

**ECONOMIC ANALYSIS OF  
CRITICAL HABITAT DESIGNATION  
FOR THE ROSWELL SRINGSNAIL,  
KOSTER'S SPRINGSNAIL, PECOS ASSIMINEA, AND  
NOEL'S AMPHIPOD**

July 2005

Prepared for:

Division of Economics  
U.S. Fish and Wildlife Service  
4401 N. Fairfax Drive  
Arlington, VA 22203

Prepared by:

Industrial Economics, Incorporated  
2067 Massachusetts Avenue  
Cambridge, MA 02140

## TABLE OF CONTENTS

<b>EXECUTIVE SUMMARY .....</b>	<b>ES-1</b>
<b>SECTION 1: FRAMEWORK FOR THE ANALYSIS.....</b>	<b>1-1</b>
1.1 Approach to Estimating Economic Effects.....	1-2
1.2 Scope of the Analysis.....	1-5
1.3 Analytic Time Frame .....	1-8
1.4 Information Sources.....	1-8
<b>SECTION 2: BACKGROUND .....</b>	<b>2-1</b>
2.1 Species and Designation .....	2-1
2.2 Land Use Activities in the Proposed Critical Habitat Designation.....	2-3
<b>SECTION 3: SOCIOECONOMIC PROFILE.....</b>	<b>3-1</b>
3.1 Economic Profile of Chaves County, New Mexico and Pecos and Reeves Counties, Texas .....	3-1
3.2 Economic Activities Occurring Within and Adjacent to the Proposed CHD .....	3-5
<b>SECTION 4: ECONOMIC IMPACTS.....</b>	<b>4-1</b>
4.1 Pre-Designation Impacts (2002-2005).....	4-3
4.2 Post-Designation Impacts (2005-2025) .....	4-5
<b>REFERENCES .....</b>	<b>R-1</b>
<b>APPENDIX A: ANALYSIS OF IMPACTS TO SMALL ENTITIES AND ENERGY MARKETS .....</b>	<b>A-1</b>

## EXECUTIVE SUMMARY

1. The purpose of this report is to assess the potential economic impacts associated with the designation of critical habitat for the Roswell springsnail, Koster's springsnail, Pecos assiminea, and Noel's amphipod (four invertebrates) and their habitat. This analysis is consistent with the designation as described in the proposed rule. As such, this analysis does not reflect potential changes to the proposed critical habitat designation (CHD) in the final rule. Description of the critical habitat in the final rule may consequently differ from that presented in this analysis. This report was prepared by Industrial Economics, Incorporated for the Service.
2. This report 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 affect the habitat within the proposed boundaries.
3. The four invertebrates are aquatic species native to natural springs, sinkholes, and associated spring runs in dry regions of Chaves County, New Mexico and Pecos and Reeves Counties, Texas. The Service has proposed to designate four units of critical habitat for the four invertebrates. The proposed units encompass 1,524 acres of land within Bitter Lake National Wildlife Refuge in Chaves County, New Mexico and on The Nature Conservancy lands in Pecos and Reeves Counties. All lands proposed as critical habitat are currently occupied by at least one of these invertebrate species.
4. Approximately 74 percent of the proposed CHD occurs on the Bitter Lake National Wildlife Refuge, a refuge managed by the Service to protect and provide habitat for a number of species. The remaining 26 percent of the proposed CHD occurs on lands managed by The Nature Conservancy as preserves.
5. 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 that exclusion will not result in extinction of the species.

### **Results of the Analysis**

6. This analysis considers impacts of conservation measures within Units 1 and 2, both managed by the Bitter Lake National Wildlife Refuge in New Mexico and separated by a few hundred meters, and within Units 3 and 4, which are both managed by The Nature Conservancy in Texas. This analysis focuses on quantifying impacts to activities most likely to be affected by the proposed critical habitat designation. These activities include:
  - Oil and gas development within the Bureau of Land Management's (BLM) Bitter Lake Habitat Protection Zone in Chaves County, New Mexico;

- Livestock operations within Chaves County, NM; and
  - Federal, State, and The Nature Conservancy management activities within Chaves County, NM and Pecos and Reeves Counties, TX.
7. This analysis also examines activities that have the potential to be impacted by the proposed designation, but given uncertainties as to the nature of these impacts and future management direction, these impacts are not quantified. These activities include:
- Oil and gas development on private lands in New Mexico and Texas;
  - Irrigated agricultural production within New Mexico and Texas; and
  - Expanding urban development within Chaves County, NM.
8. This analysis considers the economic impacts of conservation measures taken prior to and subsequent to the final listing and designation of critical habitat for the four invertebrates. Pre-designation impacts are typically defined as all management efforts that have occurred since the time of listing. The four invertebrates have not been listed, but were proposed for listing in February 2002. Since the proposed listing and designation of critical habitat of the four invertebrates, approximately **\$336,000 to \$494,000** (in present value terms for 2002 through 2004, assuming a seven percent discount rate) in costs have been incurred related to Bitter Lake National Wildlife Refuge conservation measures and the development of a Recovery and Conservation Plan for the four invertebrate species by the State of New Mexico.
9. The present value of total post-designation costs is approximately **\$3.8 million to \$7.5 million** (assuming a seven percent discount rate), or an annualized cost of \$352,000 to \$691,000 from 2005 to 2025. Approximately 81 percent of these costs are associated with impacts to oil and gas activities on BLM lands within the Bitter Lake Habitat Protection Zone. Federal, State and The Nature Conservancy management activities are expected to generate 15 percent of total forecast costs.
- **Oil and Gas Development:** Impacts to oil and gas activities are estimated at \$2.7 million to \$6.1 million in present value terms (assuming a seven percent discount rate) or an annualized cost of up to \$561,000 from 2005-2025. This is 81 percent of total forecast costs. These costs are associated with drilling modifications in complying with the BLM Bitter Lake Habitat Protection Zone stipulations to prevent groundwater contamination within the aquifer on which the four invertebrates depend in Units 1 and 2. A maximum of 63 wells within the Bitter Lake Habitat Protection Zone will be required to comply with additional drilling modifications. While these project modifications may increase drilling costs by up to 20 percent per well, the number of impacted wells represents about four percent of all wells on Federal, State, and private land in Chaves County and under 0.2 percent of total producing natural gas wells within the State of New Mexico. The potential annual production of these 63 wells would represent less than four percent of total annual natural gas production in Chaves County (a total of 30,000,000 thousand cubic feet

in 2004).<sup>1</sup> Thus, overall impacts to the regional oil and gas economy are likely to be small. Similar impacts could occur to oil and gas developments on private and State lands in New Mexico and Texas. However, currently no additional State protective measures on drilling operations to ensure protection to aquatic species are anticipated.

