Review of the Draft Economic Analysis of Critical Habitat Designation for the Arkansas River Shiner

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Executive Summary

The Draft Economic Analysis presents estimates of the costs of conserving the Arkansas River Shiner. Estimates are presented for several industries and economic activities: water management activities, oil and gas production, concentrated animal feeding operations (CAFOs), agriculture (crop production, livestock grazing, and groundwater pumping), transportation activities, and recreation activities. The analysis considers 5 units of essential habitat that encompass 1,244 river miles and 144,852 acres of riparian habitat within 18 watersheds with a combined area of 21.2 million acres. As detailed in this analysis, the geographic extent of economic activities affected by shiner conservation varies across industries. For CAFOs, the economic impacts encompass the entire watershed area, and, for oil and gas activities and agriculture, the economic impacts are confined to land within or adjacent to the buffer area of essential shiner habitat.

A general problem with the draft economic analysis is that it presents only highly aggregated economic impacts for each of the 18 watersheds containing essential habitat. Working at such a high level of spatial aggregation makes it more difficult for the Secretary of the Interior to exclude lands based on economic impacts. Further, watersheds are not commonly used or even sensible *economic* boundaries. It would be preferable to work at a more disaggregated level to better understand what portions of critical habitat account for the largest share of economic impacts or impose the greatest burden on landowners and industries.

The costs associated with shiner conservation efforts relating to oil and gas development consider only project modification costs to future permitted oil and gas drilling activity in the area within and adjacent to the essential shiner habitat. The estimated project modification costs resulting from past consultations in the period 1998-2004 are taken to be representative of future project modification costs. Both the frequency (number of consultations per year) and the magnitude (average project modification cost per consultation) of the impacts are assumed to be identical in the period 2005-2025 as the frequency and the magnitude of the impacts recorded through consultations in the period 1998-2004.

A general problem with the oil and gas analysis is that if fails to consider alternative scenarios in which energy prices are higher than in the recent past. Since drilling activity

is positively related to the price of energy, it follows that conservation costs borne by oil and gas producers would be higher in such an alternative.

Another omission from the draft economic analysis is the cost of delay resulting from Section 7 consultation. Oil and gas producers value the flexibility to respond to changing conditions in energy markets, and permitting delays can be quite costly. The economic costs of delay have been considered in other critical habitat analyses, and should be considered in this case as well.

The draft economic analysis considers economic losses resulting from changes in water management activities. The analysis is confined to one of the three dams (Ute - Canadian) in the area of essential shiner habitat. The estimated economic impact of shiner conservation efforts on water management activities at Ute dam is calculated based on the assumption that the current seepage rate of 4 cfs from Ute dam (2,896 acre-feet per year) is maintained to support the shiner. The final economic analysis should also include impacts to flood control

The draft economic analysis also considers in passing potential losses from restrictions on groundwater pumping (although this analysis is included in the chapter on agricultural impacts). The draft analysis never quantifies any impacts resulting from changes in groundwater extraction. This impact is excluded from the analysis due to the assumed lack of a Federal nexus for private groundwater pumping and the difficulty in identifying a Section 9 take by individual users.

The draft analysis presents a rudimentary attempt at measuring the total value of groundwater resources in the watersheds containing critical habitat. Considering only crop irrigation, the implied value of groundwater as capitalized into land values in the region proposed for inclusion is approximately $128 million. Of course, groundwater is utilized by other industries in the study area, and is also used for residential consumption, implying that the economic effects of groundwater pumping limitations would extend far beyond agriculture.

The economic cost of shiner-related conservation requirements for CAFOs is calculated for all operations located within the 21.2 million watershed acres that drain into essential habitat. Using spatial data provided by state regulatory agencies, the analysis identifies 372 CAFOs located in watersheds containing essential shiner habitat. The analysis assumes that 100% of the CAFOs will be required to implement all of the general permit requirement recommendations made by the Oklahoma Field Office of the U.S. Fish and Wildlife Service (see Exhibit 6-3). The DEA does not, however, take into account the possibility that future consultations will result in more stringent regulatory requirements in the buffer zone. Even in states where the NPDES program is delegated, the U.S. EPA still retains oversight and enforcement authority over the program.

The draft economic analysis contemplates costs to row cropping operations under two scenarios. 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. Scenario 2 assumes that farmers discontinue participation in Federal farm assistance programs in order to avoid a Federal nexus for critical habitat requirements related to shiner protection. The costs associated with shiner conservation efforts on livestock grazing operations are calculated under the assumption that riparian areas within the area of essential shiner habitat are to be excluded from grazing. For both row crop and grazing impacts, the draft economic analysis considers regional economic changes that result from shiner conservation efforts.

1. Background

The Draft Economic Analysis (DEA) analyzes the potential economic impacts associated with the proposed critical habitat designation for the Arkansas River shiner (*Notropis girardi*). The document was prepared by Industrial Economics, Inc. (IEc) under contract to the U.S. Fish and Wildlife Service. The analysis considers 5 units of essential habitat that encompass 1,244 river miles and 144,852 acres of riparian habitat within a total watershed area of 21.2 million acres (18 watersheds). Economic impacts are considered for administrative costs, water management activities, oil and gas production, concentrated animal feeding operations (CAFOs), agriculture (crop production, livestock grazing, and groundwater pumping), transportation activities, and recreation activities. Distributional impacts across watershed units, and impacts to the energy industry and to small business entities are discussed in appendices to the main report.

The DEA provides cost estimates for the economic impact of shiner conservation measures on the industries listed above over the period 1998 (the year of the Shiner's final listing) to 2025 (twenty years from the year of final designation). All economic values are in 2004 dollars.

