilizes the average of these data, or 0.63 AUMs per acre. Using this estimate, the analysis calculates a total (stocking capacity) of 48,769 AUMs on rangeland in essential habitat.

Value per AUM on Non-Federal Grazing Lands

237. Exhibit 7-13 summarizes grazing fee rates for cattle (per AUM) on private non-irrigated lands for those states that contain essential shiner habitat. The analysis utilizes these private grazing fee rates per AUM, in perpetuity, to estimate the economic losses associated with potential AUM reductions on non-Federal lands to avoid incidental take.[146]

Exhibit 7-13

PRIVATE NON-IRRIGATED GRAZING FEE RATES FOR CATTLE BY STATE ($/AUM)

State	$2003	Perpetuity ($2004, 3%)*	Perpetuity ($2004, 7%)
Kansas	$13.50	$455.90	$195.38
Oklahoma	$7.00	$236.39	$101.31
Texas	$8.50	$287.05	$123.02
New Mexico	$8.60	$290.42	$124.47

Note: Calculated into perpetuity assuming a three/seven percent discount rate. Values adjusted to $2004 using "Table 1.1.9. Implicit Price Deflators for Gross Domestic Product."
Source: Source: NASS. 2004. Agricultural Prices 2003 Summary. USDA.

Future Impacts of Shiner Conservation on Non-Federal Grazing Activities

238. This section discusses the future impacts of shiner conservation activities on non-Federal lands by looking at restrictions in grazing effort (lost AUM value) and regional economic impacts. This analysis forecasts total future grazing reductions of up to 48,769 AUMs as a result of shiner conservation, resulting in future livestock value losses to ranchers of approximately $8.5 million (constant, 2004 dollars). The Lower Canadian Deer and Lower Canadian Walnut watersheds contain the largest proportions of these losses, at 16 percent and 10 percent of total livestock value losses respectively. Exhibit 7-14 presents the total future economic impacts on livestock grazing due to shiner conservation activities.

[146] Perpetuity calculates the value today of a stream of identical cash flows every year from today to infinity. In this case, grazing fee rates in perpetuity are equivalent to a rancher paying an identical grazing fee every year from the current year to infinity.

Exhibit 7-14

FUTURE IMPACTS ON LIVESTOCK GRAZING DUE TO SHINER CONSERVATION ACTIVITIES[1]

CHD Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Rangeland Area (acres)	AUM/ acre	AUMs	$/AUM (PV 2005 - 2024,2005$, 3%)	$/AUM PV 2005 - 2024,2005$, 7%)	Total Constant Costs 2005 - 2024 (2004$)	Annualized Livestock Value Losses (three percent)	Annualized Livestock Value Losses (seven percent)
Proposed for Inclusion											
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	3,115	0.63	1,962	$134	$109	$341,968	$17,611	$14,929
	11090101	Middle Canadian-Trujillo	Texas	4,876	0.63	3,072	$132	$109	$529,030	$27,245	$23,095
	11090105	Lake Meredith	Texas	4,269	0.63	2,689	$132	$109	$463,168	$23,853	$20,220
1b	11090106	Middle Canadian-Spring	Texas	2,975	0.63	1,874	$132	$210	$322,781	$16,623	$14,091
	11090201	Lower Canadian-Deer	Oklahoma	15,288	0.63	9,631	$109	$210	$1,366,042	$70,351	$59,636
	11090202	Lower Canadian-Walnut	Oklahoma	9,839	0.63	6,199	$109	$210	$879,206	$45,279	$38,383
	11090204	Lower Canadian	Oklahoma	613	0.63	386	$109	$210	$54,803	$2,822	$2,392
3	11040006	Upper Cimarron-Liberal	Kansas	3,629	0.63	2,286	$210	$109	$625,294	$32,203	$27,298
	11040008	Upper Cimarron-Bluff	Kansas	4,095	0.63	2,580	$210	$109	$705,744	$36,346	$30,810
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	4,031	0.63	2,540	$109	$109	$360,187	$18,550	$15,724
	11050002	Lower Cimarron-Skeleton	Oklahoma	2,850	0.63	1,795	$109	$210	$254,662	$13,115	$11,118
Subtotal				**55,580**		**35,015**			**$5,902,886**	**303,999**	**257,697**
Proposed for Exclusion											
2	11100102	Middle Beaver	Oklahoma	3,863	0.63	2,434	$109	$66	$345,215	$17,779	$15,071
	11100201	Lower Beaver	Oklahoma	6,072	0.63	3,825	$109	$66	$542,530	$27,940	$23,685
	11100301	Middle North Canadian	Oklahoma	3,636	0.63	2,291	$109	$66	$324,892	$16,732	$14,184
4	11030004	Coon-Pickerel	Kansas	2,641	0.63	1,664	$210	$127	$455,108	$23,438	$19,868
	11030010	Gar-Peace	Kansas	2,918	0.63	1,839	$210	$127	$502,935	$25,901	$21,956
	11030013	Middle Arkansas-Slate	Kansas	2,562	0.63	1,614	$210	$127	$441,556	$22,740	$19,277
	11060001	Kaw Lake	Kansas	138	0.63	87	$210	$127	$23,807	$1,226	$1,039
Subtotal				**21,830**					**$2,636,043**	**135,756**	**115,079**
Total				**77,410**					**$8,538,929**	**439,755**	**372,776**

[1] Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

Regional Economic Impacts

239. This section presents the regional economic impacts expected to result from reductions in grazed AUMs generated by shiner conservation activities. The above analysis estimates 48,769 AUMs reduced each year on non-Federal grazing lands over the next 20 years due to shiner conservation activities.

240. Decreases in livestock production due to reductions in AUMs in essential shiner habitat areas will occur only if no substitute forage is available. As a result, it is unclear that a reduction in AUMs in shiner habitat areas would necessarily lead to a reduction in herd size, as long as replacement forage is available. However, this analysis assumes that AUMs will be reduced as a result of shiner conservation (i.e., effectively assuming that no replacement forage is available). This analysis captures the value of these losses to rancher wealth by assuming that ranchers lose the value of these AUMs.

241. To estimate the regional economic impact of grazing restrictions, this analysis first estimates the number of AUMs likely to be lost annually as a result of shiner conservation activities. Direct effects are calculated by converting this AUM reduction into an estimated loss in livestock production. Next, the analysis utilizes IMPLAN to estimate indirect and induced impacts on the region in terms of output and jobs.

Future Regional Economic Impact Estimates

242. Future regional economic impacts are estimated using the estimate the value of lost AUMs calculated in Exhibit 7-15. This analysis assumes future AUM reductions of 48,769 due to shiner conservation activities. The calculation of the direct effect of reduced AUMs on annual livestock production rely on the following assumptions:

- The five-year average of livestock production per head in Kansas, Oklahoma, Texas, and New Mexico ($584)[147]; and

- Value per head is converted to annual forage value (per AUM) by dividing by 18 ($32).[148]

243. Exhibit 7-16 presents the results of the IMPLAN analysis. The future reduction in livestock production as a result of AUM reductions is shown to result in an annual economic loss of approximately $2.7 million ($2004) and 29 lost jobs. This impact represents approximately 0.16 percent of total output from the livestock industry in this region.[149]

[147] Value of all cattle and calves sales (dollars per head of livestock), 1997-2002. NASS, Census of Agriculture, 2002.
[148] Assuming one calf per cow and a monthly requirement of 0.5 AUMs per calf. Lewandrowski, Jan and K. Ingram, Restricting Grazing on Federal Lands in the West to Protect Threatened and Endangered Species: Ranch and Livestock Sector Impacts. *Review of Agricultural Economics*, Volume 24, Number 1 (78-107).
[149] This data is from IMPLAN for the Range-Fed, Ranch-Fed, and Cattle Feedlots livestock sectors.

Exhibit 7-15

CALCULATION OF FUTURE DIRECT EFFECT OF GRAZING REDUCTIONS ON LIVESTOCK PRODUCTION, 20 YEARS
($2004)

CHD Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Estimated AUM Reduction (annually)	Value of Livestock Production (per AUM)[1]	Total Livestock Production Loss[2]
Proposed for Inclusion						
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	1,962	$32	$62,799
	11090101	Middle Canadian-Trujillo	Texas	3,072	$32	$98,294
	11090105	Lake Meredith	Texas	2,689	$32	$86,057
1b	11090106	Middle Canadian-Spring	Texas	1,874	$32	$59,973
	11090201	Lower Canadian-Deer	Oklahoma	9,631	$32	$308,201
	11090202	Lower Canadian-Walnut	Oklahoma	6,199	$32	$198,363
	11090204	Lower Canadian	Oklahoma	386	$32	$12,364
3	11040006	Upper Cimarron-Liberal	Kansas	2,286	$32	$73,151
	11040008	Upper Cimarron-Bluff	Kansas	2,580	$32	$82,562
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	2,540	$32	$81,264
	11050002	Lower Cimarron-Skeleton	Oklahoma	1,795	$32	$57,456
Subtotal				**35,015**		**$1,120,485**
Proposed for Exclusion						
2	11100102	Middle Beaver	Oklahoma	2,434	$32	$77,886
	11100201	Lower Beaver	Oklahoma	3,825	$32	$122,403
	11100301	Middle North Canadian	Oklahoma	2,291	$32	$73,301
4	11030004	Coon-Pickerel	Kansas	1,664	$32	$53,241
	11030010	Gar-Peace	Kansas	1,839	$32	$58,836
	11030013	Middle Arkansas-Slate	Kansas	1,614	$32	$51,656
	11060001	Kaw Lake	Kansas	87	$32	$2,785
Subtotal				**13,753**		**$440,109**
Total				**48,769**		**$1,560,594**

Notes:
(1) Value of production represents the five year average for Oklahoma, Kansas, New Mexico, and Texas.
(2) Totals may not sum due to rounding.

Exhibit 7-16

FUTURE REGIONAL ECONOMIC IMPACT OF REDUCTIONS IN LIVESTOCK PRODUCTION, 20 YEARS (ANNUAL, $2004)*

CHD Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Direct Effect (Output)	Indirect Effect (Output)	Induced Effect (Output)	Total Impact (Output)
Proposed for Inclusion							
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	$63,710	$31,486	$13,876	$109,071
	11090101	Middle Canadian-Trujillo	Texas	$99,720	$49,282	$21,719	$170,720
	11090105	Lake Meredith	Texas	$87,305	$43,146	$19,015	$149,466
1b	11090106	Middle Canadian-Spring	Texas	$60,843	$30,069	$13,252	$104,163
	11090201	Lower Canadian-Deer	Oklahoma	$312,669	$154,522	$68,100	$535,291
	11090202	Lower Canadian-Walnut	Oklahoma	$201,239	$99,453	$43,830	$344,521
	11090204	Lower Canadian	Oklahoma	$12,544	$6,199	$2,732	$21,475
3	11040006	Upper Cimarron-Liberal	Kansas	$74,211	$36,675	$16,163	$127,050
	11040008	Upper Cimarron-Bluff	Kansas	$83,759	$41,394	$18,243	$143,396
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	$82,442	$40,743	$17,956	$141,141
	11050002	Lower Cimarron-Skeleton	Oklahoma	$58,289	$28,807	$12,695	$99,791
Subtotal Output				**$1,136,731**	**$561,776**	**$247,581**	**$1,946,085**
Proposed for Exclusion							
2	11100102	Middle Beaver	Oklahoma	$79,015	$39,050	$17,210	$135,274
	11100201	Lower Beaver	Oklahoma	$124,178	$61,369	$27,046	$212,593
	11100301	Middle North Canadian	Oklahoma	$74,364	$36,751	$16,197	$127,311
4	11030004	Coon-Pickerel	Kansas	$54,013	$26,693	$11,764	$92,471
	11030010	Gar-Peace	Kansas	$59,689	$29,499	$13,000	$102,188
	11030013	Middle Arkansas-Slate	Kansas	$52,405	$25,899	$11,414	$89,717
	11060001	Kaw Lake	Kansas	$2,825	$1,396	$615	$4,837
Subtotal Output				**$446,489**	**$220,657**	**$97,246**	**$764,391**
Total Output				**$1,583,219**	**$782,431**	**$344,829**	**$2,710,479**
Total Employment				**13**	**11**	**6**	**29**

*Regional economic impact measures represent one-time changes in economic activity (i.e., not present values); thus, these estimates represent annual losses.

Caveats to Economic Analysis of Impacts on the Livestock Grazing Activities

244. Exhibit 7-17 summarizes the key assumptions of the analysis of economic impacts on the grazing activities, as well as the potential direction and relative scale of bias introduced by these assumptions.

Exhibit 7-17

CAVEATS TO THE ECONOMIC ANALYSIS ON LIVESTOCK GRAZING ACTIVITIES

Key Assumption	Effect on Impact Estimate
All private lands supporting rangeland vegetation in Kansas, Oklahoma, Texas, and New Mexico are assumed to be used for livestock grazing.	+
While there is no history of grazing restrictions on private lands for the shiner, this analysis incorporates a scenario that assumes restrictions are likely in the future to reflect the possibility that private landowners may modify their grazing practices to avoid incidental take under section 9.	+/-
In estimating costs on non-Federal grazing land, this analysis assumes that the entire area of essential habitat will be excluded from grazing use due to shiner conservation.	+
To estimate the number of AUMs reduced on non-federal grazing lands in the proposed designation, this analysis utilizes 0.63 AUMs per acre. Actual stocking capacity of land in essential shiner habitat may be higher or lower than this figure.	+/-
The IMPLAN model used to estimate regional economic impacts is a static model and does not account for the fact that the economy will adjust. IMPLAN measures the effects of a specific policy change at one point in time. Over the long-run, the economic losses predicted by the model may be overstated as adjustments such as re-employment of displaced employees occurs.	+
The IMPLAN model used to estimate regional economic impacts relies on 1998 data. If significant changes have occurred in the structure of the affected counties economies, the results may be sensitive to this assumption. The direction of any bias is unknown.	+/-
The annual production value of livestock is $32/AUM.	+/-
- : This assumption may result in an underestimate of real costs. + : This assumption may result in an overestimate of real costs. +/- : This assumption has an unknown effect on the magnitude of cost estimates.	

7.4 Impacts to Groundwater Pumping Activities

245. De-watering of streams from groundwater pumping is one of the stresses that may prevent sufficient stream flows to support shiner populations. In the past, the Service has not required limits on groundwater pumping to protect the shiner or its habitat. However, if limits on groundwater pumping are considered as a means to protect the shiner in the future, this could have a significant economic impact on groundwater users.

246. The principal challenge in addressing this potential category of impact is an absence of hydrologic data (e.g., conjunctive characteristics of ground and surface water; level of pumping that would allow for recovery of historic groundwater levels; the geographic area over which changes in pumping would be required) for all watersheds that comprise the proposed designation. However, to better understand this category of

potential impact, the analysis provides information on areas where groundwater pumping may have the potential to affect stream flow in essential shiner habitat. Specifically, where available, this analysis provides information on the amount of groundwater withdrawn in identified areas and the breakdown of these withdrawals by type of use.[150] The analysis then provides an estimate of the value of groundwater in these areas based on differences in land values estimated across irrigated and non-irrigated land parcels.

247. Groundwater pumping for agricultural, municipal, industrial, and domestic use could potentially be impacted by shiner protection where groundwater pumping leads to dewatering of river segments in essential habitat. Although a Federal nexus does not exist for private groundwater pumping and section 9 take is difficult to attribute to individual pumpers, third-party involvement could result in limits to groundwater pumping in areas of overdraft in shiner habitat. In the absence of a known quantity of water required for shiner protection, this analysis analyzes the value of groundwater in essential shiner habitat in three steps.

- **Step One**: The analysis identifies a subset of watersheds containing essential shiner habitat that overlays the High Plains Aquifer. In these areas, groundwater pumping is substantial and serves as the primary source of water for irrigated agriculture. In addition, depletion of the High Plains/Ogallala Aquifer is a public and well-studied problem and a number of studies linking groundwater extraction to surface water flows are available.

- **Step Two**: Next, using spatial data compiled by the USGS, the analysis identifies the acres of irrigated land in the subset of watersheds identified in Step One. Spatial data locating irrigated land is limited to land areas overlaying the aquifer; therefore, the analysis does not spatially locate irrigated acres in all areas of essential habitat.

- **Step Three**: Finally, because irrigation is the most predominant use of groundwater in the counties that overlay the High Plains Aquifer, the analysis uses differences in values across irrigated and non-irrigated land in the identified watersheds to calculate the implied value of groundwater as capitalized into land values. In doing so, the analysis makes two assumptions. First, in allocating the implied value of groundwater as a potential loss to the agricultural industry, the analysis assumes that farmers do not substitute surface water for groundwater to maintain property values where surface water is available and groundwater use is limited. Second, the analysis assumes that state-level differences in irrigated and non-irrigated land correspond to localized land values. This disregards differences in land value across regions within states, which may be significant.

Background

248. Groundwater pumping is particularly high in land areas overlying the High Plains Aquifer. This aquifer underlies 174,000 square miles in portions of eight states: Colorado, Kansas, Nebraska, New Mexico, Oklahoma, South Dakota, Texas, and

[150] This information is provided in Section 2 of this report.

Wyoming. More than 90 percent of water withdrawals from the aquifer are used for irrigation, representing 30 percent of groundwater used for irrigation in the United States.[151] In 2002, 91.3 percent of Oklahoma's groundwater withdrawals from the High Plains Aquifer were utilized for irrigation.[152] For this reason, groundwater is used more extensively for irrigated agriculture in those portions of Kansas, Oklahoma, New Mexico, and Texas that overlay the aquifer than in those that do not (see Exhibit 7-18).