- **Livestock Operations:** Impacts to livestock operations are estimated to range from \$91,000 to \$257,000 from 2005-2025 (assuming a seven percent discount rate) or an annualized cost of up to \$24,000. Costs are anticipated to be incurred as a result of section 7 consultation on Concentrated Animal Feeding Operations (CAFOs) within Chaves County, New Mexico. This analysis assumes that every CAFO facility within Chaves County will need to ensure that operational discharges avoid or eliminate impacts to the four invertebrates and their habitat. This will most likely be ensured associated with the facility's securing of a wastewater discharge permit through either through EPA or that State.<sup>2</sup>
- **Federal, State, and The Nature Conservancy management activities.** An estimated \$1,053,000 (in present value terms assuming a seven percent discount rate), an annualized cost of \$107,000, comprising 15 percent of total costs, is anticipated to be incurred due to conservation management activities that benefit the four invertebrates over from 2005 to 2025. These activities include biological monitoring and habitat enhancement projects.

10. Impacts to irrigated agriculture and urban development activities have the potential to occur as a result of the proposed CHD. However, given uncertainties in the nature of these impacts and future management directions, this analysis is unable to provide a quantitative estimate of impacts to these activities.

- **Irrigated Agricultural Production.** Within New Mexico, conservation management techniques are currently in place that will ensure minimum surface water discharge at Units 1 and 2. In 1996, Bitter Lake National Wildlife Refuge gained legal assurance of sufficient water in its aquatic habitats. Moreover, the state of New Mexico is currently in process of retiring water rights of irrigated farmland adjacent to Units 1 and 2 to ensure water compact deliveries to Texas. Within Texas, further hydrological studies are necessary to determine the impact of groundwater pumping on surface and groundwater levels at Units 3 and 4. Thus, impacts to irrigated agriculture on private lands may occur but are unlikely given present conditions.
- **Expanding urban development.** Development concerns within Bitter Lake National Wildlife Refuge are more directly related to the potential for groundwater contamination from septic tanks constructed in Chaves County than to groundwater

---

<sup>1</sup> Go-Tech General Production Data, accessed at <http://octane.nmt.edu/data/ongard/general.asp>.

<sup>2</sup> The State of New Mexico is currently pursuing authorization for primacy for the NPDES permit program from EPA, New Mexico Environmental Department of Surface Water Quality, accessed at <http://www.nmenv.state.nm.us/swqb/NPDES>.

withdrawals for municipal use. Currently, it is unknown whether modifications to septic tank construction on private lands will be required to provide additional protection for the four invertebrates. Therefore, the potential impact of the proposed designation on residential development cannot be quantified. Within Texas, regional groundwater quantity and quality concerns are more directly related to oil and gas development and irrigated agriculture than to municipal water needs.

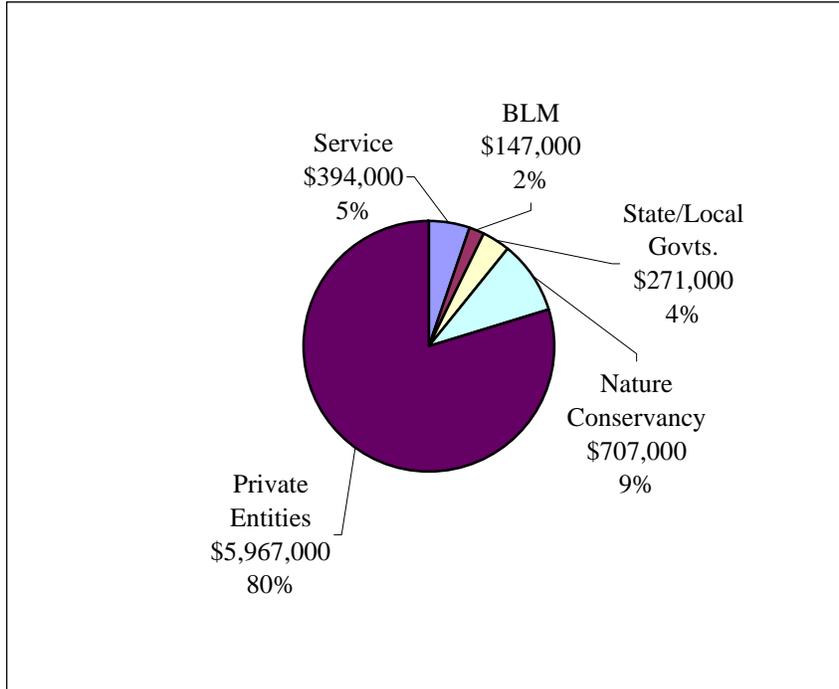
11. Approximately 91 percent of forecast costs are related to activities occurring within and adjacent to Units 1 and 2 in Chaves County, New Mexico. The remaining 9 percent of estimated costs are related to activities occurring within and adjacent to Units 3 and 4 in Pecos and Reeves Counties, Texas.
12. The economic impacts of conservation efforts for the four invertebrates will be manifested primarily as increased costs for private parties via consultations with Federal Agencies (80 percent). The BLM is anticipated to bear two percent of the total cost of four invertebrates conservation; the Service, five percent; the state of New Mexico, four percent; and The Nature Conservancy, nine percent. Consultations that may involve private entities include those related to oil and gas drilling operations within the BLM's Habitat Protection Zone in Chaves County and livestock operations within Chaves County. Exhibit ES-1 and ES-2 provide a tabular and graphical distribution of estimated present value costs (assuming a seven percent discount rate). Exhibit ES-3 presents estimated costs by proposed critical habitat unit.