The study area encompasses parts of 4 states (Kansas, Oklahoma, Texas, and New Mexico) and is divided into 18 watersheds. The watershed area is defined by taking hydrologic unit codes (HUCs) from the U.S. Geological Survey (USGS) and using the smallest delineation, the watershed or cataloging unit, to define the watershed boundaries. The eighteen watersheds that encompass the proposed designation include a total of 21.2 million watershed acres. A buffer area of 144,853 acres of land fall within the 21.2 million watershed acres defines the essential habitat for the shiner (300 lateral feet to each side along 1,244 river miles). Of the 144,853 acres, 38,273 acres (Units 2 and 4) are proposed for exclusion from the final rule and the remaining 106,580 acres (Units 1a, 1b, and 3) are proposed for inclusion in the essential shiner habitat. Economic activities are identified within the areas defined as essential shiner habitat (both proposed included and proposed excluded portions) through the use of Geographic Information Systems (GIS) and spatial data, and the economic impacts of shiner conservation activities are assigned by industry and by watershed.

The geographic extent of economic activities affected by shiner conservation depends on industry type. For CAFOs, the economic impacts encompass the entire watershed area

(21.2 million watershed acres), and, for oil and gas activities and agriculture, the economic impacts are confined to land within or adjacent to the buffer area of essential shiner habitat (144,853 acres).

A general criticism of the DEA is that it fails to pinpoint areas of high economic impact by describing costs at a spatially disaggregated level. Rather, the DEA lists only impacts by industry for each of the 18 watersheds comprising the study area. Certainly, economic activities are not uniformly distributed within each of these watersheds. More precise information about the location of oil and gas wellfields, CAFOs, agriculture and other industries within the watersheds would allow for a more exact exclusion of lands for economic reasons, if the Secretary determines that such alterations of proposed critical habitat are warranted.

The failure to further pinpoint areas of high economic impact is despite the fact that GIS data were used to calculate costs of designation. It should be remembered that the purpose of economic analysis of critical habitat designation is not an aggregate cost-benefit analysis of the policy of conserving habitat, but rather to identify specific areas where the costs of conservation are so large as to cause undue hardship relative to the biological benefits enjoyed by the species from additional habitat protections. Presenting impacts at an aggregated, watershed makes the economic exclusion decision more difficult and makes it harder to avoid adverse economic impacts resulting from critical habitat designation.

Another general criticism of the DEA is that the authors neglect the role of risk and uncertainty about future impacts. For example, in the oil and gas analysis, the authors consider only a slight variant of the recent past in making future projections. As detailed below, such an assumption overlooks the real possibility that impacts could be much greater in the event of a sustained increase in energy prices. Given that future scenarios are difficult if not impossible to predict with certainty, the DEA should acknowledge the effect of altering assumptions.

2. Oil and Gas Production

The Draft Economic Analysis calculates the economic cost of shiner-related project modifications for well development based on past Section 7 consultation efforts. The estimated project modification costs resulting from past consultations in the period 1998-2004 are taken to be representative of future project modification costs. Both the frequency (number of consultations per year) and the magnitude (average project modification cost per consultation) of the impacts are assumed to be identical in the period 2005-2025 as the frequency and the magnitude of the impacts recorded through consultations in the period 1998-2004. Shiner-related requirements are assumed to have no impact on total oil and gas production levels in the region and no bearing on any decisions not to drill. The area considered for shiner-related requirements on oil and gas activities is land within and adjacent to the buffer area of essential shiner habitat.

The costs associated with shiner conservation efforts on oil and gas development consider only project modification costs to future permitted oil and gas activities in the area within and adjacent to the essential shiner habitat. In the period 1998-2005, the Fish and Wildlife Service lists 37 consultation records for oil and gas well development activities (23 in Oklahoma and 14 in Texas). All 37 consultations for oil and gas well development were informal consultations and there were no formal consultations.

EPA regulations governing storm water permits are scheduled to change in June 2006, at which time the threshold for location disturbance will decrease from five acres or more to one acre or more. As most oil and gas operations in current use disturb between 1-5 acres, new oil and gas wells currently exempt from Federal NPDES permitting will require a NPDES construction general permit. For this reason, the estimated number of oil and gas wells affected each year by shiner conservation efforts is taken at a higher rate than 6 projects per year (based on 37 informal consultation over the six-year period 1998-2004). Instead, the number of future oil and gas well development projects is calculated using spatial data on well locations constructed over the period 2000-2005 within and adjacent to the essential habitat. For each county, the analysis assumes that the greatest number of wells constructed in any one of the past five years represents baseline well activity in 2005. Well development activity in each county is assumed to increase at 1% per year thereafter over the period 2005-2025.

Example. In Seminole County, Oklahoma, six wells were constructed in 2002, but no wells were constructed in either 2003 or 2004. The analysis projects the number of future wells developed in Seminole County, Oklahoma to be 6 in the year 2005 with 1% annual growth in well development to $6*(1.01)^{20} = 7.32$ wells in the year 2025, for a total development level of 133.4 wells over the period 2006-2025 (an average of 6.7 wells drilled per year).