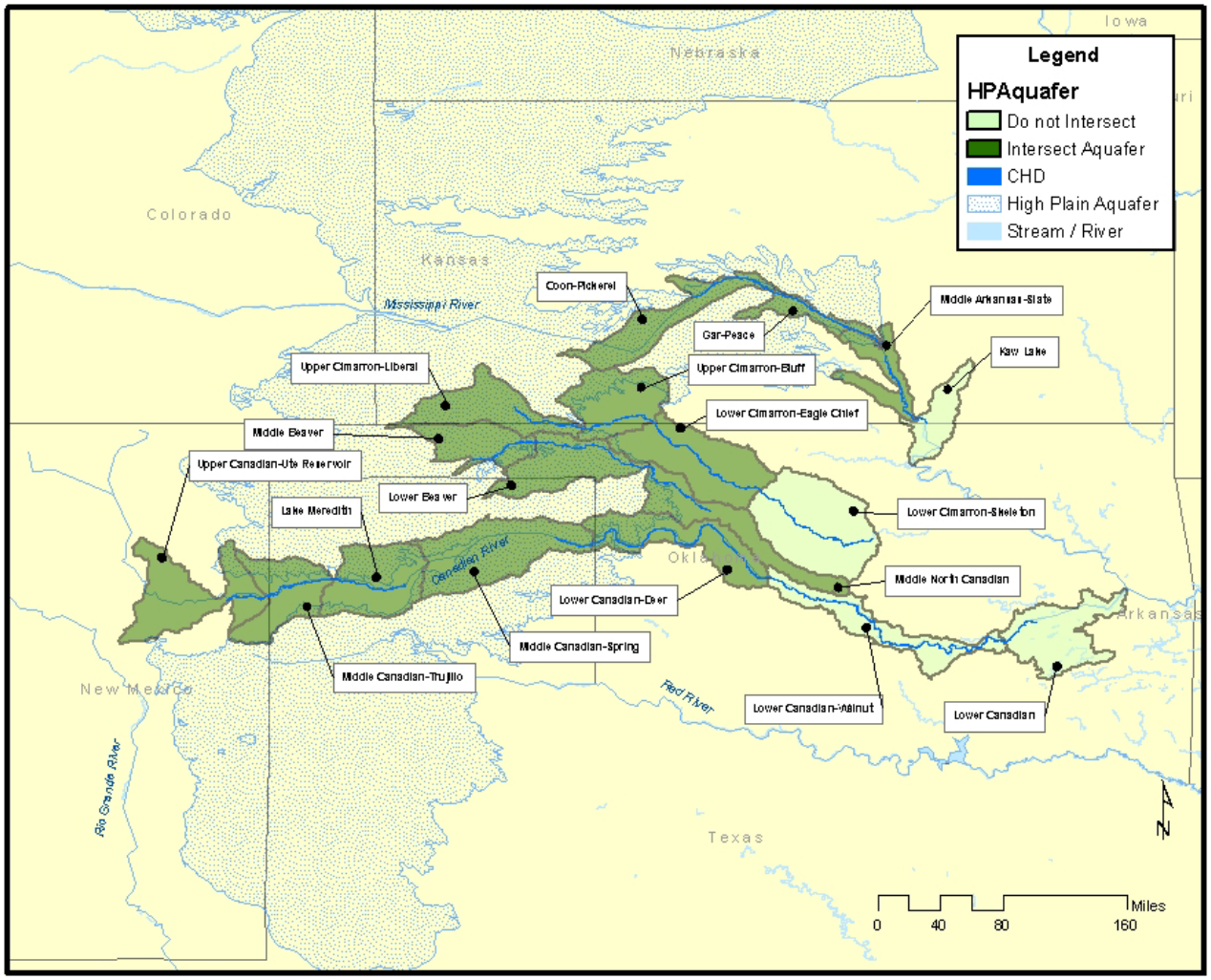
Identifying Watersheds of Intensive Groundwater Use

249. Using spatial data from the USGS, the analysis identifies the subset of watersheds containing essential shiner habitat that also overlays the High Plains Aquifer. Exhibit 7-18 presents the map of watersheds identified and shows the location of the High Plains Aquifer in relation to these watersheds. Watersheds displayed in dark green are those that intersect the aquifer.

[151] The High Plains Aquifer Information Network, accessed at http://www.hiplain.org/states/index.cfm?state=9&c=1&sc=84 on February 20, 2005.
[152] USGS Oklahoma District Water Use, accessed at http://ok.water.usgs.gov/wateruse/aqdata-00.html on February 28, 2005.

Exhibit 7-18

MAP OF WATERSHEDS THAT CONTAIN ESSENTIAL HABITAT AND OVERLAY THE HIGH PLAINS AQUIFER



Source: IEc analysis; USGS High Plains Region Ground Water Study, http://co.water.usgs.gov/nawqa/hpgw/HPGW_home.html, accessed February 2005

Estimating Areas of Irrigated Land

250. Irrigated acreage for lands overlaying the High Plains Aquifer is available from the USGS High Plains Region Ground Water Study.[153] This data utilizes satellite imagery from the Landsat Thematic Mapper (nominal date 1992) to classify and locate areas of irrigated land in the High Plains Region. Using this methodology, the analysis identifies a total of 901,923 acres of groundwater-irrigated land in the watersheds that that overlay the aquifer. The analysis then applies the average percentage of areas irrigated with groundwater across counties that overlay the High Plains Aquifer (88 percent as summarized in Exhibit 7-19) to this figure to estimate roughly 793,692 acres of groundwater-irrigated land in essential shiner habitat.

Exhibit 7-19

GROUNDWATER IRRIGATION IN COUNTIES THAT OVERLAY THE HIGH PLAINS AQUIFER

State	County	% of Irrigation from Groundwater	% of Total Groundwater Use for Irrigated Agriculture
Kansas[1]	Clark	100%	77%
	Barton	100%	93%
	Sumner	88%	85%
	Meade	100%	97%
	Rice	100%	97%
	Sedgwick	99.41%	57%
	Seward	100%	95%
	Pawnee	100%	96%
	Reno	100%	43%
Oklahoma	Ellis	100%	93%
	Beaver	99%	85%
	Dewey	93%	74%
	Harper	35%	51%
	Texas	100%	93%
	Woodward	90%	32%
	Roger Mills	81%	86%
Texas[2]	Hemphill	N/A	51%
	Oldham	N/A	58%
	Potter	N/A	71%
New Mexico	Quay	6%	68%
Average over High Plains Counties		**88%**	**75%**

Notes:
(1) Although Comanche County, Kansas overlays the High Plains Aquifer, 2002 data from the Kansas Water Office suggests that groundwater was not used for irrigation in Comanche County. For this reason, Comanche is considered an outlier and is excluded from the average irrigation calculation in this table.
(2) Data permitting estimation of the percentage of irrigation from groundwater were not available for Texas counties.

[153] USGS High Plains Region Ground Water Study, accessed at http://co.water.usgs.gov/nawqa/hpgw/HPGW_home.html, February 2005.

Estimating the Implied Value of Groundwater in Irrigated Agriculture

251. Farmland values for irrigated and non-irrigated land differ in the states that contain essential shiner habitat. As stated, this analysis uses this difference as a proxy for the value of groundwater, assuming all irrigation water is derived from groundwater sources. In doing so, the analysis also assumes there are no additional confounding factors that explain the difference in land value across irrigated and non-irrigated land parcels. Exhibit 7-20 summarizes farmland value in Kansas, Oklahoma, Texas, and New Mexico. In order to capture more precisely farmland values for irrigated and non-irrigated land, where possible this analysis utilizes regional variations within states that correspond most closely with the location of essential habitat.

Exhibit 7-20

AVERAGE LAND VALUES IN THE STATES THAT ENCOMPASS THE PROPOSED DESIGNATION ($2004)

State	Non-Irrigated Land Value ($2003)	Irrigated Land Value ($2003)	Difference ($2003)	Difference ($2004)
Kansas*				
Southwest	$450	$985	N/A	$535.0
Southcentral	$680	$1,320	N/A	$640.0
Average	$565	$1,153	N/A	**$587.5**
Oklahoma	$660	$820	$160	**$162**
Texas	$920	$1,000	$80	**$81**
New Mexico	$270	$2,650	$2,380	**$2,411**
*Kansas land values are presented in $2004.				

Results: Estimating the Implied Value of Groundwater at the Watershed Level

252. Exhibit 7-21 summarizes the distribution of groundwater value across watersheds. As noted, to the extent that groundwater use is not limited by shiner conservation activities, these implied land values will not be lost in watersheds that contain essential shiner habitat.

Exhibit 7-21

IMPLIED VALUE OF GROUNDWATER IN COUNTIES THAT OVERLAP THE HIGH PLAINS AQUIFER[1]

CHD Unit Number	HUC Number	Watershed Name	States Overlaid	Irrigated Acres	Acres Irrigated by Groundwater	Difference in Land Value	Total Loss in Constant Dollars (2004$) 2005 - 2024	Annualized Value of Groundwater (three percent)	Annualized Value of Groundwater (seven percent)
1a	11090101	Middle Canadian-Trujillo	Texas	186	164	$81	$13,276	$684	$710
	11090105	Lake Meredith	Texas	49,652	43,693	$81	$3,541,267	$182,375	$189,458
1b	11090201	Lower Canadian-Deer	Oklahoma	17,977	15,819	$162	$2,564,266	$132,060	$137,188
	11090106	Middle Canadian-Spring	Texas	80,215	70,589	$81	$5,721,093	$294,636	$306,078
3	11040006	Upper Cimarron-Liberal	Kansas	203,993	179,514	$588	$105,464,614	$5,431,428	$5,642,357
	11040008	Upper Cimarron-Bluff	Kansas	20,391	17,944	$588	$10,542,116	$542,919	$564,003
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	2,623	2,308	$162	$374,114	$19,267	$20,015
2	11100102	Middle Beaver	Oklahoma	209,330	184,210	$162	$29,859,775	$1,537,778	$1,597,498
	11100201	Lower Beaver	Oklahoma	94,251	82,941	$162	$13,444,439	$692,389	$719,277
	11100301	Middle North Canadian	Oklahoma	6,304	5,547	$162	$899,199	$46,309	$48,107
4	11030004	Coon-Pickerel	Kansas	145,907	128,399	$588	$75,434,162	$3,884,859	$4,035,728
	11030010	Gar-Pearce	Kansas	51,100	44,968	$588	$26,418,638	$1,360,560	$1,413,397
	11030013	Middle Arkansas-Slate	Kansas	19,994	17,595	$588	$10,337,110	$532,361	$553,035

[1] Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

253. Exhibit 7-22 summarizes the key assumptions of the analysis of economic impacts on groundwater pumping, as well as the potential direction and relative scale of bias introduced by these assumptions.

Exhibit 7-22

CAVEATS TO THE ECONOMIC ANALYSIS ON GROUNDWATER PUMPING ACTIVITIES

Key Assumption	Effect on Impact Estimate
While there is no history of groundwater restriction for the shiner, this analysis assumes that groundwater pumping may be limited in the future to protect the shiner.	+
The analysis assumes that all groundwater will be removed from use in irrigated agriculture in watersheds that contain essential habitat.	+
USGS spatial data accurately locates areas of irrigation in watersheds that contain essential habitat.	+/-
The difference between irrigated and non-irrigated land values represents a reasonable approximation of the value of groundwater in the watersheds that contain essential habitat.	+/-
State-level irrigated and non-irrigated land values approximate local variations in these land values.	+/-
- : This assumption may result in an underestimate of real costs. + : This assumption may result in an overestimate of real costs. +/- : This assumption has an unknown effect on the magnitude of cost estimates.	

254. This section evaluates the effect of shiner conservation activities on transportation activities, such as bridge construction, repair, and replacement. These activities have the potential to affect shiner habitat, for example, through soil erosion, water quality or flow changes. This analysis first quantifies the economic impact on past transportation projects of implementing shiner conservation activities, and then examines the likelihood of similar economic impacts to future road and bridge construction and maintenance activities.

255. Transportation projects are affected by shiner conservation activities only when they cross riparian zones. Thus, future bridge construction, repair, and replacement projects are most likely to be impacted by essential shiner habitat. Past project modifications to transportation activities have incurred costs ranging from $100,000 to $212,000 (constant, 2004 dollars). Future projects over the next 20 years within proposed shiner habitat are estimated to experience impacts of $117,000 to $482,000 (constant, 2004 dollars). In present value terms, this range of potential impacts is $89,000 to $370,000 using a three percent discount rate, or $66,000 to $273,000 using a seven percent discount rate. In annualized terms, this range is $6,000 to $25,000 using a three percent discount rate, or $6,000 to $26,000 using a seven percent discount rate. Past consultations regarding the shiner have not resulted in significant constraints on the size or location of transportation projects. This analysis assumes that future transportation projects will continue to take place, but may be subject to additional administrative burden and costs.

8.1 Estimated Past Impacts

256. The shiner consultation history includes 24 informal consultations and 3 formal consultations on transportation projects (including road, bridge, and rail construction projects): 16 in Oklahoma, two in Kansas, nine in Texas, and none in New Mexico. These consultations involved the Federal Highway Administration (FHWA), USACE, State Departments of Transportation (DOTs), and the Bureau of Indian Affairs (BIA), and addressed the construction, expansion, and repair of bridges, roads, and rail projects.

257. In general, the Service has recommended that instream transportation activities minimize disturbance to water bodies and avoid activity during the shiner spawning season. Shiner conservation activities that have been recommended on past transportation projects are summarized in Exhibit 8-1.

Exhibit 8-1

SHINER CONSERVATION ACTIVITIES RECOMMENDED ON PAST TRANSPORTATION PROJECTS

- Temporary storage/staging areas located beyond 300 feet.
- Restricting vehicle/motorized equipment to outside river channel.
- Removal of water/fish from bermed areas immediately following completion of berms under supervision of qualified fisheries biologist.
- Restoring natural contours of the river channel/bank.
- Scheduling construction outside of the shiner peak spawning period.
- Placing erosion control/sedimentation barriers within action area and removing and disposing sediment off-site.
- Re-vegetation.
- Monitoring.
- Salvaging dead fish.[1]

Note:
(1) Shiner consultation record, including U.S. Highway 385 Consultation and Burlington Northern-Santa Fe Railroad Consultation

258. Three biological opinions have been issued for past consultations on transportation activities and the shiner. Two formal consultations covered projects in Texas while the third consultation concerned a project in Oklahoma. In a 2003 formal consultation, the Federal Highway Administration consulted with the Service on the replacement of the U.S. bridge and its approaches at the Canadian River in Oldham County, Texas. In a 2004 formal consultation, the Burlington Northern–Santa Fe (BNSF) Railroad consulted with the Service via USACE on a proposal to construct a new railroad bridge at the Canadian River just upstream of U.S. Highway 60 in Hemphill County, Texas. Within Oklahoma, USACE consulted with the Service on BNSF Railway's proposed railway bridge construction over the Cimarron River near the town of Wanoka. Project modifications recommended by the Service resulted in additional projects costs estimated at approximately $29,000 per project.[154] Agencies indicate that phasing projects around the shiner spawning season resulted in additional burden but that specific information to capture these costs are not available.

259. Informal consultations on the shiner in the past have resulted in project modification costs ranging from $500 to $5,000 per project.[155]

260. Past economic costs to transportation activities are estimated to have been approximately $100,000 to $212,000 between 1998 and 2004 (constant, 2004 dollars).

[154] Cost estimates based upon information provided by Charlotte J. Kucera, Environmental Affairs Division, Texas Department of Transportation, February 25, 2005. Additional costs related to utilizing rock riprap, silt fence, sand bagging, staff time for monitoring, etc.
[155] Cost estimates provided by the Kansas Department of Transportation, February 23 and 24, 2005.

8.2 Potential Future Impacts

261. This section describes the projected transportation activities that are foreseeable within or affecting essential shiner habitat.

Oklahoma

262. The Oklahoma Department of Transportation provided information on slated projects within essential habitat. USACE has indicated the potential for a new Mustang/Tuttle bridge crossing the Canadian River near Oklahoma City. Based upon a review of projected bridge construction, maintenance, and enhancement projects within essential habitat and a review of the consultation record for the shiner, an estimated 47 projects may trigger section 7 consultation with the Service on impacts to the shiner in Oklahoma.

263. As discussed in Section 3, a formal consultation is ongoing with the Service regarding bridge construction over the Canadian River (Unit 1b) on State Highway 81 with the FHWA. Although the consultation is not complete, the FHWA has indicated that the shiner is unlikely to pose any additional costs on the project, as project funds saved in the event of ROW reduction would be spent on habitat conservation measures, leading to insignificant net changes in the cost of the project.[156]

Kansas

264. The Kansas Department of Transportation (KDOT) anticipates consultation with the Service on the shiner on average three times per year. The proposal to establish essential habitat extending 300 feet from the riverbank in eight counties in Kansas will increase the requirements for shiner section 7 consultation. According to KDOT, essential shiner habitat is crossed by U.S. or State highways at sixteen locations. The proposal to designate critical habitat at these locations has the potential to affect bridge and bridge approach design, construction, and maintenance. In the past, KDOT has indicated that consultation with the Service regarding the shiner has resulted in additional project costs ranging from $500 to $5,000 per project.[157]

Texas

265. USACE has indicated two potential bridge projects crossing essential shiner habitat. These projects are:

- U.S. highway 87 bridge crossing the Canadian River in Potter County, Texas, near the Lake Meredith Recreation Area; and

[156] Personal communication with Shannon Dumolt, FHWA Oklahoma, on May 2, 2005.
[157] Written communication with Scott Vogel and Jim Peterson, Kansas Department of Transportation, February 23 and 24, 2005.

- Replacement of the U.S. Highway 385 bridge crossing the Canadian river in Oldham County.

266. These projects both have the potential to result in formal consultation and the issuance of a biological opinion by the Service. Potential project modifications are expected to be similar to past project modifications, resulting in additional costs of up to $29,000 per project (constant, 2004 dollars). Based upon a review of the administrative record and information provided by the Texas Department of Transportation, the agency may consult with the Service on average 1.8 times per year for a total of 37 consultations over twenty years.[158]

New Mexico

267. Transportation-related activities in New Mexico are not expected to experience an economic impact associated with shiner conservation activities in the foreseeable future. Currently, there are no bridge, road, or rail projects planned by the New Mexico Department of Transportation and District 4 (encompassing Quay County) within essential habitat.[159]

8.3 Summary of Results

268. Using information provided by State DoTs as summarized above, the analysis estimates costs on a watershed basis by allocating potential projects evenly among watersheds in the states. Exhibit 8-2 presents the results of the analysis. As shown, total impacts to transportation activities in watersheds proposed for inclusion may total up to $482,000 over the next 20 years (constant, 2004 dollars), with the highest impacts potentially occurring in the Middle Canadian-Trujillo, Lake Meredith, and Middle Canadian-Spring watersheds (Units 1a and 1b).

[158] Personal communication with Tom Bruechert, Texas Department of Transportation, March 1, 2005.
[159] Personal communication with Peter McDonald, Assistant District Engineer, New Mexico Department of Transportation, February 24, 2005.

Exhibit 8-2

FUTURE TRANSPORTATION COSTS IN WATERSHEDS THAT CONTAIN ESSENTIAL SHINER HABITAT

Unit Number	HUC	Watershed Name	State Overlaid	# Projected Consultations	Total Project Modification Costs (constant 2004 dollars)		Annualized Costs (seven percent)		Annualized Costs (three percent)	
					Low	High	Low	High	Low	High
Proposed for Inclusion										
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	0	$0	$0	$0	$0	$0	$0
	11090101	Middle Canadian-Trujillo	Texas	10.7	$24,333	$69,333	$1,302	$3,709	$1,253	$3,571
	11090105	Lake Meredith	Texas	10.7	$24,333	$69,333	$1,302	$3,709	$1,253	$3,571
1b	11090106	Middle Canadian-Spring	Texas	10.7	$24,333	$69,333	$1,302	$3,709	$1,253	$3,571
	11090201	Lower Canadian-Deer	Oklahoma	6.4	$6,750	$34,875	$361	$1,866	$348	$1,796
	11090202	Lower Canadian-Walnut	Oklahoma	6.4	$6,750	$34,875	$361	$1,866	$348	$1,796
	11090204	Lower Canadian	Oklahoma	6.4	$6,750	$34,875	$361	$1,866	$348	$1,796
3	11040006	Upper Cimarron-Liberal	Kansas	10.0	$5,000	$50,000	$268	$2,675	$258	$2,575
	11040008	Upper Cimarron-Bluff	Kansas	10.0	$5,000	$50,000	$268	$2,675	$258	$2,575
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	6.4	$6,750	$34,875	$361	$1,866	$348	$1,796
	11050002	Lower Cimarron-Skeleton	Oklahoma	6.4	$6,750	$34,875	$361	$1,866	$348	$1,796
Subtotal				**83.9**	**$116,750**	**$482,375**	**$6,246**	**$25,807**	**$6,013**	**$24,842**
Proposed for Exclusion										
2	11100102	Middle Beaver	Oklahoma	6.4	$6,750	$34,875	$361	$1,866	$348	$1,796
	11100201	Lower Beaver	Oklahoma	6.4	$6,750	$34,875	$361	$1,866	$348	$1,796
	11100301	Middle North Canadian	Oklahoma	6.4	$6,750	$34,875	$361	$1,866	$348	$1,796
4	11030004	Coon-Pickerel	Kansas	10.0	$5,000	$50,000	$268	$2,675	$258	$2,575
	11030010	Gar-Peace	Kansas	10.0	$5,000	$50,000	$268	$2,675	$258	$2,575
	11030013	Middle Arkansas-Slate	Kansas	10.0	$5,000	$50,000	$268	$2,675	$258	$2,575
	11060001	Kaw Lake	Kansas	10.0	$5,000	$50,000	$268	$2,675	$258	$2,575
Subtotal				**59.1**	**$40,250**	**$304,625**	**$2,153**	**$16,297**	**$2,073**	**$15,688**
Total				**143.0**	**$157,000**	**$787,000**	**$8,400**	**$42,105**	**$8,086**	**$40,531**

Note: Annualized costs are calculated assuming payments are made at the end of the year. The total present value cost upon which the annualized estimate is based assumes no discounting in year 2005.