<b>Exhibit ES-1</b>							
<b>SUMMARY OF ESTIMATED ADMINISTRATIVE AND PROJECT MODIFICATION COSTS ASSOCIATED WITH EACH PARTY</b>							
<b>Cost Category</b>	<b>Administrative</b>		<b>Project Modification</b>		<b>Total</b>		<b>% Total</b>
	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>	<b>Low</b>	<b>High</b>	
Service	\$69,000	\$232,000	\$151,000	\$162,000	\$219,000	\$394,000	5%
Other Federal Agencies	\$15,000	\$44,000	\$52,000	\$102,000	\$67,000	\$147,000	2%
State and Local Governments	\$34,000	\$101,000	\$164,000	\$170,000	\$197,000	\$271,000	4%
The Nature Conservancy	\$0	\$0	\$707,000	\$707,000	\$707,000	\$707,000	9%
Private Entities	\$31,000	\$75,000	\$2,588,000	\$5,892,000	\$2,619,000	\$5,967,000	80%
<b>Total</b>	<b>\$148,000</b>	<b>\$453,000</b>	<b>\$3,661,000</b>	<b>\$7,034,000</b>	<b>\$3,809,000</b>	<b>\$7,486,000</b>	<b>100%</b>

\*Note totals may not sum due to rounding.

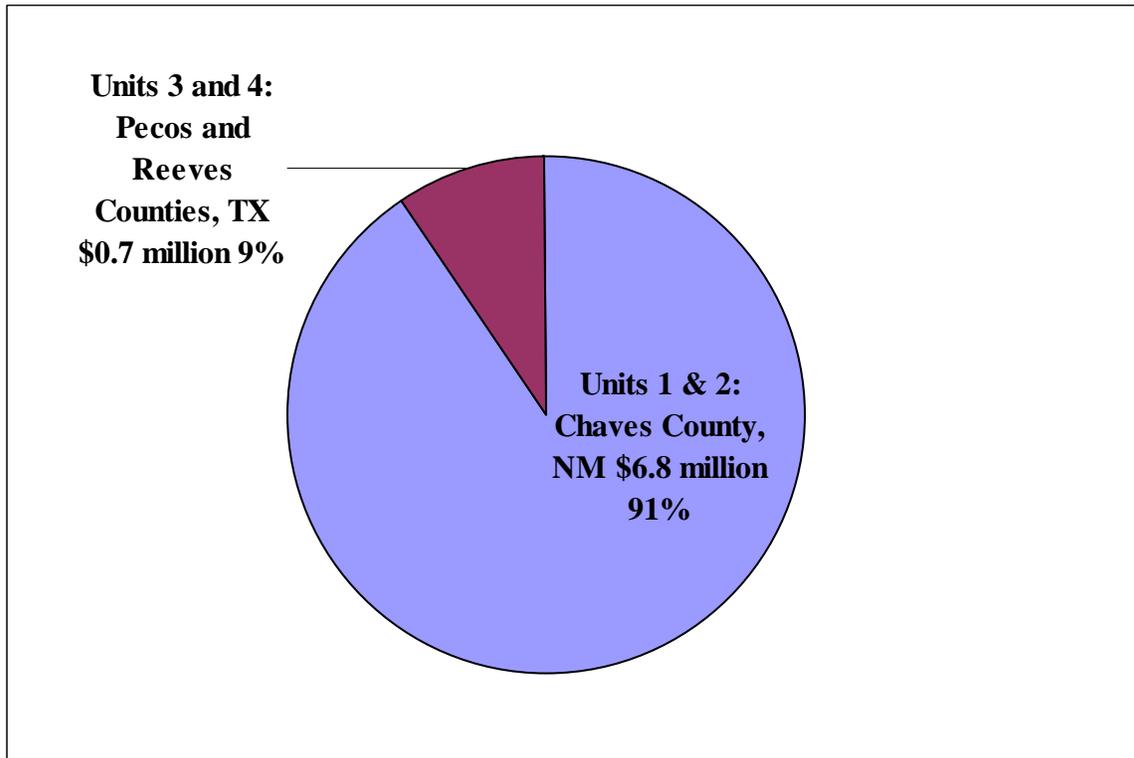
**Exhibit ES-2**

**SUMMARY OF TOTAL ESTIMATED COSTS ASSOCIATED WITH EACH PARTY**



**Exhibit ES-3**

**SUMMARY OF COSTS BY UNIT**



13. Economic impacts to the oil and gas industry may translate into impacts to small oil and gas entities operating within the Bitter Lake Habitat Protection Zone and in Chaves County. However, given the large number of oil and gas businesses within New Mexico and that many regional oil and gas businesses operate outside of Chaves County, the number of potentially affected small businesses will be a small percentage of all small oil and gas entities in New Mexico. No impacts to small entities within the irrigated agricultural industry are expected, as groundwater withdrawal activities for agricultural production are unlikely to change as a result of critical habitat for the four invertebrates. In the event that CAFO operators are required to implement additional measures to ensure groundwater protection within the aquifer on which the four invertebrates depend, small entities within the livestock operations industry may be impacted by the proposed designation. Significant impacts to the energy sector are not expected as a result of the proposed critical habitat designation. The yield of the potentially impacted wells within the Bitter Lake Habitat Protection Zone represents a small percentage of total State natural gas production. Moreover, increased drilling costs for wells within the Bitter Lake Habitat Protection Zone are not likely to translate in a one percent increase in energy production costs across the state of New Mexico.
14. Exhibit ES-4 provides an overview of the present value of costs associated with conservation efforts for the four invertebrate species over the next 20 years. To discount and annualize costs, guidance provided by the Office of Management and Budget (OMB) specifies the use of a real rate of three and seven percent.<sup>3</sup>

<b>Exhibit ES-4</b>		
<b>PRESENT VALUE OF TOTAL ECONOMIC COSTS (2005 - 2025)</b>		
	<b>Total Cost</b>	
	<b>Low</b>	<b>High</b>
Total Activity Cost	\$6,734,000	\$13,389,000
Present Value (7%)	\$3,809,000	\$7,486,000
Present Value (3%)	\$5,143,000	\$10,176,000
Annualized (7%)	\$352,000	\$691,000
Annualized (3%)	\$334,000	\$660,000

### **Uncertainties**

15. Exhibit ES-5 presents several key assumptions that introduce uncertainty into this economic analysis of four invertebrate species conservation efforts, as well as the potential direction and relative scale of bias introduced by the assumption.