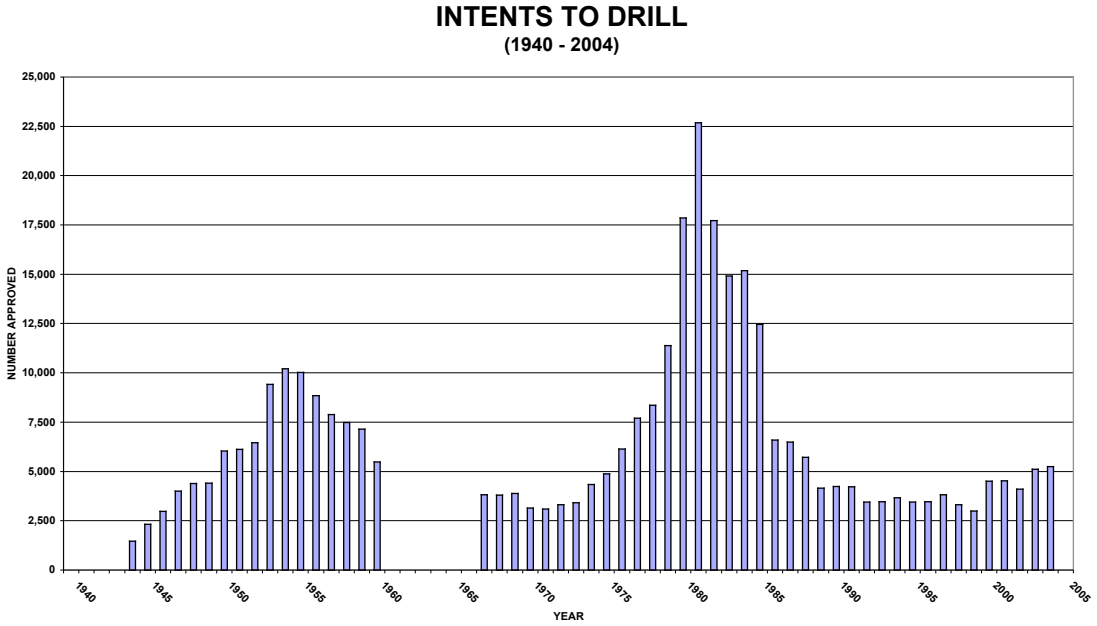
The forecast drilling activity within essential shiner habitat is decomposed by county within the watershed and projected in a comparable manner as in the example above (see Exhibit 5-7). The area of essential shiner habitat proposed for inclusion involved maximum annual well construction of 31 wells in the period 2000-2004 (the sum of the maximum construction levels in each county over the five-year period) and the total well potential over the period 2005-2025 is 711. The area proposed for exclusion involved maximum annual well construction of 5 wells in the period 2000-2004 and the total well potential over the period 2005-2025 is 111.

The area designated as critical habitat constitutes one of the most important regions of oil and gas production in the United States. For the state of Oklahoma, the 2003 data provided in the DEA shows 1,312 wells were drilled in the counties that fall within the proposed critical habitat designation area. The 2004 data shows that 1,332 wells were drilled in those same counties making up 62% of the total wells drilled in Oklahoma, 44% of the total liquids (crude oil and condensate) production, and 61% of the total gas production. This production is important to both the state and the nation - Oklahoma ranks 6th in the country for crude oil production and 2nd in the country for natural gas production.

While the DEA correctly focuses on development of new oil and gas wells, the scenario wherein oil and gas well development increases by 1% per year over the 20-year study period is presented in the DEA as a conservative one (i.e., likely to overstate impacts). However, given the citations to the report, the authors appear to confuse production rates and drilling activity. Domestic production declines rates are indeed around 25-30% per year. However, to meet demand, drilling activities must increase. The National Petroleum Council Natural Gas study, Volume I , Dec. 1999 states that the "the U.S. drilling fleet must expand to undertake the dramatic increase in activity that will be required over the next decade to produce additional supply. The total number of oil and gas wells drilled per year (including dry holes) will have to double, from approximately 24,000 in 1998 to over 48,000 by 2015."

More generally, the DEA fails to note that drilling activity is tied to the price of energy. Again taking Oklahoma as an example, from 1994 to 2004, oil and gas approved intents to drill in increased 30% (3% average annual increase). Through July, the total approved intents to drill issued in CY 2005 are 3,173. Should drilling activity remain at this level through the second half of the year, the total annual number of approved intents to drill would be over 6,300. This would constitute a 17% increase in drilling activity over 2004.

The graph below shows clearly that in a "boom" scenario such as occurred in 1981, approved intents to drill in Oklahoma could be in excess of 20,000. It would seem that IEc needs to conduct a scenario where drilling and workover activity is at a higher rate than the one considered in the DEA.



Source: Oklahoma Corporation Commission, Oil & Gas Conservation Division.

The estimated compliance cost associated with shiner conservation efforts on oil and gas well development is given by the estimated project modification costs summarized by past consultations (see Exhibit 5-6). Typical project modification costs are provided by the Oklahoma and Texas field offices of the U.S. Fish and Wildlife Service. The project modification costs range from $25,000 to $64,000 per project for "typical project modifications" (all mitigation activities with the exception of directional drilling). Typical project modifications include relocating pads and surface roads, installing drainage or sloping on the pad, installing erosion control structures on the side of the pad, and revegetating ungraveled areas. Directional drilling was recommended in two of the 37 informal consultations in Oklahoma and Texas (representing 5.4% of consultations) and involved an additional cost of $200,000 per well.

The cost per project for oil and gas well development in the DEA is calculated as follows:

(1) $25,000 to $64,000 per project;
(2) Directional drilling required on 5% of wells, for an expected cost per project of 0.05*(200,000) = $10,000.

Table 1. Estimated Project Modification Costs for 711 Future Wells Developed in the Region Proposed for Inclusion in the Essential Shiner Habitat

Required measure per project	Lower bound (per well)	Upper bound (per well)	Total Cost of 711 Wells (in millions)
Typical project modifications	$25,000	$64,000	$17.8m - $45.5m
Directional Drilling	$10,000	$10,000	$7.1m
Estimated Total Cost	**$35,000**	**$74,000**	**$24.8m - $52.6m**

The Draft Economic Analysis estimates project modification cost associated with shiner conservation efforts on oil and gas well development in the region proposed for inclusion in the essential shiner habitat to be in the range of $25 million to $53 million.

The study does not consider the possibility that significant delays may arise in production as a result of shiner conservation. The study cites the Department of Energy (DOE)/Office of Fossil Energy published report on the estimated impacts of proposed storm water discharge requirements for the oil and gas industry. The study used a nationwide sample to estimate a total of 28 days of unscheduled delay associated with review and consultation at an average cost of $2,800 per day. A comparable delay associated with shiner conservation efforts on oil and gas well development would increase the cost by 28*(2,800) = $78,400 per well and raise the expected total cost across the 711 projected well developments by $55.7 million.