269. In addition to the activities discussed in previous sections of this report, other economic activities may be affected by shiner conservation activities. These activities include recreation, utilities and communication, exotic plant control, and real estate development. In addition, the section considers the costs of management plans for private lands related to shiner conservation.

270. This section describes impacts of shiner conservation on these activities and provides information on potential future impacts. For the most part, the impacts to these activities resulting from shiner protection efforts include section 7 consultation efforts and related project modifications. In addition, there may potentially be impacts related to closures of recreation areas.

9.1 Impacts to Recreation Activities

271. While there have been no consultations on recreational activities involving the shiner to date, restrictions on off-road vehicle (ORV) use could be implemented in the future on National Park Service lands at Lake Meredith in Texas to protect the shiner and its habitat. There are two ORV areas within the Lake Meredith National Recreation Area, Rosita and Blue Creek; however, only Rosita falls within essential shiner habitat. NPS has indicated that during the months of shiner spawning (July through September) the Agency may exclude ORV use from the water and confine the activity to the riverbank.[160]

272. Regulations that restrict ORV use may impose costs on ORV users. For instance, prohibiting ORV use in Lake Meredith would result in a loss of consumer surplus for ORV users (see Text Box). Allowing ORV use in the park but under area restrictions during certain times of the year would also result in a consumer surplus loss, but less than the loss resulting from a full restriction. As with other recreational activities, the extent of the welfare loss to an individual ORV user depends on the availability of substitutes (either alternate places to use ORVs or alternate activities). All else equal, the fewer an individual's substitutes for ORV use, the greater the consumer surplus loss.

[160] Personal communication with Linda Dansby and Paula Day, National Park Service, November 29, 2005.

273. This analysis focuses on quantifying the potential consumer surplus loss associated with ORV use restrictions at Rosita within the Lake Meredith National Recreation Area. Information provided by NPS indicates that use in the park during the months of July through September averages approximately 23,299 visitor-days; thus potentially 23,299 trips could be lost on an annual basis due to future restrictions related to shiner conservation during this three-month period.[161] Considering some visitors will find substitute areas or activities, or will comply with the restrictions and continue to use the park during July through September but avoid crossing and accessing waters, this lost trip estimate may overstate potential impacts. However, absent a full user survey, the total welfare value of lost trips is estimated to represent the efficiency loss. As NPS and ORV user groups indicate a preference for crossing the river segments, this high-end estimate is considered reasonable for this analysis.

> ***Defining Consumer Surplus and Welfare Effects***. Welfare economics is based upon the idea that social welfare can be maximized by using resources in ways that yield the greatest benefits to society. Economists generally rely on consumer surplus as a measure of net social welfare. Consumer surplus is based on the principle that some consumers benefit because they are able to purchase goods or services at a price that is less than their total willingness to pay (i.e., the maximum amount they would pay for the good). In the context of this analysis, ORV users realize consumer surplus when the value of their fishing or hunting experience exceeds the "price" they pay for the experience in terms of travel costs, equipment costs, and other fees.

274. A decrease in ORV use at the park may also impact businesses that offer services to ORV users. While these businesses are not directly affected by the park's regulation of ORV users, they are likely to be impacted nonetheless. ORV dealers may experience a decrease in demand for sales, rentals, repairs, and other services.. In addition, gas stations, markets, hotels, and other businesses may experience a decrease in demand for supplies and services. Therefore, this analysis quantifies the regional economic impact to measure the ripple effect on the local economy. The primary sources of information for this activity are monthly visitor use data for the Rosita ORV area from NPS and a review of the economics literature for ORV user-day values.

Efficiency Effects

275. This section estimates the consumer surplus, or welfare, impacts associated with lost or restricted ORV opportunities at Rosita within the Lake Meredith National Recreation Area. Estimates of the consumer surplus generated by ORV use in Lake Meredith National Recreation Area requires information on the number of trips lost to this area and the value of each trip. The number of potentially lost trips is derived from ORV visitation data provided by Lake Meredith National Recreation Area staff and is presented in Exhibit 9-1. This analysis does not project an increase in ORV visitation over the period of analysis. Data

[161] Visitor Use Statistics - Lake Meredith National Recreation Area provided by NPS.

indicate fluctuation in annual visitation trends and an overall five-year decline. Assuming a constant level of visitation is therefore considered reasonable for this analysis, and may overstate costs. Welfare value of ORV trips is based on a relevant study from the economic valuation literature, illustrated in Exhibit 9-2. Based on this study, the analysis utilizes a value of $19.90 per ORV use day (constant, 2004 dollars).

Exhibit 9-1

NUMBER OF POTENTIAL ORV USER DAYS LOST DUE TO SHINER RESTRICTIONS AT LAKE MEREDITH NATIONAL RECREATION AREA

	ORV Days (July through September)
Rosita Creek	23,299
Total Lost Trips (Annual)	**23,299**
Note: Rosita visitation numbers reflect an average of 2000-2004 visitation data.	

Exhibit 9-2

SUMMARY OF ORV WELFARE VALUES

Author (date)	Study Location	Value (constant, 2004 dollars)*
Rosenberger and Loomis (2001)	National	$19.90 per trip
* Welfare values are adjusted to current dollars using the GDP Deflator, Budget of the United States Government, Fiscal Year 2005, Historical Tables.		

276. Based on welfare value and the number of ORV days potentially lost due to restrictions for the shiner, welfare losses are estimated to total $464,000 annually (constant, 2004 dollars). Over twenty years, this equates to a total future economic efficiency effect of $9.3 million (constant, 2004 dollars). As shown in Exhibit 9-3, in present value terms the total potential impact is $7.1 million using a three percent discount rate or $5.3 million using a seven percent discount rate. In annualized terms, this potential impact is equivalent to $477,000 using a three percent discount rate or $496,000 using a seven percent discount rate. Exhibit 9-3 presents the results of the analysis.

Exhibit 9-3

ECONOMIC EFFICIENCY LOST DUE TO SHINER CLOSURES AT LAKE MEREDITH NATIONAL RECREATION AREA

	Total Lost Days	Value per Day (constant, 2004 dollars)	Annual Welfare Loss (constant, 2004 dollars)
ORV use	23,299	$19.90	$464,000 [1]
Present Value, Total Welfare Loss over 20 Years @ 3%			**$7,104,000**
Annualized Welfare Loss @ 3%			**$477,000**
Present Value, Total Welfare Loss over 20 Years @ 7%			**$5,255,000**
Annualized Welfare Loss @ 7%			**$496,000**

Notes:
[1] This figure differs from the figure reported in the Executive Summary due to the annualization method applied in the Executive Summary to obtain annual costs.

Distributional Effects

277. Distributional effects, also referred to as regional economic impacts, may result from the loss of ORV use at Lake Meredith associated with seasonal restrictions at Rosita.[162] These regional economic impacts are expressed in terms of changes in revenues, local employment, and tax receipts. Direct impacts are felt primarily in the tourism-related sectors of the local economy, while secondary impacts, resulting from the loss of circulation of spending through the local economy, are felt in a broader range of sectors.

278. A 2003 NPS economic study provides data on spending profiles of visitors on day trips to National Parks.[163] This study indicates that, on average, expenditures (adjusted to 2004 dollars) for an ORV day range from $38.50 to $53.43 per day. Given the estimate of 23,299 ORV days potentially lost to the region per year,[164] this results in a direct economic loss to the area of approximately $897,000 to 1.3 million per year (constant, 2004 dollars). This loss in direct spending flowing through the economy results in total impacts of approximately $1.1 to $1.6 million in lost sales, 31 to 44 jobs, and $117,000 to $168,000 in indirect business taxes per year (Exhibit 9-4). These estimates assume that ORV users do not substitute ORV use at Rosita with other locations or activities, and as such represents an upper-bound estimate of potential regional impacts.

[162] It is important to note that distributional effects are fundamentally different measures of economic impact than efficiency effects, and thus cannot be added to or compared with estimates of changes in economic efficiency.
[163] National Park Service. Economic Analysis of Management Alternatives for Personal Watercraft in Lake Meredith National Recreation Area, Revised Final Report. June 2003, accessed at http://www.nps.gov/amis/pwc_economics.pdf.
[164] Economic impacts are expected to occur in counties surrounding Lake Meredith, including Hutchinson, Moore, and Potter Counties.

Exhibit 9-4

SUMMARY OF REGIONAL ECONOMIC IMPACTS DUE TO POTENTIAL ORV RESTRICTIONS AT LAKE MEREDITH NATIONAL RECREATION AREA (ANNUAL, 2004$)

Total Expenditures	Total Regional Economic Impact	Jobs	Indirect Business Taxes
$897,000	$1,101,634	31	$116,815
$1,291,544	$1,586,186	44	$168,195

Source: IMPLAN analysis and National Park Service. Economic Analysis of Management Alternatives for Personal Watercraft in Lake Meredith National Recreation Area, Revised Final Report. June 2003, accessed at http://www.nps.gov/amis/pwc_economics.pdf.

279. Exhibit 9-5 summarizes the key assumptions of the analysis of economic impacts on recreational activities, as well as the potential direction and relative scale of bias introduced by these assumptions.

Exhibit 9-5

CAVEATS TO THE ECONOMIC ANALYSIS ON RECREATION ACTIVITIES

Key Assumption	Effect on Impact Estimate
ORV users do not substitute other locations or activities for Rosita within Lake Meredith National Recreation Area pursuant to park closures for shiner spawning.	+
The analysis uses $19.90 as the estimate for the value per visitor day of ORV use.	+/-
The IMPLAN model used to estimate regional economic impacts is a static model and does not account for the fact that the economy will adjust. IMPLAN measures the effects of a specific policy change at one point in time. Over the long-run, the economic losses predicted by the model may be overstated as adjustments such as re-employment of displaced employees occurs.	+/-
The IMPLAN model used to estimate regional economic impacts relies on 1998 data. If significant changes have occurred in the structure of the affected counties' economies, the results may be sensitive to this assumption. The direction of any bias is unknown.	+/-

- : This assumption may result in an underestimate of real costs.
+ : This assumption may result in an overestimate of real costs.
+/- : This assumption has an unknown effect on the magnitude of cost estimates.

9.2 Impacts to Utility Activities

280. Utility projects related to wastewater treatment facility management and construction, construction of water and transmission lines, and telecommunications projects have resulted in 94 informal consultations on the shiner. The majority of consultations have occurred within Oklahoma (77), with 16 in Texas and one recorded for Kansas. Federal Agencies primarily engaging in consultation with the Service on the shiner include EPA, the Federal Communications Commission (FCC), and the Rural Utilities Service. Exhibit 9-6 summarizes the consultation history for the shiner on utility projects by activities and Federal agencies.

Exhibit 9-6

PAST SHINER CONSULTATIONS ON UTILITIES PROJECTS BY ACTION AGENCY AND TYPE OF PROJECT

Action Agency	Water Lines	Wastewater Management	Telecom	Transmission Lines	Wind Power	Fiber Optic Lines	Total
EPA	4	20	1	0	0	1	**26**
Other	5	0	1	10	3	0	**19**
FCC	0	0	15	1	0	1	**17**
RUS	3	0	0	4	0	2	**9**
HUD	2	3	0	0	0	0	**5**
BIA	3	1	0	0	0	0	**4**
DOC	3	1	0	0	0	0	**4**
DOH	4	0	0	0	0	0	**4**
USACE	2	1	0	0	0	0	**3**
DOE	0	0	0	0	1	0	**1**
FERC	0	0	0	1	0	0	**1**
USDA	1	0	0	0	0	0	**1**
Total	**27**	**26**	**17**	**16**	**4**	**4**	**94**

Source: Shiner administrative record (OK, KS, and TX).
FCC: Federal Communication Commission; RUS: Rural Utilities Service; HUD: Housing and Urban Development; DOC: Department of Commerce; DOH: Department of Health; DOE: Department of Energy; FERC: Federal Energy Regulation Commission.

281. In the past, the Service has recommended that utilities projects avoid work during the shiner spawning season (June 15 to August 15) and avoid the use of heavy equipment within fifty feet of either side of the river. Where projects cross river segments, the Service has recommended directional boring. Other modifications include recommendations that streams be crossed at right angles, limiting vegetation disturbance, using sediment filter devices.[165]

282. Project modifications have been recommended most frequently for waterlines projects. For example, of the 77 utilities-related consultations regarding utilities projects in Oklahoma, eight involved projects modifications and all were related to waterlines construction. Complying with project modifications related to waterlines and other utilities-related projects may not result in significant additional expenditures to developers. For example, one engineering company indicates that direct costs of directionally boring instead of using traditional trenches are comparable.[166] Moreover, additional costs associated with avoiding essential habitat may not occur as the potential for surface water contamination from waterline and other utilities projects is small.[167]

[165] Administrative record for the shiner.
[166] Personal communication with Phil Brown, Brown Engineering, P.C, March 9, 2005.
[167] Ibid.

283. The number of future utilities projects are assumed to occur at the same frequency as past projects within and adjacent to essential habitat. Project modifications are likely to be recommended for most utilities projects related to the construction of waterlines and wastewater management projects. Thus, approximately 257 consultations in Oklahoma, three in Kansas, and 53 in Texas may occur regarding utilities projects over the twenty-year period of analysis, for a total of 313 consultations, or roughly 16 per year.[168] The potential for project modifications resulting in large economic costs to future utilities projects is unknown. However, information regarding specific utilities projects and activities that may result in additional costs to entities is presented below.

284. Within Texas, the Canadian River Municipal Water Authority anticipates consultation with the Service and potential project modifications related to it. Over the next 20 years, the CRMWA anticipates it will require two section 404 permits and the City of Amarillo will require one for pipelines. While the CRMWA indicates that well fields are often placed at a greater distance from the river for shiner protection, and that major transmission pipelines generally cost $1 million per mile, data to estimate the incremental cost to CRMWA projects in the future are unavailable. Mesa Water Inc. anticipates consulting with the Service on the shiner regarding future waterline projects that will require a section 404 permit. For these projects, potential project modifications are unknown, and, as a result, the analysis limits estimation of future costs to potential section 7 consultation requirements that are captured in Section 3 of this report.

285. The City of Norman, Oklahoma Wastewater Treatment Division, has consulted with the Service in the past regarding facility improvements and land application of treated biosolids. The Service has recommended that the facility increase the frequency of whole effluent toxicity (WET) tests to ensure that effluent entering the Canadian River does not adversely impact the shiner. If tests reveal that effluents are at potentially harmful levels to the shiner the Service has indicated that formal consultation may be necessary.[169] The Norman Wastewater Treatment Division has noted that in the likelihood of future consultation, additional monitoring costs and other project modification costs may be incurred;[170] however, these additional costs are presently unknown.

9.3 Impacts to Exotic Plant Control on Federal and Private Lands

286. Salt cedar and Russian olive are exotic, non-native species that thrive in the riparian areas identified as essential shiner habitat . These plants use large amounts of water (10-14 acre-feet per acre per year)[171] and are generally seen as a significant factor in reducing streamflow where they are located. As a result, numerous salt cedar removal projects have

[168] The average number of consultations regarding utilities projects per year in each state is multiplied by twenty in order to determine future number of consultations.
[169] Administrative record for the shiner, 2-14-02-I-0589
[170] Personal communication with Ralph Arnett, Superintendent, Norman Wastewater Treatment Plant, February 25, 2005.
[171] Canadian River Riparian Restoration Project Plan, accessed at http://www.hardingcounty.org/CRRRP/CRRRPProjectPlan.pdf on March 12, 2005.

been undertaken in essential shiner habitat by various Federal agencies, such as NRCS, USBR, and the NPS. NRCS has prioritized exotic plant control, and offers cost-share assistance to private landowners through programs such as EQIP to undertake control activities. While most exotic plant control programs are not undertaken specifically for shiner conservation, these programs benefit the species where they increase streamflow in shiner habitat. Moreover, the consultation record indicates that salt cedar control has not been found to adversely impact the shiner. For this reason, additional impacts related to shiner protection are not anticipated.

9.4 Impacts to Wildlife Management Areas in the Proposed Designation

287. The Oklahoma Department of Wildlife Conservation leases 14,877 acres of land surrounding Canton Dam from the USACE and administers it as the Canton Wildlife Management Area (WMA). Habitat management in Canton WMA includes controlled burning on 1,000-1,500 acres each year, and prescribed grazing on approximately 5,200 acres.[172] Grazing land is leased to private ranchers on 5-month seasonal contracts with stocking rates averaging approximately one animal unit for every 18 acres of land.[173] The listing of the shiner has not impacted these operations in the past, due in large part to the probable absence of the shiner from the North Canadian River. Future impacts are contingent on designation of Unit 2 and requirements that may be placed on Canton WMA operations in the future. These requirements are presently unknown.

9.5 Impacts to Real Estate Development Activities

288. Conservation activities to protect the shiner and its habitat may impact real estate development. Related impacts are addressed in other chapters. For example, real estate development increases demand for domestic, commercial, and industrial water use, transportation infrastructure, and recreational opportunities; each of these activities is addressed elsewhere in this report. This section presents a summary of economic impacts on real estate development, relevant background information, and an overview of the methodology used to evaluate economic impacts related to shiner conservation.

Pre-designation Impacts

289. Past section 7 consultations addressing development projects impacting the shiner have been limited. To date, there have been no formal consultations and a limited number of informal consultations on development activities. Costs associated with these informal consultations are included in Section 3 of this report.

[172] Canton Wildlife Management Area, accessed at www.wildlifedepartment.com/canton on March 3, 2005.
[173] Personal communication with Steve Conrady, Senior Biologist, Canton Wilderness Management Area, on March 3, 2005.

Post-designation Impacts

290. Post-designation impacts to development activities are limited to potential informal consultation costs, and are captured in Section 3 of this report. Future project modifications to development projects are not anticipated in essential shiner habitat.

Background on Residential Development in the Proposed Designation

291. Essential shiner habitat is generally located within the FEMA 100-year floodplain, in largely rural areas with low population densities. Generally, Federal guidelines govern real estate development in floodplains. Many jurisdictions in flood-prone areas participate in the National Flood Insurance Program (NFIP), managed by the Mitigation Division of the Federal Emergency Management Agency (FEMA). Communities voluntarily adopt FEMA's floodplain management ordinances in exchange for Federally-backed flood insurance.

292. The 100-year floodplain is defined as all land subject to inundation by the 100-year flood (i.e., the flood elevation with a one percent chance of being equaled or exceeded each year). FEMA defines these lands as Special Flood Hazard Areas and places special requirements on development within them. While FEMA regulates development in these areas, individual jurisdictions may place additional restrictions on construction above and beyond FEMA regulations.