<sup>3</sup> A real discount rate is adjusted to eliminate the effect of expected inflation to discount constant-dollar or real benefits and costs.

**Exhibit ES-5**

**CAVEATS TO THE ECONOMIC ANALYSIS**

<b>Key Assumption</b>	<b>Effect on Cost Estimate</b>
The presence of other threatened and endangered species (i.e., Pecos gambusia and Leon Springs pupfish) will have no influence on the cost of conservation efforts for the four invertebrates.	+
The BLM Habitat Protection Zone groundwater protection requirements for drilling operations for the Pecos gambusia will adequately address four invertebrates concerns (i.e., no additional modifications will be required for the four invertebrates). Note that costs on drilling operations associated with the Pecos gambusia are included in the analysis.	-
Federally reserved water rights at Bitter Lake National Wildlife Refuge will ensure minimum surface water discharge at Units 1 and 2.	-
Oil and gas activities occurring on private lands surrounding the proposed CHD will not be impacted by the proposed rule.	-
Decisions by operators not to drill on leased lands within the Habitat Protection Zone will result mainly in increased compliance costs, and not in regional economic impacts.	-
Every CAFO facility within Chaves County, New Mexico will need to ensure that operational discharges avoid impacts to the four invertebrates and their habitat. This will most likely be ensured with the facility's securing of a wastewater discharge permit through either the EPA or State as described in Section 4.2.2.	+
No Habitat Conservation Plans will be developed by non-Federal entities for the four invertebrate species.	-
- : 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 estimates.	

- 
16. The purpose of this analysis is to estimate the economic impact of actions taken to protect the Roswell springsnail, Koster's springsnail, Pecos assiminea, and Noel's amphipod (four invertebrates) and their habitat. This report 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 affect the habitat within the proposed boundaries. Costs are examined that (a) have been incurred since the date the species was proposed for listing and through the final designation of critical habitat (pre-designation costs), and (b) are forecast to occur after the listing designation is finalized (post-designation costs).
17. This analysis is consistent with the designation as described in the proposed rule. As such, this analysis does not reflect potential changes to the proposed CHD in the final rule. Description of the habitat designation in the final rule may consequently differ from that presented in this analysis.
18. 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.<sup>4</sup> 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).<sup>5</sup> This report also complies with direction from the U.S. 10<sup>th</sup> 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.<sup>6</sup>

---

<sup>4</sup> 16 U.S.C. §1533(b)(2).

<sup>5</sup> 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.

<sup>6</sup> In 2001, the U.S. 10<sup>th</sup> 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 (10<sup>th</sup> Cir. 2001)).

19. This section provides the framework for this analysis. First, it describes the general analytic approach to estimating economic effects, including discussion of both efficiency and distributional effects. Next, it discusses the scope of the analysis, including the link between existing and critical habitat-related protection efforts and economic impacts. Finally, it describes the information sources employed to conduct this analysis.

### **1.1 Approach to Estimating Economic Effects**

20. This economic analysis considers both the economic efficiency and distributional effects that may result from species and habitat protection. Economic efficiency effects generally reflect “opportunity costs” associated with the commitment of resources required to accomplish species and habitat conservation. For example, if activities on private lands 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 habitat conservation.

21. 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, the energy industry, or governments. This information may be used by decision-makers to assess whether the effects of the designation unduly burden a particular group or economic sector. For example, while habitat conservation activities may have a small impact relative to the national economy, individuals employed in a particular sector of the regional economy may experience a significant level of impact. The difference between economic efficiency effects and distributional effects, as well as their application in this analysis, are discussed in greater detail below.

22. Where data are available, the analysis attempts to capture the net economic impact imposed on regulated entities and the regional economy of conservation actions for the four invertebrates. That is, the economic impact of species conservation to the land management agencies and regulated community net of any direct off-setting benefit they experience.

#### **1.1.1 Efficiency Effects**

23. 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 discern the implications on a societal level of a regulatory action. For regulations specific to the conservation of the four invertebrates, 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 surplus in affected markets.<sup>7</sup>

24. In some instances, compliance costs may provide a reasonable approximation for the efficiency effects associated with a regulatory action. For example, a 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 his or her land not been designated critical habitat. In the case that compliance activity is not expected to significantly affect markets – that is, not result 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 provides a reasonable estimate of the change in economic efficiency.
25. Where habitat protection measures are expected to significantly impact a market, it may be necessary to estimate changes in producer and consumer surpluses. For example, a designation that precludes the development of large areas of land may shift the price and quantity of housing 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 real estate market.
26. This analysis begins by measuring costs associated with measures taken to protect species and habitat. As noted above, in some cases, compliance costs can provide a reasonable estimate of changes in economic efficiency. In the case of the four invertebrates, compliance costs are expected to represent a reasonable estimate of efficiency effects, and thus impacts on consumer and producer surpluses in affected markets are considered but not estimated.

### **1.1.2 Distributional and Regional Economic Effects**

27. 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.<sup>8</sup> 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 these are fundamentally different measures of economic impact than efficiency effects,

---

<sup>7</sup> 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 (2<sup>nd</sup> Ed.)*, Prospect Heights, Illinois: Waveland Press, Inc., 1990; and U.S. 240-R-00-003, September 2000, available at <http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html>.

<sup>8</sup> 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>.

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

28. This analysis considers how small entities, included small businesses, organizations, and governments, as defined by the RFA, may be affected by proposed critical habitat designation.<sup>9</sup> In addition, in response to Executive Order 13211 “Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,” this analysis considers the impacts of critical habitat on the energy industry and its customers.<sup>10</sup> While small business impacts are discussed, significant impacts on the energy sector are not expected. See Appendix A for an analysis of impacts to small businesses and the energy industry.