3. Oil and Gas Pipeline Activities

The costs associated with shiner conservation efforts on oil and gas pipeline activities are calculated in a comparable manner as the costs on oil and gas well development. The analysis considers only project modification costs to future permitted oil and gas pipeline

activities in the area within and adjacent to the essential shiner habitat and projects costs from past section 7 consultation records over the period 1998-2005. Over the period 1998-2004, the Fish and Wildlife Service lists 89 consultation records for oil and gas pipeline activities (77 in Oklahoma and 12 in Texas). All 89 consultations for oil and gas pipeline activities were informal consultations.

The estimated number of oil and gas pipelines affected each year by shiner conservation efforts is taken at the rate of past section 7 consultation activity (89 consultations over 6 years or approximately 15 projects per year). Pipeline activity is assumed to increase at 1% per year over the period 2005-2025. The analysis projects the total level of pipeline activity in essential shiner habitat to involve 15 pipeline projects in the year 2005 with growth to 18.30 pipeline projects in the year 2025, for a total pipeline development level of 333.59 pipelines over the period 2006-2025 (an average of 16.7 pipelines constructed per year).

The Draft Economic Analysis assumes 334 new pipelines will be constructed in essential shiner habitat over the twenty year period 2005-2025. Of the 334 projected new pipelines, 257 forecasted pipeline projects are in the proposed area for inclusion and the remaining 77 forecasted pipeline projects are in the proposed area for exclusion.

Data for 2004 from the Oklahoma Corporation Commission (OCC) show that 76% of the wells drilled in the counties that fall within the proposed critical habitat area are gas wells (1,011 gas wells). All of these completed wells will need gathering lines to collect the gas and convey it to processing plants. The installation of gathering lines is completed by the operator or a gas gathering company. Industry sources interviewed in the preparation of this review indicate that the estimate for future pipelines contained in the DEA appears to be low given the large number of gas wells drilled, and IEc should review their assumptions in this regard when preparing the final economic analysis.

The estimated compliance cost associated with shiner conservation efforts on oil and gas pipeline activities are given by the project modification costs summarized by past consultations (Exhibit 5-11). Typical project modification costs are provided by the Oklahoma and Texas field offices of the U.S. Fish and Wildlife Service. The project modification costs range from $5,000 to $10,000 per pipeline project for directionally boring and $12,000 per pipeline project to avoid locating the pipeline within the 300 foot buffer area of essential shiner habitat.

The assumed cost per pipeline is calculated as follows:

(1) $5,000 to $10,000 per pipeline project for directionally boring;
(2) $12,000 per pipeline project for avoiding a 300 foot perimeter along the river.

In total, the costs related to these modifications range from $17,000 to $22,000 per pipeline project, depending on the level of conservation efforts required at a particular site. The estimated cost is presented as a range of cost for the 257 future pipelines projected in the region proposed for inclusion in essential shiner habitat.

Table 2. Estimated Project Modification Costs for 257 Future Pipelines Developed in the Region Proposed for Inclusion in the Essential Shiner Habitat

Required measure per project	Lower bound (per pipeline)	Upper bound (per pipeline)	Total Cost of 257 Pipelines (million $s)
Directionally boring	$5,000	$10,000	$1.3 - $2.6
Avoid 300 foot perimeter	$12,000	$12,000	$3.1
Estimated Total Cost	**$17,000**	**$22,000**	**$4.4 - $5.7**

By the method outlined in the Draft Economic Analysis (followed here), the estimated project modification cost associated with shiner conservation efforts on oil and gas pipeline projects in the included area is $4.4 million to $5.7 million. However, this range of costs exceeds that presented in paragraph 177 (and Exhibit 5-13), which states a range of total cost between $3.8 - $4.4 million ($15,000 - $17,000 per pipeline project).

The Draft Economic Analysis states the expected range of cost per future pipeline project to be $17,000 to $22,000 per pipeline project (paragraph 176), but attributes a cost of $15,000 to $17,000 per pipeline project in the region proposed for inclusion in the essential shiner habitat. Over the twenty year period 2005-2025, the difference amounts to underestimating of the cost of shiner conservation on pipeline projects by an amount between $0.6 million to $1.3 million.

The study does not consider regional economic impacts to oil and gas pipeline activities. Regional impacts would occur if shiner conservation measures led to a reduction in overall production levels.

As in the case of oil and gas development, the study does not consider the possibility that significant delays may arise in pipeline construction as a result of shiner conservation.

4. Economic Impact on Water Management Activities and Groundwater Extraction

Water Management Activities

The study calculates the economic cost of shiner-related requirements for water management activities at one of the three dams (Ute - Canadian) in the area of essential shiner habitat. Sanford dam and Optima dam are excluded, because water releases to support the shiner habitat are not anticipated from either Sanford or Optima dam.

The estimated economic impact of shiner conservation efforts on water management activities at Ute dam is calculated based on the assumption that the current seepage rate of 4 cfs from Ute dam (2,896 acre-feet per year) is maintained to support the shiner. The cost of diverting the 2,896 AF of water from the municipal water supply that draws from Ute dam is computed using wholesale water prices projected by the Eastern New Mexico Rural Water Authority (ENMRWA). ENMRWA Projections on wholesale water prices

range from $0.92 to $18.11 per 1,000 gallons ($296/AF to $5,831/AF) and average $1.66 per 1,000 gallons ($535/AF) over the communities served by the project.

The assumed cost for water management at Ute dam is calculated as follows:

(1) $535 per acre foot of water diverted;
(2) 2,896 acre feet of water released for shiner conservation in each year.