Analytical Approach[174]

293. To estimate future development within essential shiner habitat, the analysis limits potential shiner impacts on real estate development to areas within essential habitat where real estate demand is great enough to support floodplain development in the future. While the additional construction and insurance costs specific to floodplain development make it unlikely in most areas, real estate markets in some high-demand locations may support new development in the floodplain. This analysis identifies the areas within essential habitat where floodplain development is most likely.

294. The analysis relies on population density to identify areas where floodplain development is most probable. First, spatial data is used to identify census tracts intersecting shiner habitat. Next, population density is calculated from Census 2000 data for each census tract intersecting the habitat.

295. Floodplain development is assumed to be most probable in those census tracts that are densely populated. In these states, census tracts with at least 1,000 persons per square mile were considered most likely to support floodplain development. In sum, 13 census tracts located in 5 counties are identified as likely to support floodplain development. Exhibit 9-7 presents the counties identified as most likely to support floodplain development.

[174] This section describes the methodological approach used to estimate the economic impacts associated with future land development within essential shiner habitat; past development projects in the states that contain the designation have not required project modification due to shiner concerns. The methodology is adapted from the methodology used in the Economic Analysis of Critical Habitat Designation for the Southwestern Willow Flycatcher.

Exhibit 9-7 COUNTIES IDENTIFIED AS MOST LIKELY TO SUPPORT DEVELOPMENT WITHIN ESSENTIAL SHINER HABITAT	
State	**County(s)**
Kansas	Barton, Cowley, Reno, Sedgwick
Oklahoma	Cleveland
Source: Based on spatial analysis of Census 2000 population density.	

296. While spatial analysis utilizes the best available data, some areas identified as most likely to support floodplain development may be constrained by existing flood control infrastructure, local floodplain and floodway ordinances, or other factors not reflected in the GIS data available for this analysis. To account for factors not captured in the spatial analysis, county and city planners were contacted to verify development potential in floodplain areas identified as the most likely to support development. Based on information provided, development projects in the counties identified in Exhibit 9-7 are not anticipated to be affected by conservation measures associated with the shiner.

Exhibit 9-8 CAVEATS TO THE ECONOMIC ANALYSIS ON DEVELOPMENT ACTIVITIES	
Key Assumption	**Effect on Impact Estimate**
The analysis assumes floodplain development is likely only in those areas with densities greater than 1,000 people per square mile.	+/-
- : This assumption may result in an underestimate of real costs. + : This assumption may result in an overestimate of real costs. +/- : This assumption has an unknown effect on the magnitude of cost estimates.	

9.6 Development of Shiner Management Plans by Private Entities

297. Currently, a coalition of private entities in New Mexico and the Western Texas Panhandle are developing a management plan for shiner protection in unit 1a. The plan delineates specific actions to be undertaken by these parties to improve shiner habitat in the unit, for the stated short-term goal of facilitating exclusion of Unit 1a from the final listing and the long-term goal of delisting of the species. The Oklahoma Agricultural Legal Foundation is working on plans for units 1b and 3, and are using the management plan for unit 1a as a template.[175] The management plans for units 1b and 3 are not available for review; therefore, this analysis uses administrative cost estimates of the plan for Unit 1a to estimate costs for units 1b and 3. CRMWA, the lead agency in developing the management plan for unit 1a, anticipates that the total administrative cost of plan preparation will be roughly $50,000 once the plan is finalized and approved.[176] The analysis assumes identical

[175] Personal communication with Marla Peek, Director of Regulatory Affairs, Oklahoma Farm Bureau, on February 22, 2005.
[176] Personal communication with John C. Williams, Canadian River Municipal Authority, February 24, 2005.

costs for plan preparation for units 1b and 3, resulting in total administrative costs of $150,000 for plan preparation. This estimate may overstate costs where economies of scale lower plan preparation costs for units 1b and 3.

298. Primary activities under the draft management plan for Unit 1a include salt cedar and Russian olive control activities, water management at Ute dam, and restoration of riparian and upland habitat. Landowner participation in actions suggested by the plan is voluntary. An outline of the six objectives of the plan is presented in Exhibit 9-9. Cost information related to these objectives is not currently available.

Exhibit 9-9

PRINCIPAL ELEMENTS OF THE UNIT 1A DRAFT MANAGEMENT PLAN FOR THE SHINER

Objective	Activities
Maintain and restore the natural hydrology of streams containing the Arkansas River Shiner	• Identify areas where salt cedar and/or Russian olive are located and determine effective conservation measures to restore historic flows. • Provide landowners incentives to participate in salt cedar control programs (e.g. through local cost share with NRCS CRP, CCRP, and EQIP). • Manage amount and timing of releases from Ute Dam, when possible, to benefit shiner spawning. • Maintain and improve grassland resources by promoting restoration of uplands to native grasses and control brush (such as mesquite) through NRCS grassland management programs. • Prevent regrowth of salt cedar where control programs have been utilized (e.g., through biological control programs). • Undertake salt cedar control at Lake Meredith using fire and mechanical methods to the extent that policy decisions, authority, and funds allow.
Reduce impacts that adversely alter the geomorphology of shiner streams	• Encourage erosion control measures along riparian zones and slopes adjacent to shiner streams; encourage minimal disturbance to those areas during construction projects (e.g., work with government agencies to develop BMPs). • Provide financial and technical assistance to landowners interested in reestablishing native vegetation along riparian zones, especially in those areas with high erosion potential. • Minimize riparian disturbance in areas with high erosion potential (e.g. provide alternate watering sources for livestock through EQIP; habitat fence construction; stream bank stabilization; livestock shelter/wintering areas outside of riparian areas; section 319 program).
Minimize non-point source water quality impacts in Shiner streams	• Reduce input of saline brine into Shiner streams from non-point sources. o Continue the Lake Meredith Salinity Control Project (LMSCP). o Continue evaluation of base-level streamflow and chloride concentrations to evaluate LMSCP and document changes in quantity and quality of flows from salt cedar control and reduction in brine inflow. o Continue routine inspections of sewage treatment facilities. o Continue technical assistance for permitting and designing CAFOs. o Provide incentives for landowners to establish riparian buffers or filter strips along agricultural fields with high runoff potential (through NRCS CRP, EQIP; section 319 program).
Population monitoring and assessment	Draft plan in progress by SWCAEC for the ARS Coalition.
Public Outreach and Extension	• Coordinate with Federal, state, and local entities to identify potential problems and management options for the shiner through the shiner advisory group. • Provide biannual press releases to agriculture and conservation groups on current state of the shiner and Federal activities for the shiner. • Use media sources to inform the public about shiner recovery efforts in the region. • Develop an informal brochure for distribution to landowners, schools, and members of the public to explain the importance of recovery of the shiner and activities of the conservation plan. • Prepare and deliver a presentation on the shiner and the management plan at professional society meetings and workshops.
Evaluation	Prepare annual progress reports.

Source: Canadian River Municipal Water Authority, Arkansas River Shiner (*Notropis girardi*) Management Plan for the Canadian River of Eastern New Mexico and the Western Texas Panhandle, Draft January 2005.

APPENDIX A: RFA/SBREFA SCREENING ANALYSIS

299. This Appendix considers the extent to which the analytic results presented in the previous sections reflect potential future impacts to small entities in units of essential shiner habitat that are proposed for inclusion in the final rule.[177] The screening analysis presented in this Appendix is conducted pursuant to the Regulatory Flexibility Act (RFA) as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) in 1996. Information was gathered from the Small Business Administration, U.S. Census Bureau, and U.S. Department of Agriculture. Following is a summary of the sources of potential future impacts on small businesses related to essential shiner habitat.

- ***Increased compliance costs to concentrated animal feeding operations (CAFOs)***. Shiner conservation activities have the potential to affect approximately 67 of the 4,125 small animal feeding businesses (roughly 1.6 percent) located within States that contain proposed shiner habitat and impacted CAFOs (Oklahoma, Texas, and Kansas). The watersheds with highest potential impacts to small CAFOs are the Lower Canadian (Unit 1b) Lower Cimarron-Skeleton (Unit 3) watersheds. Impacts are possible in the form of additional compliance costs related to a number of potential requirements, including increased storage capacity in wastewater retention structures and various monitoring and testing activities. These compliance costs may lead to financial stress at up to 33 facilities. The large range in potential financial impact is related to the size (number of animals) of the concentrated feeding facility. Specifically, smaller facilities realize lower gross revenues when revenues are estimated on a per-animal basis. Because compliance costs are roughly equivalent across facilities housing the same type of animal, compliance costs at smaller facilities represent a higher percentage of the facility's gross revenue. It is important to note that upper-bound estimates of potential impacts result from conservative assumptions (that is, assumptions that are intended to overstate rather than understate costs) regarding the number and type of project modifications required of CAFO facilities as detailed in Section 6 of this report.

- ***Increased compliance costs to oil and gas production activities***. Project modifications to oil and gas activities resulting from shiner conservation

[177] Impacts to small entities in essential habitat proposed for exclusion from critical habitat are presented separately in this Appendix.

activities will have minimal effects on small oil and gas and pipeline businesses in counties that contain proposed shiner habitat. Impacts are expected to be limited to additional costs of compliance for oil and gas projects. Assuming that each potentially impacted well and pipeline represent individual well and pipelines businesses, annual compliance costs are roughly 0.14 percent of estimated 1997 revenues for potentially impacted small oil and gas well production businesses and 0.09 percent of estimated 1997 revenues for potentially impacted small pipeline businesses in these counties.[178]

- ***Reduced crop production in proposed shiner habitat***. While shiner conservation activities have not impacted private crop production since the listing of the species in 1998, the analysis considers that farmers may make decisions that lead to reductions in crop production within proposed critical habitat. Section 7 presents a scenario in which farmers choose to retire agricultural land from production in order to avoid section 9 take of the species. The screening analysis estimates that up to 14 small farms in States that contain proposed shiner habitat could be impacted under this scenario. This represents a small percentage (less than one percent) of total farm operations in these States.

- ***Reduced livestock grazing on non-Federal lands.*** Limitations on livestock grazing may impact ranchers in the region. As discussed in Section 7, shiner conservation activities could result in a reduction in the level of grazing effort within proposed shiner habitat on non-Federal private lands. On non-Federal lands, however, impacts are uncertain, because maps describing the overlap of privately grazed lands and the designation are not available (i.e., that portion of each ranch which could be impacted by the designation). If each affected ranch is small, then approximately 20 to 43 ranches annually could experience losses in cattle grazing opportunities as a result of shiner conservation activities on non-Federal lands. This represents a small percentage (less than one percent for the upper-bound estimate) of beef cow operations in those States where habitat is proposed for designation.

- ***Reduced recreation activity***. As detailed in Section 9, limitations on ORV use at the Rosita ORV area within Lake Meredith National Recreation Area in Hutchinson County, Texas during the months of July to September may result in up to 23,299 lost visitor days annually. These lost visitor days represent 2.4 percent of the three-year average of total visitor trips to Lake Meredith National Recreation Area (2002 to 2004), and roughly 25 percent of annual ORV visitor trips to Rosita from 2000 to 2004. Recreation-related sales generated by small businesses in Hutchinson County, Texas are estimated at $88.5 million.[179] Thus, the total annual impact of reduced consumer expenditure ($897,00 to $1.3 million annually) is equivalent to 1.0 percent to 1.5 percent of small business revenues of affected industries in Hutchinson County. While small business

[178] 1997 revenue data is the most current available data from the United States Economic Census.
[179] U.S. Census Bureau, 1997 Economic Census for Hutchinson County Texas.

impacts are likely to be minimal at the county level, some individual small businesses may experience greater impacts. However, data to identify which businesses will be affected or to estimate specific impacts to individual small businesses are not available.

300. For each of these economic sectors, Exhibit A-1 provides the Small Business Administration size standards for various types of businesses within the industry and the affected geographic region examined in this Appendix.

301. The remainder of this section addresses the potential impacts to each of the activities that may involve small entities identified above. For each activity, the number of small entities affected and potential economic impact on those small entities is estimated.

Exhibit A-1

SMALL BUSINESS SIZE STANDARDS FOR ACTIVITIES WITH SMALL BUSINESS IMPACTS AND AFFECTED REGIONS

NAICS Code/Industry	Size Standard	Affected Region
CAFOs		
112112: Cattle Feedlots	$1,500,000	Most watersheds containing essential shiner habitat in Kansas, Oklahoma, and Texas
112120: Dairy Cattle and Milk Production	$750,000	
112210: Hog and Pig Farming	$750,000	
112320: Broilers and Other Meat Type Chicken Production	$750,000	
112410: Sheep Farming	$750,000	
Oil and Gas		
211111: Crude Petroleum and Natural Gas Extraction	500 employees	Most watersheds containing essential shiner habitat in Kansas, Oklahoma, and Texas
213111: Drilling Oil and Gas Wells	500 employees	
213112: Support Activities for Oil and Gas Operations	$6,000,000	
486110: Pipeline Transportation of Crude Oil	1,500 employees	
486210: Pipeline Transportation of Natural Gas	$6,000,000	
486910: Pipeline Transportation of Refined Petroleum Products	1,500 employees	
Agriculture		
All Grain, Fruit, Vegetable, Tobacco, Cotton, and Miscellaneous Crop Farming	$750,000	Most watersheds containing essential shiner habitat
Livestock Grazing		
112111: Beef Cattle Ranching and Farming	$750,000	All watersheds containing essential shiner habitat
Recreation		
Food and Beverage Stores		Lake Meredith National Recreation Area, Hutchinson County, Texas
445110: Supermarkets and Other Grocery (Except Convenience) Stores	$23,000,000	
445120: Convenience Stores	$23,000,000	
445299: Other Specialty Food Stores	$6,000,000	
445310: Beer, Wine and Liquor Stores	$6,000,000	
Food Service and Drinking Places		
722110: Full-Service Restaurants	$6,000,000	

Exhibit A-1

SMALL BUSINESS SIZE STANDARDS FOR ACTIVITIES WITH SMALL BUSINESS IMPACTS AND AFFECTED REGIONS

NAICS Code/Industry	Size Standard	Affected Region
722211: Limited Service Eating Places	$6,000,000	
722410: Drinking Places	$6,000,000	
Accommodations		
721110: Traveler Accommodation	$6,000,000	
721211: Recreational Vehicle Parks and Recreational Camps	$6,000,000	
Transportation		
441210: Recreational Vehicle Dealers	$6,000,000	
441221: Motorcycle Dealers	$6,000,000	
441310: Automotive Parts and Accessories Stores	$6,000,000	
441320: Tire Dealers	$6,000,000	
447190: Service Stations, Gasoline	$7,500,000	
532120: Truck, Utility Trailer, and RV (Recreational Vehicle) Rental and Leasing	$21,500,000	

Source: SBA's Table of Small Business Size Standards based on NAICS 2002, accessed at http://www.sba.gov/size/indextableofsize.html.

Small Business Impacts on Concentrated Animal Feeding Operations

302. Impacts to CAFOs associated with shiner conservation activities involve increased costs of compliance to these operations; the analysis does not forecast CAFO facility closures in areas that contain shiner habitat proposed for designation. Due to regulatory uncertainty regarding the potential future costs of shiner conservation activities on CAFOs, Section 6 presents a scenario in which all CAFOs within watersheds that contain essential shiner habitat are subject to 100 percent of compliance costs associated with potential shiner-related requirements. It important to note that this conservative scenario is intended to overstate rather that understate costs. To the extent that all requirements are not required of all CAFOs in watersheds that contain proposed habitat, or that some or all of the compliance measures are already in place at existing facilities, the scenario will overstate potential costs. Potential requirements are summarized in Exhibit 6-3. The methodology employed to calculate associated costs is detailed in Appendix D.

303. The analysis models both the one-time capital costs and the recurring annual costs of compliance that CAFO facilities may incur. On a per-facility basis, one-time capital costs are forecast to range from $35,000 to $251,000 while recurring annual costs are forecast to range from $11,000 to $33,000 annually (constant, 2004 dollars). Over the twenty-year time period of the analysis, CAFOs in watersheds proposed for inclusion in critical habitat may incur up to $69 million in compliance costs (constant, 2004 dollars). The screening analysis conducted in this section concludes that part of this cost will be borne by approximately 67 small business CAFOs; 33 of these are anticipated to experience financial stress as a result of shiner-related compliance costs. These 33 CAFOs represent approximately 0.8 percent of

the 4,125 small animal feeding operations in Kansas, Oklahoma, and Texas as shown in Exhibit A-2.

Exhibit A-2

SMALL ANIMAL FEEDING OPERATIONS IN STATES CONTAINING PROPOSED SHINER HABITAT

State	NAICS Code/Industry	# of Businesses	# of Small Businesses
Kansas	112112: Cattle Feedlots	1299	1192
	112120: Dairy Cattle and Milk Production	333	315
	112210: Hog and Pig Farming	204	178
	112320: Broilers and Other Meat Type Chicken Production	2	2
	112410: Sheep Farming	34	34
	Kansas State Total	**1872**	**1721**
Oklahoma	112112: Cattle Feedlots	396	368
	112120: Dairy Cattle and Milk Production	154	143
	112210: Hog and Pig Farming	47	34
	112320: Broilers and Other Meat Type Chicken Production	31	27
	112410: Sheep Farming	16	16
	Oklahoma State Total	**644**	**588**
Texas	112112: Cattle Feedlots	1187	1032
	112120: Dairy Cattle and Milk Production	589	514
	112210: Hog and Pig Farming	94	88
	112320: Broilers and Other Meat Type Chicken Production	63	58
	112410: Sheep Farming	126	124
	Texas State Total	**2059**	**1816**
CHD Total		**4575**	**4125**

Sources: Data query of Dun and Bradstreet File 516, "Dun's Market Identifiers" for states listed.

304. In order to estimate potential impacts to small CAFO operations, the analysis relies on the small business analysis completed as part of the EPA's economic analysis of the 2003 Federal rule governing NPDES permits for CAFOs. Specifically, in the absence of revenue information on a per-facility basis, the analysis utilizes EPA's methodology for converting the SBA size standard for CAFOs (see Exhibit A-1) into animal numbers in order to determine the number of small CAFOs potentially impacted by shiner conservation activities.[180] In all cases with the exception of cattle feedlots, SBA standards define small

[180] Detailed information concerning EPA's methodology is available from: EPA, Economic Analysis of the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, December 2002. EPA employs this methodology because entity-level revenue data for CAFOs were not available. Entity-level revenue data for CAFOs considered in this analysis are also not available.

CAFOs as those operations that generate average revenues less than $750,000 annually. For cattle feedlots, the standard is less than $1,500,000 in average annual revenues. To equate SBA's definition of small CAFOs to the number of animals per facility, EPA applies the following equation:

Average number of animals/farm = SBA's small business definition ($ per year per farm)/Average total revenue per head ($/animal)

Using this equation, this analysis estimates 67 small CAFOs in watersheds that proposed for inclusion in the final rule. Results of the analysis are presented in Exhibit A-3.

Exhibit A-3

NUMBER OF SMALL CAFOS THAT MAY BE IMPACTED BY SHINER CONSERVATION ACTIVITIES

Sector	Total Annual Revenue (SBA Size Standard) (x)	Revenue per Head (Average U.S.) (y)	Number of Animals at Small CAFOs (z=x/y)	Estimated Number of Small CAFOs in CHD
Cattle	$1,500,000	$1,060	1,415	23
Dairy	$750,000	$2,573	291	1
Hogs and Pigs	$750,000	$363	2,066	25
Broilers	$750,000	$2	375,000	18
Total				**67**

Sources: SBA size standards from 13 CFR Part 121; Average revenue per head derived from USDA 1997 ARMS data (USDA/ERS, 1999, Data from the Farm Costs and Returns Survey).