#### Regional Economic Effects

29. Regional economic impact analysis can provide an assessment of the potential localized effects of conservation measures. 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 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 of jobs and revenues in the local economy.
30. 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 affected 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.
31. 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

---

<sup>9</sup> 5 U.S.C. § 601 *et seq.*

<sup>10</sup> Executive Order 13211, “Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use,” May 18, 2001.

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**

32. This analysis identified those economic activities believed to be most likely to threaten the listed species and their habitat and, where possible, quantifies the economic impact to avoid, mitigate, or compensate for such threats within the boundaries of the proposed CHD. 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.<sup>11,12</sup>
33. 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 contributes to the efficacy of the CHD efforts, the impacts of these actions are considered relevant for understanding the full effect of the proposed CHD. 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**

34. The analysis begins by looking at the costs incurred since the time that the four invertebrate species were proposed for listing in February 2002 and through the time of the listing and final designation of critical habitat. It focuses on activities that are influenced by the Service through sections 4, 7, 9, and 10 of the Act. It then looks at activities likely to occur post-designation, and quantifies the effects that sections 4, 7, 9, and 10 of the Act may have on those activities.
35. Section 4 of the Act focuses on the listing and recovery of endangered and threatened species, as well as the designation of critical habitat. According to section 4,

---

<sup>11</sup> 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 coextensively to other causes (*New Mexico Cattle Growers Association v. USFWS*, 248 F.3d 1277 (10th Cir. 2001)).

<sup>12</sup> 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. USFWS*). 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.

the Secretary is required to list species as endangered or threatened “solely on the basis of the best available scientific and commercial data.”<sup>13</sup>

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 authorized, funded, or carried out will not likely jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of the species' designated critical habitat. The administrative costs of these consultations, along with the costs of project modifications resulting from these consultations, represent compliance costs associated with the listing of the species and the designation of critical habitat.
- 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, a non-Federal entity (i.e., a landowner or local government) may develop a Habitat Conservation Plan (HCP) for a threatened or endangered species in order to meet the conditions for issuance of an incidental take permit.<sup>14</sup> 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. All lands proposed for designation for the four invertebrates are Federally-owned or managed by The Nature Conservancy. HCPs are not currently anticipated to be developed by non-Federal entities for the four invertebrate species.

### **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. In addition, under certain circumstances, the designation of critical habitat 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 may not

---

<sup>13</sup> 16 U.S.C. 1533.

<sup>14</sup> U.S. Fish and Wildlife Service, “Endangered Species and Habitat Conservation Planning.” From: <http://endangered.fws.gov/hcp/>, as viewed on August 6, 2002.

have been triggered absent the designation of critical habitat, they are included in this economic analysis.

### **1.2.3 Additional Analytic Considerations**

38. Previous economic impact analyses prepared to support critical habitat decisions have considered other types of economic impacts related to the critical habitat designation, including time delay, regulatory uncertainty, and stigma impacts. This analysis considers these types of economic impacts and has determined that the proposed habitat designation for the four invertebrates is unlikely to have economic impacts of this nature.

#### 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 or legal counsel to better understand their responsibilities with regard to critical habitat designation).

#### Stigma Impacts

40. Changes to private property values associated with public attitudes about the limits and costs of critical habitat designation are known as "stigma" impacts.

### **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.<sup>15</sup> 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.<sup>16</sup>
42. In the context of CHD, 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.<sup>17</sup> *Rather than rely on economic measures, the Service believes*

---

<sup>15</sup> Executive Order 12866, September 30, 1993, "Regulatory Planning and Review."

<sup>16</sup> 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>.

<sup>17</sup> 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>.

*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 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 through 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 examines activities taking place both within and adjacent to the proposed designation. Estimates of post-designation impacts are 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. The analysis estimates economic impacts to activities from 2005 (anticipated year of species' final listing) to 2025 (twenty years from the year of final designation).

### **1.4 Information Sources**

46. The primary sources of information for this report were communications with and data provided by:

- U.S. Fish and Wildlife Service (Service);
- Bureau of Land Management (BLM);
- The Nature Conservancy (Conservancy);
- Natural Resources Conservation Service (NRCS);
- Environmental Protection Agency (EPA);
- U.S. Army Corps of Engineers (USACE);
- New Mexico Department of Game and Fish (Department);
- New Mexico State Interstate Stream Commission (ISC);

- New Mexico Environmental Department (NMED);
- New Mexico Oil Conservation Division;
- Railroad Commission of Texas;
- Texas Commission on Environmental Quality (TCEQ);
- Chaves County Planning and Zoning Department; and
- Private and Federal Petroleum Engineers.

47. Publicly available data were also used to augment the economic analysis. This report further addresses issues and new information raised during the public comment period for the draft version of this analysis. Please refer to the reference section at the end of this document for a full list of information sources.

48. The Service has proposed to designate critical habitat for the proposed Federally endangered the Roswell springsnail, Koster's springsnail, Pecos assiminea, and Noel's amphipod, hereafter referred to as the "invertebrate species" or "four invertebrates". This section provides background on the geography, ecology, and human-uses of the proposed critical habitat designation. It details the current state of the proposed lands, including a description of management activities, land ownership, and ecology of the area.

## 2.1 Species and Designation<sup>18</sup>

### 2.1.1 Description of Species

49. Roswell springsnail (*Pyrgulopsis roswellensis*), Koster's springsnail (*Juturnia kosteri*), Pecos assiminea (*Assiminea pecos*), and Noel's amphipod (*Gammarus desperatus*) are aquatic species native to natural springs, sinkholes, and associated spring runs in dry regions of Chaves County, New Mexico and Pecos and Reeves Counties, Texas. They are found at two sites in Chaves County, New Mexico, one site in Pecos County, Texas, and one site in Reeves County, Texas. These three snails and one amphipod have an exceedingly limited distribution. The snails are distributed in geographically separate populations and likely evolved from parent species that once enjoyed a wide distribution during wetter, cooler climates.