Annual cost of water management: ($535)(2,896) = $1.55 million.
Total cost of water management over the 20-year period: $31 million.

The DEA lists total estimated future costs to dam operations resulting from shiner conservation activities at $32 million, the balance of which is represented by the calculation above.

The Draft Economic Analysis uses the average of the expected wholesale water prices calculated by the ENMRWA of $1.66/Kgal ($535/AF). The system is envisaged to deliver a total of 24,000 acre-feet of water annually. A release of 2,896 acre-feet of water for shiner conservation represents a reduction in 12% of water sales from the wholesale market. It is possible that reducing water releases by 12% for shiner conservation has a significant effect on the wholesale price that is ignored in the study.

The study does not consider water management costs at locations other than at Ute dam. According to the NRCS in Oklahoma, 16 PL-566 dams scheduled for construction in Oklahoma are located upstream of the proposed essential habitat (see paragraph 133). Water management at these proposed projects may or may not be affected by designation of critical habitat.

The DEA contains several factual errors regarding Sanford Dam, Lake Meredith, and CRMWA operations:

- Exhibit 4-1 indicates that the primary purpose of Sanford Dam is for Flood Control. Municipal/Industrial Water Supply is mentioned in Section 118 at Page 4-5, but not in Exhibit 4-1. This omission could give an inaccurate impression of the function of Lake Meredith.

- Section 118 (page 4-5) states incorrectly that CRMWA diverts water from Lake Meredith under a 1984 permit from the State of Texas. In actuality, the permit was originally issued in 1956, and was confirmed by adjudication in 1984.

- Section 118 also gives the cost of water to CRMWA member cities in FY 01-02 as $51/ per thousand gallons, whereas a correct figure would be $0.51 per thousand gallons. It should be noted that FY 01-02 was not a representative period, being the first (partial) year of operation of the Groundwater Supply Project. Costs to member cities in FY 03-04, when a high proportion of

groundwater was required due to low levels in Lake Meredith, rose to $0.62 per thousand gallons.

- Section 119 (page 4-6) refers to estimates of firm yield made by USBR prior to construction of the Canadian River Project, stating that a 1959 estimate was that Lake Meredith could supply 126,000 AF/yr, which was revised downward in 1960 to 103,000 AF/yr. Actually, both estimates were contained in the USBR Definite Plan Report prepared in 1960. USBR estimated that prior to any further development by New Mexico (no reservoirs downstream from Conchas Dam), the yield would be 126,000 AF/yr. After New Mexico took full advantage of its rights under the Canadian River Compact, the yield of Lake Meredith would be reduced to 103,000 AF/yr. The aqueduct system of the Canadian River Project was sized to deliver 126,000 AF/yr; while contracts with member cities were based on the lower delivery rate of 103,000 AF/yr.

In addition to these factual errors, the portion of the DEA covering water management impacts also rests on questionable analytic assumptions. No costs were assigned to water operations at Lake Meredith, based on 1) the conclusion that requirements to release water from Lake Meredith are not evaluated because there is no target flow established, and 2) impacts on flood control operations were not evaluated because it is uncertain whether flood control would be halted as a result of any consultation. The analysis mentions the possibility that CRMWA member cities might have to find a replacement water supply if releases were required to sustain the shiner, but no evaluation of resulting costs is included. A footnote (no. 42 on page 4-5) quotes FWS to the effect that there is no federal nexus associated with operation of Lake Meredith, other than for flood control.

Nonetheless, regional water managers have been critical of the extension of critical habitat into the flood control pool of the reservoir because of the uncertainty of consultation being required at Lake Meredith for flood control purposes. At the very least, the economic impact that would occur if consultation should interfere with flood control operations should be stated as a possibility. That possibility appears to be as likely as the outcomes evaluated in the DEA for Ute Dam.

At Ute Dam, costs of providing releases to maintain downstream flows were included in the analysis. The reasoning here is even more questionable since requiring releases to replace "lost" seepage flows could only occur if 1) the seepage flows were diverted to provide a beneficial water supply for some group of users, so that the net effect would be zero, or 2) the level of Ute Reservoir fell so low that seepage would not be produced, in which event there would be no water to release.

Groundwater Pumping

Although its effects are not proven, 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. This impact is excluded from the analysis due to the assumed lack of a Federal nexus for

private groundwater pumping and the difficulty in identifying a Section 9 take by individual users. The Coalition's disagreement with the exclusion of this impact from the analysis is described in greater detail in Section II-A of the comments prepared by its legal counsel.

While the DEA does not directly calculate the cost of critical habitat resulting from limitations on groundwater extraction, it does contain some analysis of the economic value of groundwater in the study region. The value of groundwater in essential habitat is computed using a three-step process:

(1) Identify the subset of watersheds containing essential habitat that overlay the High Plains Aquifer;
(2) use spatial data compiled by USGS to identify irrigated land acres in the subset identified in step 1;
(3) use the difference in land values across irrigated and non-irrigated land to calculate the implied value of groundwater as capitalized into land values.

Based on the analysis in steps 1 and 2, approximately 795,000 acres of irrigated land are identified that overlay watersheds containing essential habitat (330,000 acres in the region proposed for inclusion). The implied value of groundwater as capitalized into land values in the region proposed for inclusion is approximately $128 million. On an annualized basis, the value of lost crop production on irrigated land is $6.7 million (assuming a 7% rate of discount), and the annual loss this implies for regional economic activity is likely to be on the order of $12 million per year.

The DEA does not address the possibility that shiner conservation measures may limit the amount of groundwater pumping in the watersheds that drain into essential habitat. Because of the large amount of irrigated land overlaying watersheds containing essential shiner habitat, a potential groundwater use restriction would lead to larger economic impacts on agriculture than more narrow restrictions on row cropping and livestock grazing within the buffer area for essential shiner habitat.