305. To model potential impacts of shiner conservation requirements on small CAFOs within watersheds that contain essential shiner habitat, the analysis continues to rely upon EPA's small business analysis completed for the 2003 rule governing NPDES permits for CAFOs. Specifically, this analysis uses EPA's "sales test" that compares incremental pre-tax costs of compliance to total gross revenue at a facility to assess the financial affordability of shiner-related compliance costs.[181] Exhibit A-4 summarizes farm-level financial data used in EPA's economic analysis of the 2003 NPDES rule for CAFOs.

[181] EPA notes that a sales test is a more "analytically useful tool than a profit test for assessing impacts in the livestock and poultry industries" for three reasons: "First, EPA has concerns that profit-based measures might overstate vulnerability. Second, revenues are generally not as sensitive to incentives to show minimum values for tax purposes as profits and thus are not as likely as profits to be understated. Third, sales are never negative and thus a comparison between costs and sales can be adequately interpreted." EPA, Economic Analysis of the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, December 2002, page 2-42.

Exhibit A-4

FARM-LEVEL FINANCIAL INPUT DATA
(per animal head)

Sector	Gross Revenue	Net Cash Income	Depreciation	Operating Cost	Debt-Asset Ratio
Cattle					
>1000	$475.00	$9.00	$5.00	$461.00	68%
<1000	$945.00	$2.00	$5.00	$913.00	68%
Dairy					
>1000	$1,746.00	$269.00	$144.00	$1,319.00	64%
<1000	$2,492.00	$631.00	$158.00	$1,635.00	32%
Hogs					
>1000	$153.00	$24.00	$11.00	$118.00	65%
<1000	$228.00	$42.00	$17.00	$168.00	49%
Broilers					
>1000	$1.16	$0.50	$0.17	$0.47	26%
<1000	$1.42	$0.60	$0.18	$0.64	19%

Notes: Dairy values used represent Midwest estimates; Hog values represent average of independent grow-feed and independent farrow-finish hog operation types; Broiler values represent South estimates.
Source: EPA Economic Analysis of the Final Revisions to the National Pollutant Discharge Elimination System Regulation and Effluent Guidelines for Concentrated Animal Feeding Operations, Table 2-2, page 2-34.

306. Under the sales test, this analysis assumes that annual compliance costs are affordable for CAFOs if they represent less than 3 percent of annual gross revenue, moderate if they represent 3 to 10 percent of annual gross revenue, and will create financial stress for the CAFO if they exceed 10 percent of annual gross revenue.[182] Using the sales test method, the analysis estimates that 33 of the 67 small CAFOs identified fall within the financial "stress" category based on compliance costs associated with shiner conservation. These CAFOs represent roughly 0.8 percent of all small animal feeding operations in Kansas, Oklahoma, and Texas. Exhibit A-5 presents results of the analysis by watershed. As shown, the greatest financial impacts to small CAFOs in watersheds proposed for inclusion may occur in the Lower Canadian (Unit 1b) and Lower Cimarron-Skeleton (Unit 3) watersheds. However, the relatively high percentage of CAFOs that fall under the financial "stress" category using the sales test method (49 percent overall) reflects conservative estimates of the number and type of modifications that may be required at CAFO facilities in States that contain proposed shiner habitat (that is, estimates are intended to overstate rather than understate potential compliance costs) as detailed in Section 6 of this report.

[182] These criteria are adopted from EPA's analysis and modified for the purposes of this analysis.

Exhibit A-5

POTENTIAL FINANCIAL IMPACTS TO SMALL CAFOS IN WATERSHEDS CONTAINING PROPOSED SHINER HABITAT

CHD Unit Number	HUC Number	Watershed Name	Sales Test Result (Number of Affected Small CAFOs)			Sales Test Result (Percentage of Affected Small CAFOs)			Total
			Affordable	Moderate	Stress	Affordable	Moderate	Stress	
Proposed for Inclusion									
1b	11090201	Lower Canadian-Deer	1	2	0	33%	67%	0%	**3**
	11090202	Lower Canadian-Walnut	3	3	8	21%	21%	57%	**14**
	11090204	Lower Canadian	0	1	19	0%	5%	95%	**20**
3	11040006	Upper Cimarron-Liberal	4	7	2	31%	54%	15%	**13**
	11040008	Upper Cimarron-Bluff	10	2	0	83%	17%	0%	**12**
	11050001	Lower Cimarron-Eagle Chief	1	0	0	100%	0%	0%	**1**
	11050002	Lower Cimarron-Skeleton	0	0	4	0%	0%	100%	**4**
Total			**19**	**15**	**33**	**28%**	**22%**	**49%**	**67**

307. The extent to which impacted CAFOs experience financial "stress" is proportional to the size of the concentrated feeding operation (in terms of number of animals). As shown in Exhibit A-6, average sales test values for animal feeding operations decreases for larger operations. For example, cattle facilities falling within the "medium 1" size category have an average sales test value of 5 percent (signifying that potential compliance costs are, on average, 5 percent of gross revenues at these facilities on an annual basis) while cattle facilities categorized as "large 1" have an average sales test value of 3 percent. This demonstrates that, on average, financial stress as evaluated by the methodology employed is largely a function of the size of the facility relative to potential compliance costs.

Exhibit A-6

AVERAGE COMPLIANCE COSTS AS A PERCENTAGE OF GROSS REVENUE FOR MODEL FARM SIZE AND TYPE CATEGORIES
(Number of Farms in Size Category)

	Size*			
Category	Medium 1	Medium 2	Medium 3	Large 1
Cattle	5% (3)	2% (3)	2% (16)	3% (1)
Dairy	4% (1)	N/A	N/A	N/A
Layers/Broilers	64% (5)	22% (6)	15% (6)	N/A
Swine	18% (15)	10% (7)	10% (3)	N/A

Note: N/A signifies that small CAFOs do not exist for this category within watersheds that contain proposed shiner habitat.*These size categories are drawn from EPA's economic analysis of the 2003 NPDES rule for CAFOs and are unrelated to the SBA size standards. EPA's model size standards vary by region and CAFO sector. For detail on model CAFO assumptions, see EPA (2002), Table 2-1, page 2-33. Applying SBA size standards to these CAFOs results in some "medium" and "large" CAFOs qualifying as small for the purposes of the SBEFRA analysis. For example, in the midwest, "Medium 1" cattle facilities are defined as facilities with 300-499 animal units. This range is less than the threshold for small cattle CAFOs (less than 1,415) calculated in Exhibit A-2.

Impacts to CAFOs in Essential Shiner Habitat Proposed for Exclusion

308. Exhibit A-7 summarizes results for CAFO facilities that are located within watersheds containing essential shiner habitat proposed for exclusion from the final rule. As shown, 62 (41 percent) of these CAFOs may experience financial stress as a result of potential shiner-related compliance costs. These CAFOs represent approximately 1.5 percent of all small animal feeding operations in Kansas, Oklahoma, and Texas. The greatest impacts to small CAFOs in watersheds that contain habitat proposed for exclusion may occur in the Middle North Canadian and Middle Beaver watersheds (Unit 2).

Exhibit A-7

POTENTIAL FINANCIAL IMPACTS TO SMALL CAFOS IN WATERSHEDS CONTAINING SHINER HABITAT PROPOSED FOR EXCLUSION

CHD Unit Number	**HUC Number**	**Watershed Name**	**Sales Test Result (Number)**			**Sales Test Result (Percentage)**			**Total**
			Affordable	Moderate	Stress	Affordable	Moderate	Stress	
Proposed for Exclusion									
2	11100102	Middle Beaver	1	2	7	10%	20%	70%	**10**
	11100201	Lower Beaver	0	2	2	0%	50%	50%	**4**
	11100301	Middle North Canadian	0	1	3	0%	25%	75%	**4**
4	11030004	Coon-Pickerel	16	10	9	46%	29%	26%	**35**
	11030010	Gar-Peace	11	16	20	23%	34%	43%	**47**
	11030013	Middle Arkansas-Slate	5	21	18	11%	48%	41%	**44**
	11060001	Kaw Lake	1	4	3	13%	50%	38%	**8**
Total			**34**	**56**	**62**	**22%**	**37%**	**41%**	**152**

Small Business Impacts on Oil and Gas Activities

309. Impacts to oil and gas extraction and transmission from shiner conservation activities have the potential to impact some small businesses operating in proposed shiner habitat. Based on historical consultation records, impacts on oil and gas operations in the past have been related primarily to additional project modification costs to protect the shiner. However, as discussed in Section 5, given the expected change in EPA regulations governing stormwater permits in 2006, there is potential for small businesses to experience greater impacts in the future associated with additional administrative costs, increased drilling and operating costs, and potential production delays. Based on information provided by relevant authorities, no well production impacts are anticipated in New Mexico and Texas, and oil and gas transmission (pipeline) impacts will likely be minimal in Texas and absent in New Mexico. Therefore, potential impacts to small oil and gas businesses are anticipated to be concentrated within proposed habitat areas in Oklahoma and Kansas.

Impacts to Well Production Activities

310. The analysis estimates that shiner conservation activities will result in additional project modification costs of $25,000 to $65,000 per well (constant, 2004 dollars). In addition, five percent of all future well projects are assumed to require directional drilling, resulting in an additional $200,000 per project (constant, 2004 dollars). This assumption is based on past directional drilling requirements for one in twenty oil and gas well development activities. Companies implementing projects within shiner habitat are likely to incur the high-end estimate of this range; however, the magnitude of impacts will depend on a variety of factors including well proximity to critical habitat and the financial condition of the oil and gas company that owns the particular well. As discussed in Section 5, the analysis does not forecast reductions in well production activity within areas that contain proposed shiner habitat. Total annualized project modification costs across all watersheds that contain proposed shiner habitat are expected to range from $1.3 to $2.8 million (assuming a seven percent discount rate) as shown in Exhibit 5-8.

311. In estimating the potential impacts of projected project modification costs to small oil and gas businesses, the analysis compensates for data limitations regarding the location (and, therefore, the number) and revenues of impacted small oil and gas businesses by utilizing simplifying assumptions that bound potential impacts. These assumptions are:

- Each potentially impacted well within watersheds that contain proposed shiner habitat represents an individual oil and gas business;

- The proportion of oil and gas businesses that are small in counties that contain proposed shiner habitat represents a reasonable approximation of the proportion of oil and gas businesses that are small within watersheds that contain proposed shiner habitat (i.e. impacted small oil and gas businesses);

- Small business revenues within counties that contain proposed shiner habitat are reasonably approximated by estimating the percentage of statewide oil and gas revenues attributable to these counties and then multiplying the proportion of small oil and gas businesses in these counties by these revenues; and

- The ratio of small oil and gas businesses that may be impacted to total small oil and gas businesses within counties that contain proposed shiner habitat, when applied to estimated small business revenues in these counties, presents a reasonable approximation of revenues generated by small oil and gas businesses that may be impacted by shiner conservation activities.

312. As shown in Exhibit A-8, the analysis estimates approximately 891 small oil and gas production businesses in counties that contain proposed shiner habitat, or 91 percent of all oil and gas production businesses in these counties. Then, the analysis applies the percentage of oil and gas business in counties that contain proposed shiner habitat that are small (91 percent) to the number of oil and gas wells potentially impacted by shiner conservation activities (750 as estimated in Exhibit 5-8) to estimate roughly 679 small oil and gas businesses that may incur shiner-related project modification costs. Next, the analysis estimates revenues generated by these 679 small entities by applying the ratio of potentially impacted small entities to total small entities in counties that contain proposed shiner habitat (679/891 or 76 percent) to small business revenues in these counties ($2.5 billion in 1997). The resulting revenues attributable to impacted small oil and gas businesses are $1.9 billion annually. Annualized project modification costs related to shiner conservation activities ($2.8 million using a seven percent discount rate on the high-end estimate) in watersheds that contain the designation are 0.14 percent of these annual revenues.

Exhibit A-8

SMALL BUSINESS IMPACTS ASSOCIATED WITH OIL AND GAS WELL PRODUCTION ACTIVITY IN COUNTIES CONTAINING PROPOSED SHINER HABITAT

State	County	# O&G Businesses	# of Small O&G Businesses	Total Revenues in Counties with Proposed Critical Habitat [1]	Small Business Revenues in Counties with Proposed Critical Habitat [2]
Kansas	Clark	1	1	$175,863,000	$159,665,000
	Comanche	3	3		
	Meade	6	5		
	Seward	66	60		
	Kansas CHD Total	**76**	**69**		
	Kansas State Total	**897**			
Oklahoma	Beaver	20	15	$2,064,118,000	$1,851,749,000
	Blaine	16	14		
	Caddo	15	13		
	Canadian	63	57		
	Cleveland	103	100		
	Custer	37	33		
	Dewey	17	16		
	Ellis	5	4		
	Grady	36	32		
	Harper	6	6		
	Hughes	21	19		
	Kingfisher	78	67		
	Logan	22	22		
	Major	25	21		
	McClain	30	26		
	McIntosh	4	4		
	Pittsburg	27	23		
	Pontotoc	47	44		
	Pottawatomie	41	39		
	Roger Mills	10	9		
	Seminole	67	64		
	Woods	12	9		
	Woodward	95	78		
	Oklahoma CHD Total	**797**	**715**		
	Oklahoma State Total	**2,090**			
Texas	Hemphill	36	34	$545,569,000	$525,909,000
	Oldham	0	0		
	Potter	75	73		
	Texas CHD Total	**111**	**107**		
	Texas State Total	**5,879**			
New Mexico	Quay	0	0	$0	$0
	Total CHD	**984**	**891**	**$2,785,550,000**	**$2,537,323,000**
				Percentage of Small to Total O&G Businesses in CHD	**91%**
				[3] Estimated Small O&G Businesses Among Impacted O&G Wells (750)	**679**
				[4] Revenues Attributable to Impacted Small O&G Businesses	**1,933,936,000**
				Total Impact to Oil and Gas Well Production (Section 5, high annualized estimate using a seven percent discount rate)	**$2,800,000**
				Compliance Costs as Percentage of Small Business Revenues	**0.14%**

Notes: This table presents data on all oil and gas sector activities as captured by the NAICS codes 211111, 213111, and 213112 summarized in Exhibit A-1. State totals are complied using data sorted by NAICS code from the 1997 US Economic Census.

[1] In the absence of revenue information at the county level, total revenues for counties that contain proposed shiner habitat are estimated by multiplying state revenues by the proportion of statewide oil and gas businesses located in these counties.

[2] Small business revenues are calculated by applying the percentage of businesses that are small to total revenues estimated for counties that contain proposed habitat for the shiner.

[3] The number of oil and gas business potentially impacted by shiner conservation activities (750 as estimated in Exhibit 5-8) that are small is estimated by applying the ratio of small to total oil and gas businesses in the proposed CHD to potentially impacted wells. The analysis assumes that each impacted well represents an individual oil and gas business.

[4] Revenues attributable to impacted small oil and gas businesses (679) are estimated by applying the ratio of impacted small oil and gas businesses to total small businesses in the proposed CHD (679/891) to total small business revenues in the proposed CHD ($2.5 billion).

Sources: Data query of Dun and Bradstreet File 516, "Dun's Market Identifiers" for counties listed. Total state establishments and revenue information from NAICS code search of 1997 Economic Census data accessed at http://www.census.gov/epcd/ec97/industry/ on March 31, 2005.

Impacts to Well Production Activities in Essential Shiner Habitat Proposed for Exclusion

313. Exhibit A-9 summarizes potential impacts to small oil and gas well production businesses in essential shiner habitat proposed for exclusion following the same methodology used above. As shown, potential compliance costs are 0.18 percent of revenues for these small businesses.

Exhibit A-9

SMALL BUSINESS IMPACTS ASSOCIATED WITH OIL AND GAS ACTIVITY IN COUNTIES CONTAINING SHINER HABITAT PROPOSED FOR EXCLUSION

State	County	# O&G Businesses	# of Small O&G Businesses	Total Revenues in Counties with Habitat Proposed for Exclusion [1]	Small Business Revenues in Counties with Habitat Proposed for Exclusion [2]
Kansas	Barton	99	88	$849,235,000	$786,757,000
	Cowley	16	14		
	Pawnee	2	2		
	Reno	18	15		
	Rice	11	11		
	Sedgwick	212	202		
	Sumner	9	8		
	Kansas EH Total	**367**	**340**		
	Kansas State Total	**897**			
Oklahoma	Beaver	20	15	$367,760,000	$295,244,000
	Harper	6	6		
	Texas	21	15		
	Woodward	95	78		
	Oklahoma EH Total	**142**	**114**		
	Oklahoma State Total	**2,090**			
Total in EH		**509**	**454**	**$1,216,995,000**	**$1,082,001,000**
				Average Percentage of Small to Total O&G Businesses in CHD	**89%**
				[3] Estimated Small O&G Businesses Among Impacted O&G Wells (117)	**104**
				[4] Revenues Attributable to Impacted Small O&G Businesses	**248,711,000**
				Total Impact to Oil and Gas Well Production (Section 5, high annualized estimate using a seven percent discount rate)	**$442,000**
				Compliance Costs as Percentage of Small Business Revenues	**0.18%**

Notes: This table presents data on all oil and gas sector activities as captured by the NAICS codes 211111, 213111, and 213112 summarized in Exhibit A-1. State totals are complied using data sorted by NAICS code from the 1997 US Economic Census.
[1] In the absence of revenue information at the county level, total revenues for counties that contain shiner habitat proposed for exclusion are estimated by multiplying state revenues by the proportion of statewide oil and gas businesses located in these counties.
[2] Small business revenues are calculated by applying the percentage of businesses that are small to total revenues estimated for counties that contain habitat proposed for exclusion for the shiner.
[3] The number of oil and gas business potentially impacted by shiner conservation activities (117 as estimated in Exhibit 5-8) that are small is estimated by applying the ratio of small to total oil and gas businesses in counties that contain habitat proposed for exclusion to potentially impacted wells. The analysis assumes that each impacted well represents an individual oil and gas business.
[4] Revenues attributable to impacted small oil and gas businesses ($248 million) are estimated by applying the ratio of impacted small oil and gas businesses to total small businesses in the habitat proposed for exclusion (104/454) to total small business revenues in the habitat proposed for exclusion (1 billion).
Source: Data query of Dun and Bradstreet File 516, "Dun's Market Identifiers" for counties listed. Total state establishments and revenue information from NAICS code search of 1997 Economic Census data accessed at http://www.census.gov/epcd/ec97/industry/ on March 31, 2005.

Impacts to Pipeline Activities

314. As discussed in Section 5, the majority of past oil and gas-related pipeline consultations have resulted from the maintenance of existing pipelines and construction of new pipelines, and have required project modifications to pipeline projects. The analysis assumes future impacts to pipeline activities will be related to project modifications with no anticipated reduction in pipeline activity or transmission delays. Project modifications specific to oil and gas transmission activities are forecast to range between $17,000 and $22,000 (constant, 2004 dollars) per project depending on the level of conservation effort required at a particular site. Impacts are not expected in New Mexico, and some counties in Oklahoma and Kansas (see Exhibit 5-12).