### 2.1.2 Description of Designation<sup>19</sup>

50. The Service has proposed to designate four units of critical habitat for these four invertebrates, encompassing a total of 1,524 acres. All of the proposed critical habitat units are currently occupied by at least one of these invertebrate species, and all four are also currently inhabited by at least one other Federally listed endangered species. Descriptions of each critical habitat unit are provided below:

- **Unit 1: Sago/Bitter Creek Complex, Bitter Lake National Wildlife Refuge (Bitter Lake NWR), Chaves County, New Mexico.** Sago Spring, Bitter Creek, and the

---

<sup>18</sup> U.S. Fish and Wildlife Service, *Endangered and Threatened Wildlife and Plants; Listing Roswell springsnail, Koster's springsnail, Pecos assiminea, and Noel's amphipod as Endangered With Critical Habitat*, Federal Register, Vol. 67, No. 29, February 12, 2002.

<sup>19</sup> Ibid.

adjacent gypsum sinkholes comprise the core population center for all four species. The proposed designation includes all springs, seeps, sinkholes, and outflows surrounding Bitter Creek and the Sago Spring Complex. This 521 acre designation is also home to the Federally listed Pecos gambusia, Interior least tern, and Pecos sunflower. It is entirely within the Federally managed Bitter Lake NWR.

- **Unit 2: Impoundment Complex, Bitter Lake NWR, Chaves County, New Mexico.** This complex includes portions of impoundments 3, 5, 6, 7, 15, and Hunter Marsh. This is a another population center for all four invertebrates, with Koster’s springsnail being the principal species present. The proposed designation includes all springs, seeps, sinkholes, and outflows surrounding the Bitter Lake NWR impoundments. This 606 acre designation is also home to the Federally listed Pecos gambusia, Interior least tern, and Pecos sunflower. It is entirely within the Bitter Lake NWR.
  
- **Unit 3: Diamond Y Springs Complex, Pecos County, Texas.** Unit 3 comprises a major population of Pecos assiminea. The proposed designation includes the Diamond Y Spring and approximately 6.8 kilometers (km) or 4.2 miles (mi.) of its outflow ending approximately 0.8 km downstream of the State Highway 18 bridge crossing. Also included is approximately 0.8 km of Leon Creek upstream of the confluence with Diamond Y Draw. All surrounding riparian vegetation and mesic soil environments within the spring, outflow, and portion of Leon Creek are also proposed for designation, as these areas are considered habitat for the Pecos assiminea. This designation incorporates approximately 380 acres of aquatic and neighboring mesic habitat that is also home to the Federally endangered Pecos gambusia, Leon Springs pupfish and Pecos sunflower. The property is owned by The Nature Conservancy.
  
- **Unit 4: East Sandia Spring, Reeves County, Texas.** This spring contains a population of Pecos assiminea. The proposed designation includes the springhead itself, surrounding seeps, and all submergent vegetation and moist soil habitat found at the margins of these areas. These areas are considered habitat for the Pecos assiminea. This designation is approximately 16.5 acres of aquatic and neighboring upland habitat that is also home to the Federally listed Pecos gambusia, Comanche Springs pupfish, and Pecos sunflower. The property is owned by The Nature Conservancy.

<b>Exhibit 2-1</b>			
<b>LAND OWNERSHIP WITHIN PROPOSED CHD FOR THE FOUR INVERTEBRATES</b>			
<b>Owner</b>	<b>Units 1 &amp; 2 New Mexico</b>	<b>Units 3 &amp; 4 Texas</b>	<b>Total</b>
Federal Land (National Wildlife Refuge)	1,127 acres	None	1,127 acres
Private Land (The Nature Conservancy)	None	396.5 acres	396.5 acres
<b>Total</b>	<b>1,127 acres</b>	<b>396.5 acres</b>	<b>1,523.5 acres</b>
<b>Percent of Total</b>	<b>74%</b>	<b>26%</b>	<b>100%</b>

### 2.1.3 Overlap with Other Endangered Species

51. Exhibit 2-2 lists a number of endangered and threatened species that are known to inhabit the proposed critical habitat units. Section 7 consultations regarding a proposed action consider all listed species that may be affected by the action. As a result, section 7 consultations for the four invertebrates may also consider other listed species that occur within the proposed CHD. Many management actions within and adjacent to the proposed CHD have been directed towards Pecos gambusia and Leon Springs pupfish recovery and protection. Costs of habitat restoration projects driven by efforts to preserve these species' habitat that may benefit the four invertebrates are considered in this analysis. To the extent possible, this analysis distinguishes costs related specifically to four invertebrates' conservation where multiple species are subject of a single conservation effort or section 7 consultation. In the case that another species clearly drives a project modification or conservation effort, the associated costs are appropriately not attributed to the four invertebrates. Where it is unclear which species is the causative factor or a particular conservation effort that benefits multiple species, this analysis includes the full costs and acknowledges the multiple considerations that may contribute to the undertaking of that conservation effort.

Exhibit 2-2				
OVERLAP WITH OTHER THREATENED AND ENDANGERED SPECIES				
Unit	Category	Common Name	Scientific Name	Status
1 & 2	Bird	Interior least tern	<i>Sterna antillarum</i>	Federally endangered
1, 2, 3 & 4	Fish	Pecos gambusia	<i>Gambusia nobilis</i>	Federally endangered
1, 2, & 4	Plant	Pecos sunflower	<i>Helianthus paradoxus</i>	Federally threatened
3	Fish	Leon Springs pupfish	<i>Cyprinodon bovinus</i>	Federally endangered with critical habitat
4	Fish	Comanche Springs pupfish	<i>Cyprinodon elegans</i>	Federally endangered

### 2.2 Land Use Activities in the Proposed Critical Habitat Designation

52. The Service has identified the following activities that may occur within or adjacent to the proposed CHD as potentially affecting the conservation status of the species or their habitat: oil and gas development, irrigated agricultural and livestock activities, residential and commercial development, and to a lesser extent, road construction and maintenance. Federal, State, and The Nature Conservancy land management activities also occur within or adjacent to the proposed CHD. These management activities include projects that benefit the four invertebrate species, including nonnative vegetation control, fire suppression, controlled burns, water control structures, and habitat enhancement projects.