The DEA also neglects to consider that groundwater is used by a range of industries, and is the source of a significant amount of drinking water in the study region. Curtailment of groundwater pumping thus would have more far-reaching economic effects than considered in the DEA.

5. Concentrated Animal Feeding Operations

The economic cost of shiner-related conservation requirements for CAFOs is calculated for all CAFOs located within the 21.2 million watershed acres that drain into essential habitat. The study assumes no difference in the requirements to be met by a CAFO located within the buffer area of 144,853 acres and a CAFO falling outside the buffer but within the 21.2 million watershed acres. Using spatial data provided by state regulatory agencies, the analysis identifies 372 CAFOs located in watersheds containing essential

shiner habitat. The analysis assumes that 100% of the CAFOs will be required to implement all of the general permit requirement recommendations made by the Oklahoma Field Office of the U.S. Fish and Wildlife Service (see Exhibit 6-3). In the absence of a more detailed analysis that would permit differentiation among CAFO locations, this assumption and the cost estimates derived from this assumption should be relied upon by the Service when considering and evaluating shiner-related measures for CAFOs.

The analysis of CAFO impacts does not use information contained in the consultation history. The consultation history for CAFOs is said to be limited in terms of the information regarding the additional CAFO requirements related to shiner conservation. The estimated compliance cost is calculated across five categories (waste retention, buffer establishment, water quality monitoring, land application procedures, and spill remediation) using EPA and USDA analyses of economic impacts pursuant to finalization of the February 2003 NPDES Rule government wastewater guidelines for CAFOs.

The assumption that shiner compliance costs are represented by the cost of NPDES requirements is generally reasonable. The DEA does not, however, take into account the possibility that future consultations will result in more stringent regulatory requirements in the buffer zone. Even in states where the NPDES program is delegated, the U.S. EPA still retains oversight and enforcement authority over the program. Moreover, many of the more recent consultations were likely conducted either prior to the adoption of the first critical habitat designation for the shiner in 2001, or after that designation was vacated by a federal court in 2003.

The five categories of estimated compliance cost are further divided into eight shiner conservation activities. The economic impact for CAFOs is the sum of the cost of implementing the following shiner conservation activities:

(1) Increase storage capacity of waste retention structures (to 270 days and additional freeboard for a 100-year, 24-hour precipitation event);
(2) No waste retention structures within 100-year floodplain;
(3) Pressure test wastewater transportation system for leaks;
(4) Increase vegetative buffer to 300 ft;
(5) Install groundwater monitoring wells;
(6) Monitor streams/rivers for chlorophyll A;
(7) Test land applied sludge and solid waste from CAFO retention for metals;
(8) Provide spill plan with application;

The range of estimated capital costs in each category is presented in Exhibit 6-4 and details on the methodology used to calculate the economic impacts are provided in Appendix D of the Draft Analysis.

The waste retention structure portion of the compliance cost depends on animal type, the number of animals, and region of activity (Exhibits D-2 and D-3). The analysis assumes

that every wastewater retention structure for all CAFOs located in watersheds containing essential shiner habitat will require relocation and the estimated capital cost is taken to be equal to the full cost of constructing new waste retention structures at each of the 372 CAFOs.

Pressure testing wastewater transportation system for leaks is assumed to be done once at each CAFO facility within a 20-year window (2005-2025). Based on IEc discussions with industry representatives, the average total cost of testing per land application area is assumed to be $20,750. This is the cost of pressure testing underground segments of wastewater pipeline only, and does not include any costs of detecting and repairing any leaks.

The current vegetative buffer at each CAFO is assumed to be 30 feet, and the cost of increasing the buffer by the remaining 270 feet is computed using the EPA estimated cost of $10.62/acre and the ratio of stream miles per acre of land provided by NPDES. The cost per acre of land application area in the watershed is calculated to be $10.05 per acre. The additional land allocated to increasing the vegetative buffer is assumed not to have any production implications on CAFO operations. The annual cost of maintaining the buffer in years subsequent to its establishment is 60% of the cost of initially establishing the buffer, or $6.03/acre.

Groundwater monitoring costs are taken from EPA estimated requirements of 4 50-foot wells per site ($9,465 per CAFO) and annually recurring costs of operation at a rate of two samples per year ($1,949 per CAFO).

The cost of monitoring for chlorophyll A assumes facilities adopt the EPA's sampling approach. EPA estimates the per facility cost of this sampling approach to be a one-time capital cost of $392 (training and coolers) and annual recurring costs of $6,252 (bottles, shipping, sample collection, laboratory fees, and record-keeping).

The cost of testing sludge and solid waste assumes annual manure testing costs of between $100 and $200.

The cost of providing a spill plan with NPDES permit applications is taken to range from $160 (environmental guidance materials = $50; plus 2 hours labor = $110) to an upper-bound of $2,530 per spill plan (the cost of developing a CNMP).

Regardless of size, all CAFOs are assumed to have one settling basin and one lagoon. For a beef CAFO, the type of pond (synthetically-lined vs. naturally-lined) is unknown and the estimated cost is the average cost across the two types. For livestock, swine, and dairy operations, both the type of waste system (flush vs. hose/scrape) and the type of lagoon (synthetically-lined vs. naturally-lined) is unknown. The estimated cost for the settling basin and the lagoon at each dairy farm is the average cost across types.

Example 1. A Large 1 sized 1600-acre beef CAFO in Oklahoma with 2,000 animals.