315. In order to estimate potential impacts of projected project modification costs to small pipeline businesses, the analysis bounds potential impacts utilizing a similar methodology as that used for oil and gas well production. Specifically, the analysis assumes that:

- Each potentially impacted pipeline within watersheds that contain proposed shiner habitat represents an individual pipeline business;

- The proportion of pipeline businesses that are small in counties that contain proposed shiner habitat represents a reasonable approximation of the proportion of pipeline businesses that are small within watersheds that contain proposed shiner habitat (i.e. impacted small oil and gas businesses);

- Small business revenues within counties that contain proposed shiner habitat are reasonably approximated by estimating the percentage of statewide pipeline business revenues attributable to these counties and then multiplying the proportion of pipeline businesses in these counties by the revenues; and

- The ratio of small pipeline businesses that may be impacted to total small pipeline businesses within counties that contain proposed shiner habitat, when applied to estimated small business revenues in these counties, presents a reasonable approximation of revenues generated by small pipeline businesses that may be impacted by shiner conservation activities.

316. As shown in Exhibit A-10, the analysis estimates that there are approximately 27 small pipeline businesses in counties that contain proposed shiner habitat, or 36 percent of all pipeline businesses in these counties. The analysis assumes that all 27 businesses are impacted by shiner-related project modifications, and that the 283 potentially impacted pipeline projects (over the next 20 years) are spread evenly across these 27 businesses, resulting in an average of 0.5 projects per company per year. The analysis estimates annual revenues generated at these 27 small entities by estimating the ratio of small entities to total entities in counties that contain proposed shiner habitat (27/74 or 36 percent) and applying

this percentage to county revenues in States that contain proposed habitat. The resulting revenues attributable to impacted small pipeline businesses are $301 million annually. Annualized project modification costs related to shiner conservation activities ($234,000 using a seven percent discount rate on the high-end estimate) in watersheds that contain the designation are 0.08 percent of these annual revenues.

Exhibit A-10

SMALL BUSINESS IMPACTS ASSOCIATED WITH PIPELINE ACTIVITY IN COUNTIES CONTAINING PROPOSED SHINER HABITAT

State	County	# Pipeline Businesses	# of Small Pipeline Businesses	Total Revenues in CHD [1]	Small Business Revenues in CHD [2]
Kansas	Clark	4	3	$92,053,000	$38,759,000
	Comanche	0	0		
	Meade	4	2		
	Seward	11	3		
	Kansas CHD Total	**19**	**8**		
	Kansas State Total	**113**			
Oklahoma	Beaver	3	1	$620,348,000	$215,773,000
	Blaine	0	0		
	Caddo	1	0		
	Canadian	2	0		
	Cleveland	1	0		
	Custer	5	2		
	Dewey	0	0		
	Ellis	2	2		
	Grady	3	1		
	Harper	1	0		
	Hughes	1	0		
	Kingfisher	3	1		
	Logan	1	0		
	Major	3	1		
	McClain	0	0		
	McIntosh	1	1		
	Pittsburg	2	1		
	Pontotoc	2	1		
	Pottawatomie	6	1		
	Roger Mills	1	1		
	Seminole	2	0		
	Woods	2	1		
	Woodward	4	2		
	Oklahoma CHD Total	**46**	**16**		
	Oklahoma State Total	**148**			
Texas	Hemphill	2	1	$139,208,000	$46,403,000
	Oldham	0	0		
	Potter	7	2		
	Texas CHD Total	**9**	**3**		
	Texas State Total	**451**			
New Mexico	Quay	0	0	$0	$0
Total CHD		74	27	$851,609,000	$300,935,000
				Estimated Small Pipeline Businesses in CHD	**27**
				[3] Revenues Attributable to Impacted Small Pipeline Businesses	**$300,935,000**
				Total Impact to Pipeline Activity (Section 5, annualized high estimate using a seven percent discount rate)	**$234,000**
				Compliance Costs as Percentage of Small Business Revenues	**0.08%**

Note: This table presents data on all pipeline sector activities as captured by the NAICS codes 486110, 486210, and 486910 summarized in Exhibit A-1. State totals are complied using data sorted by NAICS code from the 1997 US Economic Census. Revenue information for NAICS code 486910 was not available for Oklahoma and is not included in the calculation here.

[1] In the absence of revenue information at the county level, total revenues for counties that contain proposed shiner habitat are estimated by multiplying state revenues by the proportion of statewide pipeline businesses located in these counties.

[2] Small business revenues are calculated by applying the percentage of businesses that are small to total revenues estimated for counties that

contain proposed habitat for the shiner.
[3] Revenues attributable to impacted small pipeline businesses (27) are estimated by applying the ratio of impacted small pipeline businesses to total pipeline businesses in the proposed CHD (27/74) to total pipeline revenues in the proposed CHD ($852 million).
Sources: Data query of Dun and Bradstreet File 516, "Dun's Market Identifiers" for counties listed. Total state establishments and revenue information from NAICS code search of 1997 Economic Census data accessed at http://www.census.gov/epcd/ec97/industry/ on March 31, 2005.

Impacts to Pipeline Activities in Essential Habitat Proposed for Exclusion

317. Exhibit A-11 summarizes potential impacts to small pipeline businesses in essential shiner habitat proposed for exclusion following the methodology outlined above.

Exhibit A-11

SMALL BUSINESS IMPACTS ASSOCIATED WITH PIPELINE ACTIVITY IN COUNTIES CONTAINING SHINER HABITAT PROPOSED FOR EXCLUSION

State	County	# Pipeline Businesses	# of Small Pipeline Businesses	Total Revenues in Counties with Habitat Proposed for Exclusion [1]	Small Business Revenues in Counties with Habitat Proposed for Exclusion [2]
Kansas	Barton	4	3	$222,866,000	$96,898,000
	Cowley	3	1		
	Pawnee	3	2		
	Reno	7	1		
	Rice	5	2		
	Sedgwick	23	10		
	Sumner	1	1		
	Kansas EH Total	**46**	**20**		
	Kansas State Total	**113**			
Oklahoma	Beaver	3	1	$107,887,000	$40,457,000
	Harper	1	0		
	Woodward	4	2		
	Oklahoma EH Total	**8**	**3**		
	Oklahoma State Total	**148**			
	Total in EH	54	23	$330,752,000	$137,356,000
				Estimated Small Pipeline Businesses	**23**
				[3] Revenues Attributable to Impacted Small Pipeline Businesses	**137,356,000**
				Total Impact to Pipeline Activity (Section 5, annualized high end estimate using a seven percent discount rate)	**$70,000**
				Compliance Costs as Percentage of Small Business Revenues	**0.05%**

Note: This table presents data on all pipeline sector activities as captured by the NAICS codes 486110, 486210, and 486910 summarized in Exhibit A-1. State totals are complied using data sorted by NAICS code from the 1997 US Economic Census. Revenue information for NAICS code 486910 was not available for Oklahoma and is not included in the calculation here.
[1] In the absence of revenue information at the county level, total revenues for counties that contain shiner habitat proposed for exclusion are estimated by multiplying state revenues by the proportion of statewide pipeline businesses located in these counties.
[2] Small business revenues are calculated by applying the percentage of businesses that are small to total revenues estimated for counties that contain habitat proposed for exclusion.
[3] Revenues attributable to impacted small pipeline businesses (27) are estimated by applying the ratio of impacted small pipeline businesses to total pipeline businesses in counties that contain shiner habitat proposed for exclusion (27/74) to total pipeline revenues in these counties ($330 million).
Sources: Data query of Dun and Bradstreet File 516, "Dun's Market Identifiers" for counties listed. Total state establishments and revenue information from NAICS code search of 1997 Economic Census data accessed at http://www.census.gov/epcd/ec97/industry/ on March 31, 2005.

Small Business Impacts on Crop Production Activities

318. Due to uncertainty surrounding potential impacts of shiner conservation activities on private crop production, Section 7 presents three scenarios concerning farm-level decision-making once critical habitat for the shiner is designated. The first scenario assumes that

farmers may retire agricultural land in essential habitat from production, resulting in a loss in land value associated with transitioning cropland to pastureland. Losses in land value associated with retiring cropland from production range from $221 to $365 per acre, depending on the State in which essential habitat is located. A total of 6,617 acres of cropland may be impacted under this scenario; 4,209 of these acres are located in proposed shiner habitat.

319. The analysis uses USDA/NASS 2002 Census of Agriculture data to estimate the number of small farms in States that contain proposed shiner habitat. Exhibit A-12 summarizes the number of farms in each State according to size group and value of sales. As shown, the majority of farms (79 percent according to size) are small. Further, according to SBA size standards summarized in Exhibit A-1, on a value of sales basis, at least 98 percent of all farms are categorized as small. The analysis therefore assumes that all farms less than 2,000 acres are small. Then, the analysis uses the midpoint of each size category less than 2,000 acres and applies a weighted average across these size categories to estimate the average size of a small farm. For example, 50 acres is used as the midpoint for the 1-99 acres size category, and 300 acres for the 100-499 acres size category. Using this methodology, the analysis estimates that an average small farm in these States is 285 acres in area. If each affected small farm is 285 acres, then approximately 14 farms (4,000 impacted acres divided by 285 acres) could experience reductions in crop production as a result of shiner critical habitat designation. Under the assumption that 79 percent of total farms are small (or 311,813 small farms), the estimate of future impacts (14 farms) represents a small percentage (less than 1 percent) of total small farm operations in States that contain proposed shiner habitat.

320. To estimate impacts to essential shiner habitat proposed for exclusion from the shiner rule (2,400 acres of crop production), the analysis uses the methodology applied to crop production within proposed habitat above. Accordingly, if each affected small farm in shiner habitat proposed for exclusion is 285 acres, approximately 8 farms may experience reductions in crop production as a result of shiner conservation activities. This impact (8 farms) represents a small percentage (less than 1 percent) of total small farm operations in States that contain proposed shiner habitat (311,813 farms as estimated above).

Exhibit A-12

FARMS: NUMBER OF OPERATIONS BY SIZE GROUP AND SALES (2002)

Number of Operations by Area

State	Total Operations	1-99 acres	100-499 acres	500-999 acres	1,000 to 1,999 acres	2,000+ acres
Kansas	64,500	19,479	22,704	8,643	7,353	6,321
Oklahoma	83,500	33,818	34,653	7,682	4,092	3,257
Texas	229,000	110,607	77,173	18,549	12,137	10,534
New Mexico	17,700	9,310	3,292	1,168	1,080	2,832
Total	394,700	173,214	137,822	36,042	24,661	22,944
Percent	100%	44%	35%	9%	6%	6%

Number of Operations by Sales

State	Total Operations	$0-$9,999	$10,000-$49,999	$50,000-$99,999	$100,000-$499,999	$500,000+
Kansas	64,500	31,154	15,996	6,321	9,224	1,806
Oklahoma	83,500	52,438	20,291	4,342	5,261	1,169
Texas	229,000	163,735	41,907	8,702	11,221	3,435
New Mexico	17,700	12,089	2,885	867	1,310	549
Total	394,700	259,416	81,079	20,232	27,015	6,959
Percent	100%	66%	21%	5%	7%	2%

Source: USDA ERS, 2002 Data Fact Sheets for Kansas, Oklahoma, Texas, and New Mexico.

Small Business Impacts on Livestock Grazing Activities

321. On non-Federal lands, impacts on grazing activities are uncertain, because maps describing the overlap of privately grazed lands and the designation are not available (i.e., that portion of the ranch that which could be impacted by the designation). In addition, no consultations or HCPs currently exist that affect private grazing in essential shiner habitat. However, if ranchers reduce grazing effort to avoid incidental take of shiners, then impacts on those ranches would occur.

322. On non-Federal lands within proposed shiner habitat, this analysis estimates a reduction in grazing effort on private lands of zero to 35,015 AUMs annually.[183] Assuming an average monthly forage factor per cow/calf pair of 1.35, and that every cow is grazed year-round on private lands, this would be equivalent to a reduction of approximately 2,161 head of cattle annually, or 43,230 cattle over 20 years.[184] As shown in Exhibit A-13, beef cow operations can range in size from less than 50 cattle to well over 500 cattle; however, the majority of beef cow operations in the States that contain proposed shiner habitat are small (90%). For the purposes of this analysis, all privately grazed lands in proposed shiner habitat are assumed to be part of small ranches (50-100 cattle). Further, the analysis assumes

[183] An animal unit month is equivalent to forage required for one cow and calf for one month.

[184] A forage factor of 1.35 per mature cow is typical for cow/calf ranches when cows, bulls, horses, and replacement heifers are considered. (Workman, J.P. 1986. Range Economics. MacMillan Publishing Co., New York, N.Y.)

that 90 percent of total beef cow operations in affected States (216,400) are small, or 194,760 operations. If each affected ranch is small, then approximately 20 to 43 ranches annually could experience total reductions in cattle grazed as a result of shiner critical habitat designation. If these ranches depend on private rangeland forage, they would have to purchase supplemental forage to maintain herd size. The range of potentially impacted ranches (20 to 43 annually) represents a minor percentage (less than one percent for the high-end estimate) of total small beef operations (194,760) in affected States. Further, impacts are likely to be spread across a greater number of farms than estimated in this section.

323. To estimate impacts to essential shiner habitat proposed for exclusion from the shiner rule (13,753 AUMs), the analysis uses the methodology applied to grazing within proposed habitat above. Accordingly, 13,753 lost AUMs is equivalent to approximately 849 head of cattle annually, or 16,979 cattle over 20 years. If each affected ranch in areas proposed for exclusion from the final rule are small, then 8 to 17 ranches annually could experience total reductions in cattle grazed. Essential shiner habitat proposed for exclusion exists in Kansas and Oklahoma; these states contain 78,000 beef cow operations as shown in Exhibit A-13. Assuming that 90 percent of total beef operations in affected States are small (70,200), the range of potentially impacted ranches in areas proposed for exclusion represent a small percentage (less than one percent for the high-end estimate) of total small beef operations in these States.

Exhibit A-13

BEEF COWS: NUMBER OF OPERATIONS BY SIZE GROUP, 2003
(Number of head)

State	Total Operations	Extra Small > 50 Head	Small 50-99 Head	Medium 100-499 Head	Large > 500 Head
Kansas	28,000	18,500	5,300	4,020	180
Oklahoma	50,000	38,500	7,200	4,100	200
Texas	132,000	104,000	15,600	11,500	900
New Mexico	6,400	4,400	820	1,000	180
Total	216,400	165,400	28,920	20,620	1,460
Percent	100%	76.4%	13.4%	9.5%	0.67%

Source: "Livestock Operations 2003 Summary," National Agricultural Statistics Service, USDA, April 2004.

Small Business Impacts on Recreation Activities

324. As discussed in Section 9, potential restrictions on ORV use at Rosita within the Lake Meredith National Recreation Area could result in annual visitor expenditure losses of up to $1.3 million, representing 23,299 lost visitor days (from July to September) as a result of shiner conservation activities.[185] These lost visitor days represent 2.4 percent of the three-

[185] Visitor expenditures considered in the analysis include expenditures at restaurants and bars, grocery stores, oil and gas, other vehicle expenses, admissions and fees, clothing, sporting goods, and souvenirs.

year average of total visitor trips to Lake Meredith National Recreation Area (2002 to 2004), and roughly 25 percent of ORV visitor trips to Rosita ORV area from 2000 to 2004. As illustrated in Exhibit A-1, the indirect impact of this reduction in visitor trips is spread across a variety of industries including food and beverage stores, food service and drinking places, accommodations, transportation, and rental services.

325. While detailed information regarding specific small businesses that may be impacted by potential reductions in ORV-user visitor days is not available, it is possible that certain small businesses in the areas surrounding Lake Meredith National Recreation Area may experience disproportionate impacts. For example, one ORV-business owner explained that in the Amarillo-Lubbock business area there are over 2,400 ORVs sold annually, 50 percent of which are used in the Canadian River area. His particular business sells $5 million in ORVs annually, while others sell approximately $20 million annually.[186] Another representative from the ORV-user community explained that Rosita is only one-third of the total potentially impacted ORV areas in Lake Meredith National Recreation Area, and that telephone surveys of local businesses have revealed up to $5 million in sales to Canadian River ORV area users.[187] Moreover, Rosita and Blue Creek ORV areas are the only public-use ORV areas in Texas, and draw ORV users from Oklahoma and New Mexico as well.[188] However, in the aggregate, impacts to small businesses in Hutchinson County, Texas related to shiner conservation activities may represent only 0.6 percent of small business revenues (for the upper-bound estimate of 23,299 lost visitor days) as explained in the paragraphs that follow.

326. Exhibit A-14 illustrates the total number of businesses in Hutchinson County, Texas, that could be affected by this loss in sales. This exhibit also indicates the number of these businesses that are classified as small businesses (based on SBA size standards).

327. Specifically, there are 114 small businesses in these industries in Hutchinson County.[189] Depending on the sector, between 68 percent and 100 percent of the businesses serving recreators in Hutchinson County are small businesses. Sales generated by these small businesses are estimated at $88.5 million.[190] Thus, the total upper-bound annualized impact of $496,000 is equivalent to 0.6 percent of small business revenues in affected industries within Hutchinson County.

[186] Written communication from Alvin Sharp, Sharps Motorsports Inc., Amarillo, Texas, on May 10, 2005.
[187] Personal communication with Scott Salter, President, Texas Off-Roaders Association, on May 11, 2005.
[188] Personal communication with Paul Eubank, National Park Service, Lake Meredith National Recreation Area, on March 9, 2005.
[189] Dialog search of File 516, Dun and Bradstreet, "Duns Market Identifiers."
[190] U.S. Census Bureau, 1997 Economic Census for Hutchinson County Texas.

Exhibit A-14

SMALL BUSINESS IMPACTS ASSOCIATED WITH RECREATION-RELATED EXPENDITURES IN HUTCHINSON COUNTY, TEXAS

Economic Sector	# Businesses (1)	# of Small Businesses (1)	Total Revenues (2)	Small Business Revenues (3)
Food and Beverage Stores				
445110: Supermarkets and Other Grocery (Except Convenience) Stores	16	16	$34,839,000	$33,945,692
445120: Convenience Stores	13	12		
445299: Other Specialty Food Stores	3	3		
445310: Beer, Wine and Liquor Stores	7	7		
Subtotal Food and Beverage Stores	39	38		
Accommodation, Food Service and Drinking Places				
722110: Full-Service Restaurants	42	26	$15,103,000	$10,270,040
722211: Limited Service Eating Places	22	15		
722410: Drinking Places	3	2		
721110: Traveler Accommodation	6	6		
721211: Recreational Vehicle Parks and Recreational Camps	2	2		
Subtotal Accommodation, Food Service and Drinking Places	75	51		
Transportation				
441210: Recreational Vehicle Dealers	1	1	$44,093,000	$40,701,231
441221: Motorcycle Dealers	2	2		
441310: Automotive Parts and Accessories Stores	7	6		
441320: Tire Dealers	5	5		
447190: Service Stations, Gasoline	11	10		
Subtotal Transportation	26	24		
Rental Services				
532120: Truck, Utility Trailer, and RV (Recreational Vehicle) Rental and Leasing	1	1	$3,558,000	$3,558,000
Total, All Recreation-Related Sectors	**141**	**114**	**$97,593,000**	**$88,474,963**
Upper-Bound Annualized Impact from Reduced Recreation (Section 9, using a seven percent discount rate)				**$496,000**
Recreation Impact as a Percentage of Affected Small Business Revenues				**0.6%**

Notes: (1) Dialog search of File 516, Dun and Bradstreet, "Duns Market Identifiers" using NAICS codes identified in Exhibit A-1. (2) U.S. Census Bureau, 1997 Economic Census for Hutchinson County, Texas. Accessed on March 25, 2005. Where sales are not available for specific subsectors, the analysis uses the entire sector. Specifically, the analysis uses sector 445 for Food and Beverage Stores, sector 72 for Accommodations, Food Service and Drinking Places, sector 441 for Transportation, and sector 532 for Rental Services. (3) Small business revenues are estimated by applying the percentage of businesses in each sector that are small to the total revenues for that sector.
(D) = Cannot be disclosed by U.S. Census Bureau.