53. This analysis focuses on the following activities identified as the most likely to be affected by CHD for the four invertebrates. These activities include oil and gas extraction and development, livestock activities, and Federal, State, and The Nature Conservancy lands management. The analysis also examines activities that have the potential to be impacted by the proposed designation but given uncertainties as to the scale of these impacts and future management directions, these impacts are not quantified. These activities include irrigated agricultural production and expanding urban development. Each of these activities is discussed further in Sections 3 and 4.

54. This section summarizes key economic and demographic information for the counties likely to be impacted by the proposed CHD for the four invertebrates. County level data are presented to provide context for the discussion of economic impacts and to illuminate trends that may influence these impacts.

55. To provide context and comparison for the economic analysis, this section first provides demographic information for Chaves County, New Mexico and Pecos and Reeves Counties, Texas, and then details economic activities taking place within and surrounding the proposed CHD.

### **3.1 Economic Profile of Chaves County, New Mexico and Pecos and Reeves Counties, Texas**

56. The proposed CHD for the four invertebrates covers 1,127 acres within Chaves County, New Mexico and 396.5 acres within Pecos and Reeves Counties, Texas. The principal employment sectors in the three counties consist of government, health care and social assistance services, and trade, transportation, and utilities.

#### **3.1.1 Population Patterns**

57. In 2000, Chaves County had a population of 61,382, a 6.1 percent increase from a population of 57,849 in 1990. The County is anticipated to grow moderately over the next decade, with population projected to increase by 10 percent by 2020. Roswell, the County's largest city, had a population of 45,293 in 2000, growing 1.8 percent from 1990 levels.

58. From 1990 to 2000, population within Pecos County, Texas grew by 14.5 percent to 16,809. Reeves County's population in 2000 was 13,137, a 17.1 decline from 1990 levels. Both Pecos and Reeves Counties experienced a population decline between 2000 and 2003. Exhibit 3-1 summarizes population data for the areas surrounding the proposed CHD.

**Exhibit 3-1**

**POPULATION ESTIMATES FOR COUNTIES SURROUNDING THE PROPOSED CHD**

<b>Region</b>	<b>1990</b>	<b>2000</b>	<b>2010</b>	<b>2020</b>	<b>% Increase 1990-2000</b>	<b>% Increase 2000-2020</b>
United States	248,709,873	281,421,906	--	--	13.2%	--
NEW MEXICO	1,515,069	1,819,046	2,112,986	2,383,116	20.1%	31.0%
Chaves County	57,849	61,382	64,864	67,591	6.1%	10.1%
City of Roswell	44,654	45,451	--	--	1.8%	--
TEXAS	16,986,510	20,851,820	22,802,959	24,330,707	22.8%	16.7%
Pecos County	14,675	16,809	18,229	19,355	14.5%	15.1%
Reeves County	15,852	13,137	14,533	15,731	-17.1%	20.0%

**Sources:**

- (1) U.S. Census Bureau, State & County QuickFacts, accessed at <http://quickfacts.census.gov/qfd/>
- (2) Bureau of Business and Economic Research (BBER), Revised Population Projections for New Mexico and Counties, accessed at <http://www.unm.edu/~bber/demo/table1.htm>.
- (3) Texas State Data Center, Population Estimates and Projections, accessed at <http://txsdc.utsa.edu/cgi-bin/prj2004totnum.cgi>.

### **3.1.2 Business Patterns**

59. Exhibit 3-2 provides industry and payroll data for Chaves County, New Mexico and Pecos and Reeves Counties, Texas. The “Total Establishments” column displays the total number of physical locations at which business activities are conducted with one or more paid employee in the year 2002. These figures provide a measure of the average density of commercial and industrial entities in the region.
60. In 2002, Chaves County had a total payroll of \$342.9 million. The principal industries in Chaves County, in terms of annual payroll, include health care and social assistance services, retail trade, and manufacturing—all industries that are unlikely to be impacted by the proposed designation. Annual payroll within these industries totaled \$182.7 million, representing 53 percent of the total County payroll.
61. Pecos County had a total payroll of \$57.3 million in 2002, with principal industries including health care and social assistance, retail trade, and mining. Reeves County had a total payroll of \$43.6 million with primary industries comprising retail trade, health care and social assistance, and transportation and warehousing.

**Exhibit 3-2**

**ECONOMIC ACTIVITY WITHIN CHAVES COUNTY, NM AND PECOS AND REEVES COUNTIES, TX  
ANNUAL PAYROLL, EMPLOYMENT, AND TOTAL ESTABLISHMENTS BY INDUSTRY (2002)**