Earthen settling basins: Oklahoma, Large 1

average capital cost = $1,084 average annual cost = $54

Ponds: Oklahoma, Large 1

Pond system	Capital costs	Annual costs
Naturally-lined	$19,458	$973
Synthetically-lined	$48,923	$2,446
Average:	***$34,191***	***$1,710***

Total waste retention facility capital cost = 1,084 + 34,191 = $35,275
Total waste retention facility annual cost = 54 + 1,710 = $1,764
Total waste retention cost for the period 2005-2025 = 35,275 + 20*(1,764) = $70,555

Table 3. The Cost of Shiner Conservation Measures at a 2,000-Animal Beef CAFO in Oklahoma

Required measure	Capital Cost	Annual Cost	Total Cost (2005-2025)
Waste retention structure	$35,275	$1,764	$70,555
Pressure testing for leaks	$20,750	--	$20,750
Vegetative buffer	$16,080	$9,648	$209,040
Groundwater monitoring	$9,465	$1,949	$48,445
Monitoring for chlorophyll A	$392	$6,252	$125,432
Testing sludge and solid waste	$30	$200	$4,030
Spill plan with NPDES permit	$2,530	--	$2,530
Estimated Total Cost	**$84,522**	**$19,813**	**$480,782**

Example 2. A Medium 2 sized 400-acre dairy farm in Oklahoma with 500 animals.

Concrete settling basins: Oklahoma, Medium 2, Concrete Separator/Basin

Waste system	Capital costs	Annual costs
Dairy-flush	$44,963	$899
Dairy-Hose/Scrape	$4,115	$82
Average:	***$24,539***	***$491***

Lagoons: Oklahoma, Medium 2

Waste system	Capital costs	Annual costs
Dairy-flush:		
Naturally-lined	$83,141	$4,157
Synthetically-lined	$146,055	$7,303
Dairy-Hose/Scrape:		
Naturally-lined	$38,063	$1,903
Synthetically-lined	$70,597	$3,530
Average:	***$84,464***	***$4,223***

Total waste retention facility capital cost = 24,539 + 84,464 = $109,003
Total waste retention facility annual cost = 491 + 4,223 = $4,714
Total waste retention cost for the period 2005-2025 = 109,003 + 20*(4,714) = $203,283

Table 4. The Cost of Shiner Conservation Measures at a 500-Animal Dairy Farm in Oklahoma

Required measure	Capital Cost	Annual Cost	Total Cost (2005-2025)
Waste retention structure	$109,003	$4,714	$203,283
Pressure testing for leaks	$20,750	--	$20,750
Vegetative buffer	$4,020	$2,412	$52,260
Groundwater monitoring	$9,465	$1,949	$48,445
Monitoring for chlorophyll A	$392	$6,252	$125,432
Testing sludge and solid waste	$30	$200	$4,030
Spill plan with NPDES permit	$2,530	--	$2,530
Estimated Total Cost	**$146,190**	**$15,527**	**$456,730**

The Draft Economic Analysis estimates total compliance costs across 134 CAFOs in the area of the watersheds proposed for inclusion to be approximately $69 million ($174 million across all 372 CAFOs in the entire watershed area that drains into essential shiner habitat). On average, the estimated cost is $515,000 per CAFO in the proposed included area and $468,000 per CAFO in the entire area.

Apart from waste retention, the estimated capital costs and annual costs do not vary with the size of operation. As a result, the compliance costs represent a larger share of revenue for small CAFO operations than for large CAFO operations. This phenomenon can lead to financial stress among small operators. Using the sales test method, Exhibit A-5 reveals that 67 out of 134 CAFOs in the non-excluded area of the watersheds that contain essential shiner habitat may experience moderate financial stress as a result of required investments (compliance costs in excess of 3% of annual gross revenue) and 33 out of 134 CAFOs may experience significant financial stress as a result of required investments (compliance costs in excess of 10% of annual gross revenue).

The DEA considers only project modification costs, but does not consider adverse production effects at CAFOs. If output is affected by shiner-related conservation requirements, for example if acreage devoted to a vegetative buffer is taken out of production, then the requirements would reduce total CAFO sales revenue and create regional economic impacts. The potential loss of output and accompanying distributional economic impacts are not considered in the DEA and should be included in a revised final economic analysis.

Other points:

- The DEA does not address the potential complexities for the CAFO caused by the confounding effects of (1) reducing and/or eliminating land application areas for

manure, wastewater and sludge, and (2) reducing and/or eliminating the availability of groundwater for production of crops and forages necessary for nutrient utilization.

- The DEA fails to consider costs associated with CAFO permitting and other regulatory activities that may be required prior to implementation of any of the requirement recommendations made by the Oklahoma Field Office of the U.S. Fish and Wildlife Service, such as preparation of permitting documentation by consulting engineers for permit amendments, completion of permit applications for monitoring wells, meetings with regulatory agencies, and other administrative and technical requirements.

- The cost of pressure testing and developing a spill plan, calculate only testing and plan-related costs and do not consider the cost of implementing mitigation measures in the event a leak is detected or a spill occurs.

- The annualizing of total cost in the CAFO section of the DEA is done in a manner that is inconsistent with the method used in the other sections.

6. Economic Impact on Agriculture

The Draft Economic Analysis calculates the economic cost of shiner-related requirements on two types of agricultural activities: row cropping and livestock grazing. All row cropping and livestock grazing operations within the 144,853 acre buffer region of essential shiner habitat are assumed to be affected by shiner conservation.

Row Cropping

The costs associated with shiner conservation efforts on row cropping operations depend on whether or not a Federal nexus exists. Row cropping 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. However, voluntary landowner participation in a number of Federal programs is possible, so the potential exists for future impact of shiner conservation on individual operations. The Draft Economic Analysis calculates costs for two scenarios. 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. A third possibility is also discussed --that farmers complete Habitat Conservation Plans in order to obtain ITPs to avoid section 9 take of the shiner-- but these costs are not calculated on the ground that these costs cannot exceed the costs outlined in scenarios (1) and (2). The projected costs for row cropping operations are the sum of (1) and (2), although it is more likely that either (1) or (2), and not both (1) and (2) together, will occur.