APPENDIX B: POTENTIAL IMPACTS ON THE ENERGY INDUSTRY

328. Pursuant to Executive Order No. 13211, "Actions Concerning Regulations that Significantly Affect Energy Supply, Distribution, or Use," issued May 18, 2001, Federal agencies must prepare and submit a "Statement of Energy Effects" for all "significant energy actions." The purpose of this requirement is to ensure that all Federal agencies "appropriately weigh and consider the effects of the Federal Government's regulations on the supply, distribution, and use of energy."[191] The Office of Management and Budget has provided guidance for implementing this Executive Order that outlines nine outcomes that may constitute "a significant adverse effect" of a regulatory action under consideration:

- Reductions in crude oil supply in excess of 10,000 barrels per day (bbls);
- Reductions in fuel production in excess of 4,000 barrels per day;
- Reductions in coal production in excess of 5 million tons per year;
- Reductions in natural gas production in excess of 25 million Mcf per year;
- Reductions in electricity production in excess of 1 billion kilowatts-hours per year or in excess of 500 megawatts of installed capacity;
- Increases in energy use required by the regulatory action that exceed the thresholds above;
- Increases in the cost of energy production in excess of one percent;
- Increases in the cost of energy distribution in excess of one percent; or
- Other similarly adverse outcomes.[192]

329. Three of these criteria are relevant to this analysis: (1) reductions in crude oil supply in excess of 10,000 barrels per day (bbls); (2) reductions in natural gas production

[191] U.S. Office of Management and Budget, The Executive Office of the President, "Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance For Implementing E.O. 13211, M-01-27," July 13, 2001.
[192] *Ibid.*

in excess of 25 million Mcf per year; and (3) increases in the cost of energy production in excess of one percent. This analysis determines that the oil and gas industry is not likely to experience "a significant adverse effect" as a result of shiner conservation activities.

Evaluation of Whether the Designation will Result in Reductions of Crude Oil Supply in Excess of 10,000 Barrels Per Day

330. Shiner essential habitat is not anticipated to impact crude oil supply in excess of 10,000 bbls. As discussed in Section 5, while oil production and transmission projects are expected to incur additional costs related to shiner conservation activities, impacts to production levels and significant delays in production are not expected. Similarly, reductions in natural gas production in excess of 25 million Mcf per year are not expected. As discussed in Section 5, gas producers are expected to incur additional costs related to shiner conservation activities, but impacts to production levels and production delays are not expected.

Evaluation of Whether the Designation will Result in an Increase in the Cost of Energy Production in Excess of One Percent

331. The following analysis considers the probability that increased operating costs related to shiner conservation activities will lead to a regional increase in the cost of energy production of one percent or more. While modifications to oil and gas production and transmission activities increase operating costs to producers, the proposed rule is not anticipated to result in increases to the cost of energy production in excess of one percent within States that contain essential shiner habitat. First, total annual net electricity generation is estimated by fuel type for the four-state region. As shown in Exhibit B-1, the region produced 514 billion kWh of electricity in 2000.

Exhibit B-1

NET GENERATION BY FUEL TYPE, 2000
(million kWh)

Fuel Type	KS	OK	TX	NM
Coal	32,509	35,492	140,683	29,067
Gas	2,829	17,358	195,773	4,669
Petroleum	423	47	2,665	37
Hydroelectric	12	2,150	829	221
Nuclear	9,061	-	37,556	-
Other	-	214	2,261	-
Total	**44,834**	**55,261**	**379,767**	**33,994**

Source: Energy Information Administration, Electric Power Annual 2000, Tables A8 through A13, Net Generation from Coal, Petroleum, Gas, Nuclear, Hydroelectric, and Other by Census Division and State, 2000.

332. Next, the average operating expense is calculated for each fuel type. In this screening level analysis, the average, in millions per kWh, is determined for the years 1996 to 2000, and then converted to dollars per kWh (Exhibit B-2).

Exhibit B-2

AVERAGE OPERATING EXPENSES FOR MAJOR U.S. INVESTOR-OWNED ELECTRIC UTILITIES
(Mills per KWh)

Expense	2000	1999	1998	1997	1996	Average
Operating						
Nuclear	8.41	8.93	9.98	11.02	9.47	9.56
Fossil Steam	2.31	2.21	2.17	2.22	2.25	2.23
Hydroelectric	4.74	4.17	3.85	3.29	3.87	3.98
Gas Turbine and Small Scale	4.57	5.16	3.85	4.43	5.08	4.62
Maintenance						
Nuclear	4.93	5.13	5.79	6.90	5.68	5.69
Fossil Steam	2.45	2.38	2.41	2.43	2.49	2.43
Hydroelectric	2.99	2.60	2.00	2.49	2.08	2.43
Gas Turbine and Small Scale	3.50	4.80	3.43	3.43	4.98	4.03
Fuel						
Nuclear	4.95	5.17	5.39	5.42	5.50	5.29
Fossil Steam	17.69	15.62	15.94	16.80	16.51	16.51
Hydroelectric	0.00	0.00	0.00	0.00	0.00	0.00
Gas Turbine and Small Scale	39.19	28.72	23.02	24.94	30.58	29.29
Total						
Nuclear	18.29	19.23	21.16	23.34	20.65	20.53
Fossil Steam	22.45	20.21	20.52	21.45	21.25	21.18
Hydroelectric	7.73	6.77	5.85	5.78	5.95	6.42
Gas Turbine and Small Scale	47.26	38.68	30.30	32.80	40.64	37.94
Total, conversion of mills to cents/kWh						
Nuclear	0.0183	0.0192	0.0212	0.0233	0.0207	0.0205
Fossil Steam	0.0225	0.0202	0.0205	0.0215	0.0213	0.0212
Hydroelectric	0.0077	0.0068	0.0059	0.0058	0.0060	0.00642
Gas Turbine and Small Scale	0.0473	0.0387	0.0303	0.0328	0.0406	0.03794

Note: Operating expenses do not include capital or transmission costs.
Source: Energy Information Administration, Electric Power Annual 2000, Table 13. Average Operating Expenses for Major U.S. Investor-Owned Electric Utilities, 1996 through 2000.

333. The total cost of energy production for the region is then calculated as shown in Exhibit B-3. As shown, total annual costs to the oil and gas industry are 0.02 percent of the total cost of energy production. Therefore, the cost of energy production is not expected to increase by one percent or more in the region.

Exhibit B-3

REGIONAL COST OF ENERGY PRODUCTION

Fuel Type	Million kWh (2000)	Average Operating Cost 1996 to 2000 ($/kWh)	Estimated Cost of Energy Production in 2000 ($2000)	Estimated Cost of Energy Production in 2000 ($2004)
Coal	237,751	0.021176	$5,034,615,176	$5,399,121,315
Gas	220,629	0.037936	$8,369,781,744	$8,975,753,942
Petroleum	3,172	0.021176	$67,170,272	$72,033,400
Hydroelectric	3,212	0.006416	$20,608,192	$22,100,225
Nuclear	46,617	0.020534	$957,233,478	$1,026,537,182
Other	2,475	0.037936	$93,891,600	$100,689,352
Total	**513,856**		**$14,543,300,462**	**$15,596,235,415**
Comparison of Compliance Costs to Total Cost of Production				
Total Annualized Compliance Costs for Oil and Gas (Section 5, upper-bound estimate assuming a seven percent discount rate)				$3,600,000
Annual Compliance Cost as Percent of Total Costs of Production				**0.02%**

APPENDIX C: EXPLANATION OF WATERSHED METHODOLOGY

334. Due to the large geographic extent of essential shiner habitat, the analysis considers the potential impacts of shiner conservation using hydrologic unit codes (HUCs) as delineated by the United States Geological Survey (USGS). The HUC system divides the United States into successively smaller hydrologic units, ranging from drainage areas of large rivers to distinct hydrologic features at a fine resolution.[193] This analysis uses the smallest delineation, the watershed or cataloging unit (hereafter, "watershed"), as the unit of analysis. In this way, the analysis is able to order potential impacts along sections of the proposed designation as demarcated by watershed boundaries. Impacts identified can then easily be summed to the unit level.

335. Using spatial analysis of watershed data from the USGS, the analysis identifies eighteen watersheds that encompass the proposed designation as shown in Exhibit C-1. Exhibit C-2 provides detail on each watershed, including the HUC number, watershed name, the primary state the watershed overlays, the area of the watershed, and the proposed unit number and area contained within the watershed. As shown, a total of 144,853 acres of land fall within the definition of essential habitat for the shiner. Of this total, the Service has proposed roughly 38,273 acres (Units 2 and 4) for exclusion from the final rule. The eighteen watersheds identified as containing essential habitat for the shiner range in size from 377,000 acres to 2 million acres, however most watersheds are similar in size. The average area for all watersheds that contain essential shiner habitat is 1.2 million acres, with a standard deviation of 400,000 acres. In all watersheds, the area represented by essential shiner habitat is a small proportion of total watershed area, ranging from 0.12% to 2.7%.

336. In order to analyze expected future costs at the watershed level, this analysis makes extensive use of Geographic Information Systems (GIS) and spatial data. Specifically, the analysis uses a geo-spatial analysis tool, ArcGIS9, and spatial data from a variety of Federal, state, and local sources to identify the location of economic activities that could experience impacts related to shiner conservation and to assign these impacts to each watershed. Where possible, these data are ground-truthed by interviews with stakeholders and local, state, and Federal agencies.

[193] USGS Hydrologic Unit Maps, accessed at http://water.usgs.gov/GIS/huc.html on March 13, 2005.

Exhibit C-1

WATERSHEDS THAT CONTAIN ESSENTIAL SHINER HABITAT

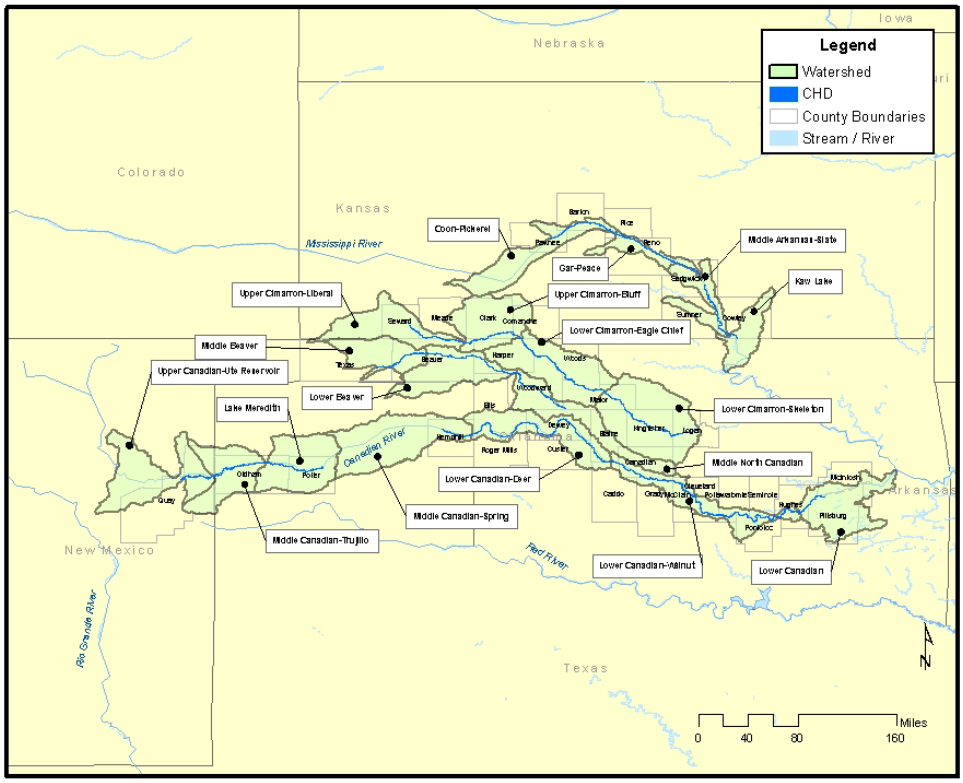


Exhibit C-2

WATERSHEDS THAT CONTAIN ESSENTIAL SHINER HABITAT

CHD Unit Number	HUC Number	Watershed Name	Primary State Overlaid	Watershed Area (acres)	Area of Buffer in Watershed (acres)	Buffer as % of Watershed area	Buffer as % of Total Buffer Area (acres)
Proposed for Inclusion							
1a	11080006	Upper Canadian-Ute Reservoir	New Mexico	1,540,434	3,129	0.20%	2.2%
	11090101	Middle Canadian-Trujillo	Texas	1,073,677	4,894	0.46%	3.4%
	11090105	Lake Meredith	Texas	1,322,606	4,676	0.35%	3.2%
1b	11090106	Middle Canadian-Spring	Texas	1,788,469	3,521	0.20%	2.4%
	11090201	Lower Canadian-Deer	Oklahoma	1,308,854	22,745	1.74%	15.7%
	11090202	Lower Canadian-Walnut	Oklahoma	1,163,772	31,388	2.70%	21.7%
	11090204	Lower Canadian	Oklahoma	1,273,614	4,163	0.33%	2.9%
3	11040006	Upper Cimarron-Liberal	Kansas	1,136,545	5,688	0.50%	3.9%
	11040008	Upper Cimarron-Bluff	Kansas	1,168,649	6,533	0.56%	4.5%
	11050001	Lower Cimarron-Eagle Chief	Oklahoma	1,613,618	10,213	0.63%	7.1%
	11050002	Lower Cimarron-Skeleton	Oklahoma	2,062,321	9,629	0.47%	6.6%
Proposed for Exclusion							
2	11100102	Middle Beaver	Oklahoma	817,144	4,214	0.52%	2.9%
	11100201	Lower Beaver	Oklahoma	1,142,433	7,404	0.65%	5.1%
	11100301	Middle North Canadian	Oklahoma	1,150,891	5,663	0.49%	3.9%
4	11030004	Coon-Pickerel	Kansas	1,035,951	5,475	0.53%	3.8%
	11030010	Gar-Peace	Kansas	376,732	7,712	2.05%	5.3%
	11030013	Middle Arkansas-Slate	Kansas	634,706	7,083	1.12%	4.9%
	11060001	Kaw Lake	Kansas	606,595	722	0.12%	0.5%
Total				**21,217,008**	**144,853**		**100%**

APPENDIX D: METHODOLOGY USED TO ESTIMATE SHINER-RELATED COMPLIANCE COSTS FOR CAFO OPERATIONS IN ESSENTIAL SHINER HABITAT

337. This appendix provides detail concerning methodologies employed to estimate potential shiner-related compliance costs for CAFO operations based on Service recommendations.[194] After presenting general background information on CAFO operations, we discuss cost methodologies for each of the Service's recommendations as summarized in Exhibit D-1.

338. Animal feeding operations ("AFOs") are defined as "operations where animals have been, are, or will be stabled or confined and fed or maintained for a total of 45 days or more in any 12-month period and where vegetation is not sustained in the confinement area during the normal growing season."[195] AFOs maintain animals, feed, manure, and production operations, and can include cattle, dairy calves, veal calves, swine, chicken, turkeys, ducks, horses, and sheep.

339. CAFOs are a subset of AFOs that meet the regulatory definition of a CAFO - primarily thresholds based on the type and number of animals - or that are designated as CAFOs by a permitting authority.[196] CAFOs typically consist of housing for the animals, possibly outdoor feedlots and confinement areas, waste retention structures, and neighboring cropland. Specific housing operations vary across and within animal types. For example, "swine are typically housed in total confinement barns, and less commonly in other housing configurations such as open buildings with or without outside access and pastures."[197] Poultry have a different housing arrangement, as "broilers and turkeys are typically housed in long barns and are grown on the floor of the house," whereas "layers are confined in cages in high-rise housing or a single layer of cages."[198]

340. Depending on the operation, most animal waste is collected in one or a combination of waste retention structures. These include earthen settling basins, concrete

[194] All costs presented in this section reflect constant 2003 dollars. The analysis escalates these costs to constant 2004 dollars for cost estimation purposes.
[195] NPDES Permit Writers' Guidance Manual and Example NPDES Permit for Concentrated Animal Feeding Operations, U. S. EPA, December 31, 2003, page 3-1.
[196] National Pollutant Discharge Elimination System Permit Regulation and Effluent Limitation Guidelines and Standards for Concentrated Animal Feeding Operations (CAFOs); Final Rule, U.S. EPA, Federal Register, Vol. 68, No. 29, February 12, 2003.
[197] Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, U.S. EPA, Office of Science and Technology, December 2002, page 1-16.
[198] *Ibid*., page 1-20.

settling basins, naturally-lined lagoons, synthetically-lined lagoons, naturally-lined ponds, and synthetically-lined ponds. Settling basins are used to remove manure solids, soil, and other solid materials from wastewater prior to storage in a pond or further treatment in a lagoon. From these structures, water is allowed to evaporate and wastes are either land-applied on adjacent cropland or removed for off-site disposal or land application.

341. The primary impact of CAFOs on the shiner and its habitat include the potential runoff of animal waste and wastewater into streams from housing structures, outdoor confinement areas, breaks in or spills from waste storage structures and wastewater transportation equipment, and non-agricultural cropland on which waste is land applied.

342. To estimate potential compliance costs with recommended requirements summarized in Exhibit D-1, the analysis relies primarily on two economic analyses previously completed by EPA and USDA. These analyses modeled potential economic impacts to CAFOs in the United States pursuant to finalization of the February 2003 NPDES Rule governing wastewater guidelines for CAFOs. Full citations associated with these reports are provided in footnotes within this Appendix. Potential recommendations summarized in Exhibit D-1 are numbered and expanded upon in the numbered sections that follow.