Scenario 1 assumes that farmers retire all agricultural land from row crop production in the 300-foot buffer area of essential habitat. Spatial land cover data (NLCD) is used to identify acres of land in the buffer devoted to row crop and small grain production. This identifies 6,617 acres of cropland in essential shiner habitat and 4,209 acres of cropland in the region proposed for inclusion. The value of crop activity in row crop production (in perpetuity) is taken to be the difference in regional land values for cropland and pastureland in the region of essential shiner habitat ($221 in Oklahoma, $321 in Texas, and $365 in the relevant region of Kansas). In the region proposed for inclusion, the value of lost row crop production is $951,813 (see Exhibit 7-6). This implies that the average difference in land values for cropland and pastureland in the 4,209 acres of row crop production in the region proposed for inclusion is $226. On an annualized basis, the value of lost crop production is $51,000 (assuming a 7% rate of discount).

The output of row crops produced on the land to be retired is assumed to represent a loss to regional economies. Using IMPLAN analysis, the future loss in crop production is anticipated to result in an annual economic loss of approximately $142,000 in regional output ($90,000 in the region proposed for inclusion).

Scenario 2 assumes that farmers discontinue participation in Federal farm assistance programs in order to avoid a Federal nexus for critical habitat requirements related to shiner protection. The study calculates the total cost share funded by EQIP, WHIP, and CRP in counties encompassing essential shiner habitat and uses the average percent of acres in each state designated for critical shiner habitat to generate an estimate of the total amount of Federal funding provided on acres within the essential shiner habitat. The estimated loss in funding from discontinued participation in Federal farm assistance programs is taken in this scenario to be the cost of shiner conservation measures on row cropping activities. In the region proposed for inclusion, lost Federal assistance is estimated to be $179,000 per year ($271,000 per year in total across proposed included and excluded regions).

The overall estimated compliance cost of shiner conservation on row cropping activities sums the estimated costs across scenarios 1 and 2. This assumes that farmers both retire land from the essential shiner habitat and discontinue participation in Federal farm assistance programs in order to avoid a Federal nexus for critical habitat requirements related to shiner protection. In the region proposed for inclusion, the annual loss amounts to $90,000 in lost regional output and $179,000 in lost Federal assistance, for a total of $269,000 per year.

Livestock Grazing

The costs associated with shiner conservation efforts on livestock grazing operations are calculated under the assumption that riparian areas within the area of essential shiner habitat are to be excluded from grazing. The exclusion of riparian grazing area allows a projection to be made on lost animal unit months (AUMs) in essential habitat areas, which is then attributed a cost using prevailing livestock prices and regional economic analysis.

The Draft Economic Analysis estimates the value of potential AUM reductions on essential habitat using a three step approach:

(1) Use geographic land cover data (NLCD) to identify areas of rangeland vegetation in essential habitat;
(2) Estimate the private grazing effort reduced on these acres using AUM per acre values reported by Kansas State University;
(3) Calculate the regional economic impacts of the lost AUMs using IMPLAN.

Step 1 of the process identifies 77,410 acres of potential rangeland within essential habitat. Using the average number of AUMs on non-federal grazing lands in Central and Western Kansas of 0.63 AUMs per acre, the lost stocking capacity resulting from exclusion of riparian areas from grazing in essential habitat is 0.63*(77,410) = 48,769. The value of the lost AUMs to ranchers is $5.9 million per year in the region proposed for inclusion ($8.5 million per year overall).

The lost AUMs of output is assumed to represent a loss to regional economies. Using input-output analysis (IMPLAN), the future loss in livestock production is anticipated to result in an annual economic loss of approximately $1.9 million in regional output in the region proposed for inclusion ($2.7 million overall).

The DEA does not mention possible fencing requirements resulting from shiner conservation efforts. Questions arising in this regard include the extent and unit cost of fencing, and responsibility for maintenance of fences. IEc should investigate these potential costs through interviews with USFWS personnel and stakeholder groups, and should consider including fencing costs in the final economic analysis.

Similarly, the DEA does not include the cost of controlling salt cedar in areas of critical habitat. In the Upper Cimarron River, there are 42.4 miles of river and riparian area, with 15 landowners. One landowner estimates he has 1 million salt cedar trees on his property. On the Canadian River, CRMWA has been treating salt cedar averaging 50 acres per mile, $200 per acre for a one-time application by helicopter. Periodic treatment will be necessary, although it is unclear at present how often they will be required. In general, though, salt cedar control costs may be significant and should be mentioned in the final economic analysis.

7. Other Economic Impacts

Recreation

The DEA quantifies the impacts of critical habitat on recreation activities in the area of proposed critical habitat. In particular, the analysis considers changes in off-road vehicle (ORV) use at in two portions of the Lake Meredith National Recreation Area: Rosita and Blue Creek. However, the DEA notes that only Rosita falls within essential shiner

habitat. The analysis further notes that NPS has indicated that it may exclude ORV use from the water and confine the activity to the riverbank during the months of shiner spawning (July through September).

The DEA calculates economic losses resulting from changes in visitation caused by these restrictions. A potential concern voiced by the Texas Off Road Association (TORA) is that actual usage of the Rosita area is 2 to 3 times higher than assumed in the DEA. The consultants should check these visitation statistics, as they are integral to the analysis.

Transportation

The DEA contains a brief analysis of impacts to transportation projects. Based on a review of past consultations relating to the shiner, the analysis notes that past project modifications to transportation activities have incurred costs ranging from $100,000 to $212,000 per project. Future projects over the next 20 years within proposed shiner habitat are estimated to experience impacts of $117,000 to $482,000 in 2004 dollars. In present value terms, the DEA presents a range of potential impacts of $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.

The DEA is silent on the delaying effects of Section 7 consultation relating to transportation projects. Given typical benefit-cost ratios for road projects, delay effects can be significant, especially if road users must take suboptimal routes that result in longer commute times. The final economic analysis should consider this issue and quantify the delaying effect of consultation on transportation projects.