Exhibit D-1

POTENTIAL SHINER-RELATED REQUIREMENTS AND ESTIMATED UNIT COMPLIANCE COSTS FOR CAFOS WITHIN AREAS OF CONCERN (constant, 2003 dollars)

Regulatory Focus	Current Regulatory Requirement	Potential Requirement[199]	Estimated Unit Capital Costs	Estimated Unit Annual Costs
Waste Retention Structure	Existing CAFOs must construct wastewater retention and control structures within the production area to contain all manure, litter, and process wastewater plus runoff and precipitation for a 25-year, 24-hour rainfall event. New sources must use a design standard for a 100-year, 24-hour rainfall event.	(1) Increased storage capacity of waste retention structures to a minimum of 270 days and additional freeboard for at least a 100-year, 24-hour precipitation event.	Per Type of Retention Structure: Earthen Settling Basins: $413 - $35,992 Concrete Separators/Basins: $3,605 - $130,713 Naturally-Lined Ponds: $11,264 - $116,765 Synthetically-Lined Ponds: $25,448 - $346,952 Naturally-Lined Lagoons: $27,447 - $233,917 Synthetically-Lined Lagoons: $48,142 - $363,000	Per Type of Retention Structure: Earthen Settling Basins: $21 - $1,800 Concrete Separators/Basins: $72 - $2,614 Naturally-Lined Ponds: $563 - $5,838 Synthetically-Lined Ponds: $1,272 - $17,343 Naturally-Lined Lagoons: $1,372 - $11,696 Synthetically-Lined Lagoons: $2,407 - $18,150
	In EPA Region 6, the draft rule states that a facility can be located in the 100-year floodplain if it is protected from inundation and damage that may occur during a flood event.	(2) No waste retention structures allowed within the 100-year floodplain.		
	In EPA Region 6, manure application equipment must be periodically inspected for leaks.	(3) Wastewater transportation systems should be pressure tested for leaks.	$20,750 per transportation system segment	
Vegetated Buffer	In EPA Region 6, the draft rule requires either a 100-foot setback or a 35-foot vegetated buffer from any down-gradient waters, open tile intake structures, sinkholes, agricultural well heads, or other conduits to surface waters.	(4) Increased buffers for land application near streams, drainages, or other conveyance devices to 300 feet. All buffers should be vegetated and no land waste application shall be allowed on buffers.	$50 - $3,125 per facility	$30 - $1,876 per facility
Water Quality Monitoring		(5) Groundwater monitoring wells should be placed appropriately to detect potential groundwater contamination at retention structures.	$9,465 per facility	$1,949 per facility
		(6) Streams/rivers upstream and downstream of the facility must be monitored for chlorophyll A using artificial or natural substrates	$392 per facility	$6,252 per facility
Land Application Procedures	In EPA Region 6, manure must be analyzed once annually for nitrogen and phosphorus content, and soil analyzed once every five years for phosphorus content.	(7) Land applied sludge and solid waste from CAFO retention structures should be tested for metals prior to application including arsenic, cadmium, copper, chromium, mercury, lead, nickel, selenium, and zinc.	$30 per facility	$200 per beef and dairy facility $103 per poultry facility $100 per other facilities
Spill Remediation Procedures	In EPA Region 6, as part of a facility's nutrient management plan, procedures for cleaning up spills shall be identified, and the necessary equipment to implement clean up shall be made available.	(8) A spill plan must be provided with the application describing proposed actions to minimize or avoid potential impacts to designated sensitive areas	$160 - $2,530 per facility	---

[199] Written communication with Daniel Fenner, Fish and Wildlife Biologist, U.S. Fish and Wildlife Service, Tulsa, Oklahoma, February 11, 2005. As noted previously, recommendations suggested by the Oklahoma Field Office are used in lieu of information contained in the consultation history, which is limited and does not provide information regarding potential CAFO requirements related to shiner conservation.

(1) Increase Storage Capacity of Waste Retention Structures to a Minimum of 270 Days and Additional Freeboard for at Least a 100-Year, 24-Hour Precipitation Event; and (2) No Waste Retention Structures Within the 100 –Year Floodplain

343. Using a conservative approach to estimate costs for these two proposed requirements, the analysis assumes that every wastewater retention structure for all CAFOs located within watersheds that contain essential shiner habitat will require relocation. In other words, the analysis assumes that every wastewater retention structure is currently located within the 100-year floodplain and/or is inadequately sized to meet the Service's proposed storage capacity requirements. As a result, the estimate adopts the conservative view that it is appropriate to estimate capital costs equal to the full cost of constructing new waste retention structures. Furthermore, the analysis also takes a conservative approach to estimating annual costs, under the assumption that the new wastewater retention structures will be larger or incorporate advanced technologies, resulting in an increase in related annual costs.

344. The approach utilizes six animal types (cattle, dairy, poultry, swine, sheep, and various/other) and up to five farm sizes modeled by EPA and USDA in their respective economic analyses discussed above. For each of these operations, EPA and USDA assumed certain characteristics including the type of wastewater retention structures (lagoons, ponds, basins, lined, concrete, etc.) present at each facility.[200] Using this information, the analysis makes the following assumptions regarding the waste retention structure configuration at each CAFO type:

- Beef cattle: one pond
- Dairy cattle: one concrete settling basin and one lagoon
- Poultry: one pond
- Swine: one concrete settling basin and one lagoon
- Sheep: one concrete settling basin and one lagoon
- Various/Other: one lagoon

345. Cost estimates assumed in this analysis generally follow these characteristics and reflect the average cost across technology types for each type of retention structure (e.g., the average between a naturally-lined pond and a synthetically-lined pond). Cost estimates also reflect the average across EPA's sub-categories of animal types (e.g., the average between beef operations and heifer operations, or the average between a dairy CAFO with a flush system and a dairy CAFO with a hose/scrape system). The analysis calculates average costs because the necessary detail for more specific estimates is unavailable. Exhibits D-2 and D-3 present the cost estimates used by EPA for its cost analysis based on model farms. An example illustrates how each cost estimate is calculated. Consider a dairy farm in Kansas with 500 animals, which is classified as a "Medium 2" size. As discussed, the analysis assumes that all dairy farms have one

[200] Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, U.S. EPA, Office of Science and Technology, December 2002, Section 1.0 and Costs Associated With Development and Implementation of Comprehensive Nutrient Management Plans - Part I, USDA/NRCS, June 2003, pages 8-27.

concrete settling basin and one lagoon, although the type of waste system (flush vs. hose/scrape) and the type of lagoon (synthetically-lined vs. naturally-lined) is unknown. To jointly comply with these two requirements for the Medium 2 dairy facility in Kansas, the cost estimate consists of one estimate for the concrete settling basin plus an estimate for the lagoon. Looking at Exhibit D-3, the capital cost estimate for a concrete settling basin is the average of two model farm estimates:

= [(Dairy-Flush Operations, Kansas, Medium 2, Concrete Separator/Basin) + (Dairy-Hose/Scrape Operations, Kansas, Medium 2, Concrete Separator/Basin)]/2

= [($44,963) + ($4,115)]/2

= $24,539.

Similarly, the capital cost estimate for a lagoon is the average of four model farm estimates:

= [(Dairy-Flush Operations, Kansas, Medium 2, Naturally-Lined Lagoon) + (Dairy-Flush Operations, Kansas, Medium 2, Synthetically-Lined Lagoon) + (Dairy-Hose/Scrape Operations, Kansas, Medium 2, Naturally-Lined Lagoon) + (Dairy- Hose/Scrape Operations, Kansas, Medium 2, Synthetically-Lined Lagoon)]/4

= [($93,768) + ($121,952) + ($48,266) + ($66,909)]/4

= $82,724.

Therefore, our total capital cost estimate for this facility to meet these two requirements related to waste retention structures is $107,263. We use a similar approach to estimate annual costs.

Exhibit D-2

COSTS ASSOCIATED WITH NEW WASTE RETENTION STRUCTURES – PART 1

Animal Type	Region (States)	Number of Animals	Size Category	Type of Waste Retention Structure					
				Earthen Settling Basins		Naturally-Lined Ponds		Synthetically-Lined Ponds	
				Capital Costs	Annual Costs	Capital Costs	Annual Costs	Capital Costs	Annual Costs
Beef	Midwest (KS)	300-499	Medium 1	$751	$38	$13,139	$657	$31,210	$1,561
		500-749	Medium 2	$1,001	$50	$14,999	$750	$36,352	$1,818
		750-999	Medium 3	$1,297	$65	$16,984	$849	$41,770	$2,089
		1,000-7,999	Large 1	$2,780	$139	$25,307	$1,265	$64,160	$3,208
		8,000+	Large 2	$35,992	$1,800	$116,765	$5,838	$346,952	$17,343
	Central (OK, TX)	300-499	Medium 1	$413	$21	$11,264	$563	$25,448	$1,272
		500-749	Medium 2	$496	$25	$12,503	$625	$29,264	$1,463
		750-999	Medium 3	$591	$30	$13,786	$689	$33,054	$1,653
		1,000-7,999	Large 1	$1,084	$54	$19,458	$973	$48,923	$2,446
		8,000+	Large 2	$12,155	$608	$83,318	$4,166	$249,710	$12,485
Heifer	Midwest (KS)	300-499	Medium 1	$758	$38	$13,215	$661	$31,300	$1,565
		500-749	Medium 2	$1,046	$52	$15,318	$766	$37,114	$1,856
		750-999	Medium 3	$1,373	$69	$17,433	$872	$43,008	$2,150
		1,000+	Large 1	$2,181	$109	$22,140	$1,107	$55,689	$2,784
	Central (OK, TX)	300-499	Medium 1	$413	$21	$11,315	$566	$25,593	$1,280
		500-749	Medium 2	$512	$26	$12,704	$635	$29,763	$1,488
		750-999	Medium 3	$618	$31	$14,204	$710	$33,887	$1,694
		1,000+	Large 1	$887	$44	$17,392	$870	$43,172	$2,159

Source: Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, U.S. EPA, Office of Science and Technology, December 2002, Appendix A.

Exhibit D-3

COSTS ASSOCIATED WITH NEW WASTE RETENTION STRUCTURES – PART 2

Animal Type	Region (States)	Number of Animals	Size Category	Type of Waste Retention Structure					
				Concrete Separators/Basins		Naturally-Lined Lagoons		Synthetically-Lined Lagoons	
				Capital Costs	Annual Costs	Capital Costs	Annual Costs	Capital Costs	Annual Costs
Dairy – Flush Operations; Swine; Sheep	Midwest (KS)	200-349	Medium 1	$28,880	$578	$66,044	$3,302	$104,317	$5,216
		350-524	Medium 2	$44,963	$899	$93,768	$4,688	$121,952	$6,098
		525-699	Medium 3	$60,458	$1,209	$121,258	$6,063	$158,748	$7,937
		700+	Large 1	$130,713	$2,614	$233,917	$11,696	$310,862	$15,543
	Central (OK, TX)	200-349	Medium 1	$28,880	$578	$58,733	$2,937	$131,074	$6,554
		350-524	Medium 2	$44,963	$899	$83,141	$4,157	$146,055	$7,303
		525-699	Medium 3	$60,458	$1,209	$106,812	$5,341	$188,613	$9,431
		700+	Large 1	$130,713	$2,614	$201,552	$10,078	$363,000	$18,150
Dairy – Hose/Scrape Operations; Swine; Sheep	Midwest (KS)	200-349	Medium 1	$3,605	$72	$33,793	$1,690	$48,142	$2,407
		350-524	Medium 2	$4,115	$82	$48,266	$2,413	$66,909	$3,345
		525-699	Medium 3	$4,601	$92	$62,361	$3,118	$87,459	$4,373
		700+	Large 1	$5,582	$112	$127,879	$6,394	$180,538	$9,027
	Central (OK, TX)	200-349	Medium 1	$3,605	$72	$27,447	$1,372	$54,632	$2,732
		350-524	Medium 2	$4,115	$82	$38,063	$1,903	$70,597	$3,530
		525-699	Medium 3	$4,601	$92	$48,425	$2,421	$91,004	$4,550
		700+	Large 1	$5,582	$112	$96,193	$4,810	$185,245	$9,262

Source: Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, U.S. EPA, Office of Science and Technology, December 2002, Appendix A.

(3) Pressure Testing of Wastewater Transportation Systems

346. The Service recommends that CAFOs pressure test wastewater transportation systems to detect leaks in piping. CAFOs would likely contract with irrigation system companies to pressure test their wastewater transportation equipment. Cost estimates for this requirement are based on several simplifying assumptions. First, the analysis assumes that only underground systems would be pressure tested based on the premise that aboveground sections of the system are visually inspected for leaks. Second, our cost estimate does not include the cost of identifying the exact location of and repairing any detected leaks. Third, each segment of underground wastewater pipeline would be tested separately. Each segment would likely correspond with a land application area, although in some cases there may be more than one segment per land application area at CAFOs with extensive land application operations. Fourth, installation and removal of testing equipment for each segment could require between one and two weeks for the installation and removal of testing equipment. Based on discussions with industry representatives, the analysis estimates per segment costs to include: $7,500 - $10,000 in labor costs per week; $2,500 - $5,000 for equipment costs per week; and $2,000 in damage to property and crops. Therefore, the average total cost per segment is $20,750.[201] In the absence of information regarding the frequency with which pressure testing would be required to occur, the analysis assumes that each impacted CAFO must pressure test wastewater transportation systems once over the twenty-year period of analysis.

(4) Increase Vegetated Buffers to 300 Feet

347. The Service proposes that CAFOs establish vegetated buffers of 300 feet for land application near streams, drainages, or other conveyance devices. EPA identifies some CAFOs that have buffers between waterways and cropland used for land application of waste, however the location of these buffers at CAFOs in essential shiner habitat is unknown. EPA has proposed setback areas in two forms. First, in its revised NPDES CAFO regulations, EPA's final rule "requires either (1) a 100-foot manure application setback from surface waters, sinkholes, open tile drain inlets, or (2) a 30-foot vegetated buffer from surface waters, sinkholes, open tile drain inlets, or (3) one or more NRCS field practices providing an equal or better level of protection."[202] Second, in its proposed NPDES general permit for CAFOs, EPA Region 6's requirements specify that "manure, litter and process wastewater may not be applied closer than 100 feet to any down-gradient surface waters" unless the CAFO exercises one of the compliance

[201] Cost estimates related to pressure testing of wastewater transportation equipment derived from personal communication with Ben Weinheimer, Texas Cattle Feeders Association, April 20, 2005 and April 25, 2005.
[202] Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, U.S. EPA, Office of Science and Technology, December 2002, page 5-72.

alternatives including "a 35-foot wide vegetated buffer where applications manure, litter, or process wastewater are prohibited."[203]

348. Accordingly, in generating a cost estimate for the establishment of 300-foot wide vegetated buffers at CAFOs, the analysis assumes that facilities currently have a 30-foot wide vegetated buffer, resulting in the creation of an additional 270-foot wide buffer for shiner protection. Based on information collected from a total of 914 filter strip projects in 28 states, EPA estimates the average construction cost of 100-foot buffers at $106.62 per acre of buffer.[204] EPA also calculates the ratio of stream length to land area based on national estimates of land area and stream miles, from which it derives an estimate of 0.00144 stream miles per acre of land.[205] This analysis adopts EPA's assumptions that each CAFO is square in shape and contains one stream running through the middle at the property's shortest distance, necessitating buffers on each side of the stream. The analysis also relies on data compiled by NRCS for acres of land at CAFOs (by livestock type, model farm region, and model farm size) on which waste was applied.[206] Therefore, this analysis estimates the cost of creating a buffer at each CAFO as:

= [land application site size in acres] * [0.00144 stream miles per acre] * [5,280 feet per mile] * [540 feet of buffer per foot of stream length] / [43,560 square feet per acre] * [$106.62 per acre], or

= $10.05 per acre of land application area.

To the extent that the wider buffer of 270-feet proposed by the Service generates economies of scale in construction costs, $106.62 per acre may be an overestimate.

(5) Groundwater Monitoring Near Waste Retention Structures

349. The Service recommends that groundwater monitoring wells be "placed appropriately" at CAFOs to detect potential groundwater contamination at waste retention structures. To estimate the cost of groundwater well installation and associated monitoring at CAFOs, the analysis relies on similar estimates developed by EPA for its revisions to the CAFO NPDES regulations. Although the placement, number, and depth of groundwater well installation will vary according to geologic conditions and the elevation and shape of the water table, EPA estimates costs for the installation of four 50-foot wells per site, one up-gradient and three down-gradient from the manure storage facility. For each site, EPA estimates capital costs for four wells of $9,465, covering well drilling, casing, screening, gravel, surface completion, well development, surveying, and initial sampling. EPA further estimates that operation and maintenance, two samples per

[203] Proposed National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Concentrated Animal Feeding Operations (CAFOs) in New Mexico, Oklahoma, and on Indian lands in New Mexico and Oklahoma (NMG010000 and OKG010000), U.S. EPA Region 6.
[204] Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, U.S. EPA, Office of Science and Technology, December 2002, pages 5-72 and 5-73.
[205] *Ibid*., page 5-72.
[206] Costs Associated With Development and Implementation of Comprehensive Nutrient Management Plans - Part I, USDA/NRCS, June 2003, Table B-11.

year per well, laboratory analysis, and shipping results in annual costs of $1,949.[207] This analysis adopts these capital and annual costs to estimate potential groundwater monitoring costs to CAFOs located in watersheds that contain essential shiner habitat.

(6) Monitoring of Streams/Rivers for Chlorophyll A

350. To evaluate the nutrient loading of waterways, the Service recommends that CAFOs monitor streams/rivers upstream and downstream of the facility for chlorophyll A using artificial or natural substrates. As part of its revisions to the CAFO NPDES regulations, EPA proposed a surface water sampling approach consisting of sampling water bodies immediately after storm events in excess of 0.5 inches precipitation up to 12 times per year. This analysis uses EPA's sampling approach as a proxy for the Service's recommendation. EPA estimates the per facility cost of this sampling approach to include $392 in one-time capital costs for training and coolers, and annual costs of $6,252 for bottles, shipping, laboratory testing, sample collection, and record-keeping.[208]

(7) Testing Sludge and Solid Waste Prior to Land Application

351. The Service suggests that land applied sludge and solid waste from CAFO retention structures should be tested prior to application for metals (arsenic, cadmium, copper, chromium, mercury, lead, nickel, selenium, and zinc), which are used as feed supplements and can accumulate in wastewater retention structures. In its revisions to the CAFO NPDES regulations in 2003, EPA includes manure testing as part of its broader nutrient management planning requirements. EPA assumes that "[c]osts associated with manure sampling apply to all facilities and include a fixed cost for equipment purchase and semiannual manure sampling costs."[209] Furthermore, EPA assumes that each semiannual sample requires one hour of labor time with the exception of dry poultry facilities, which require an additional 0.25 hours per house to collect a composite sample. Finally, EPA assumes that beef feedlots and dairies would have two samples of liquid waste and two samples of solid waste per year, for a total of four samples per year. For these activities, EPA uses unit costs of $10/hour for labor and $40 per sample for laboratory analysis, resulting in annual per facility manure testing costs between $100 - $200.[210] This analysis uses these capital and annual costs as a proxy for potential costs associated with testing land applied sludge and solid waste at CAFOs located in watersheds that contain essential shiner habitat.

[207] Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, U.S. EPA, Office of Science and Technology, December 2002, Section 5-10.
[208] Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, U.S. EPA, Office of Science and Technology, December 2002, Section 5.20.
[209] *Ibid*., page 5-69.
[210] *Ibid*., Section 5.6.3.

(8) Developing a Spill Plan

352. The Service recommends that CAFOs provide a spill plan with NPDES permit applications describing proposed actions to minimize or avoid potential impacts to designated sensitive areas in the event of manure waste spills and discharges. It is possible that some CAFOs already have spill plans or emergency response plans, to meet stand-alone requirements or as part of comprehensive nutrient management plans (CNMPs). On their own, spill plans can be straightforward, one-page documents containing emergency contact information and a checklist of actions to follow in the event of a spill.[211] Simple spill plan templates can be found free of charge on the Internet or found in environmental guidance materials for CAFOs available for $50, and would likely require no more than two hours of owner/operator time to complete. Using a labor rate of $55/hour (equivalent to the labor rate for a technical consultant), a simple spill plan may cost $160 to develop. This analysis uses this figure as a lower-bound estimate of potential costs associated with developing a spill plan.

353. Alternatively, for situations where CAFOs develop a spill plan as part of a CNMP, an upper-bound estimate for the cost of developing a spill plan would be equivalent to the cost of developing a CNMP. USDA/NRCS estimates that the cost to design a CNMP averages 46 technical hours at an hourly rate of $55, or $2,530 per spill plan.[212] This analysis uses this figure as an upper-bound estimate of potential costs associated with developing a spill plan.

[211] For example, see the template developed by the MidWest Plan Service at http://www.lpes.org/Lessons/Lesson50/50_11_Spill_Response.pdf.

[212] Costs Associated With Development and Implementation of Comprehensive Nutrient Management Plans - Part I, USDA/NRCS, June 2003, pages 103-105.

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