Industry	Chaves County, NM			Pecos County, TX			Reeves County, TX		
	Annual Payroll (\$1,000)	% Total Annual Payroll	Total Establishments	Annual Payroll (\$1,000)	% Total Annual Payroll	Total Establishments	Annual	% Total Annual Payroll	Total Establishments
Forestry, fishing, hunting, and agriculture support	\$0	0.0%	7	\$0	0.0%	2	\$0	0.0%	1
Mining	\$8,997	2.6%	52	\$9,899	17.3%	26	\$3,328	7.6%	7
Utilities	\$4,271	1.2%	8	\$2,908	5.1%	6	\$1,456	3.3%	6
Construction	\$22,471	6.6%	119	\$2,221	3.9%	21	\$985	2.3%	8
Manufacturing	\$58,141	17.0%	50	\$1,964	3.4%	8	\$0	0.0%	4
Wholesale trade	\$14,666	4.3%	66	\$2,382	4.2%	14	\$462	1.1%	7
Retail trade	\$50,140	14.6%	262	\$10,435	18.2%	75	\$11,116	25.5%	33
Transportation & warehousing	\$15,243	4.4%	59	\$3,418	6.0%	14	\$5,151	11.8%	9
Information	\$7,435	2.2%	28	\$1,326	2.3%	11	\$873	2.0%	8
Finance & insurance	\$18,684	5.4%	111	\$3,372	5.9%	23	\$1,928	4.4%	13
Real estate & rental & leasing	\$4,140	1.2%	76	\$210	0.4%	5	\$151	0.3%	8
Professional, scientific & technical services	\$18,616	5.4%	100	\$0	0.0%	12	\$1,999	4.6%	13
Management of companies & enterprises	\$4,516	1.3%	10	--	--	--	--	--	--
Admin, support, waste management, remediation services	\$0	0.0%	50	\$0	0.0%	4	\$0	0.0%	5
Educational services	\$0	0.0%	6	\$0	0.0%	1	--	--	--
Health care and social assistance	\$74,469	21.7%	159	\$10,564	18.4%	12	\$5,697	13.1%	20
Arts, entertainment & recreation	\$1,556	0.5%	15	\$0	0.0%	2	\$237	0.5%	3
Accommodation & food services	\$17,125	5.0%	96	\$3,544	6.2%	37	\$2,798	6.4%	25
Other services (except public administration)	\$14,093	4.1%	149	\$3,611	6.3%	36	\$858	2.0%	25
Auxiliaries (exc corporate, subsidiary & regional mgt)	\$143	0.0%	3	--	--	--	--	--	1
Unclassified establishments	\$0	0.0%	9	\$0	0.0%	2	\$0	--	1
<b>Total</b>	<b>\$342,942</b>	<b>100.0%</b>	<b>1,479</b>	<b>\$57,278</b>	<b>100.0%</b>	<b>311</b>	<b>\$43,653</b>	<b>84.8%</b>	<b>311</b>

**Source:**

U.S. Census Bureau, County Business Patterns, <http://www.census.gov/epcd/cbp/view/cbpview.html>

### 3.1.3 Employment by Industry

62. In 2003, a total of 21,109 individuals were employed within all economic sectors in Chaves County. The largest employment sectors within Chaves County include trade, transportation and utilities and the services industries. Employment within the government sector represented 21 percent of the job base while the health care and social assistance services industry employed 13 percent of total jobs. Accommodation and food services and retail trade both accounted for 12 percent of employment.
63. The largest employers within Pecos and Reeves Counties consist of the government and trade, transportation, and utilities sectors. In Pecos County, government jobs accounted for 36 percent of all employment while trade, transportation, and utilities employment constituted 15 percent of total jobs. In Reeves County, government jobs represented 40 percent of total jobs while trade, transportation, and utilities accounted for 19 percent of total employment. Exhibit 3-3 summarizes employment by industry within the three counties containing proposed critical habitat.

<b>Exhibit 3-3</b>						
<b>EMPLOYMENT BY INDUSTRY WITHIN COUNTIES CONTAINING PROPOSED FOUR INVERTEBRATES CRITICAL HABITAT</b>						
<b>Industry</b>	<b>Chaves County, NM</b>		<b>Pecos County, TX*</b>		<b>Reeves County, TX*</b>	
	<b>Number of Employees</b>	<b>% Total Employees</b>	<b>Number of Employees</b>	<b>% Total Employees</b>	<b>Number of Employees</b>	<b>% Total Employees</b>
Natural Resources & Mining	1,940	9%	619	13%	346	9%
Construction	882	4%	186	4%	104	3%
Manufacturing	1,331	6%	70	1%	204	5%
Trade, Transportation & Utilities	4,028	19%	755	15%	730	19%
Information	268	1%	55	1%	31	1%
Financial Activities	807	4%	152	3%	172	4%
Professional & Business Services	1,361	6%	134	3%	55	1%
Education & Health Services	2,828	13%	545	11%	349	9%
Leisure & Hospitality	2,756	13%	463	9%	269	7%
Other Services	553	3%	120	2%	49	1%
Nonclassifiable	7	0%	6	0%	5	0%
Federal Government	354	2%	50	1%	82	2%
State Government	1,538	7%	594	12%	84	2%
Local Government	2,456	12%	1,132	23%	1,369	36%
<b>Total Employment</b>	<b>21,109</b>	<b>100%</b>	<b>4,881</b>	<b>100%</b>	<b>3,849</b>	<b>100%</b>
<b>Sources:</b>						
New Mexico Department of Labor, <a href="http://www.dol.state.nm.us/wordtext/taled.xls">http://www.dol.state.nm.us/wordtext/taled.xls</a>						
Texas Workforce Commission, Labor Market Information, <a href="http://www.tracer2.com/admin/uploadedPublications/1237_coveredemployment2003.xls">http://www.tracer2.com/admin/uploadedPublications/1237_coveredemployment2003.xls</a>						
<b>Notes:</b>						
Texas data reported for 4 <sup>th</sup> quarter of 2003.						

### **3.1.4 Income and Unemployment<sup>20</sup>**

64. Chaves County had a per capita personal income of \$22,727 in 2002. This was slightly lower than New Mexico's per capita personal income of \$24,823. The poverty rate in 1999 for Chaves County was 18.4 percent, a higher rate than New Mexico's average poverty rate of 12.4 percent. The unemployment rate in Chaves County in 2003 was 8.6 percent, higher than the statewide average of 6.4 percent.
65. Pecos County had a per capita personal income of \$15,346 in 2002, representing 53 percent of the Texas statewide average of \$29,039. The poverty rate in Pecos County was 20.4 percent in 1999, which was higher than Texas' average of 15.4 percent. In 2003, Pecos County's average unemployment rate was 5.5 percent, lower than the statewide average of 6.8 percent.
66. In 2002, Reeves County had a per capita personal income of \$17,139. This represented 59 percent of the state average. The County's poverty rate in 1999 was 28.9 percent, or nearly double the statewide poverty level. Reeves County has experienced high unemployment relative to the state. In 2003 the County's average unemployment rate was 11.3 percent.

## **3.2 Economic Activities Occurring Within and Adjacent to the Proposed CHD**

67. The Service and The Nature Conservancy manage all of the proposed critical habitat units. These entities undertake habitat conservation activities to preserve the ecosystem and native species. Economic activities that could generate groundwater contamination or result in the depletion of aquifers may impact the four invertebrates and their habitat. Potentially affected activities within Chaves County, New Mexico and Pecos and Reeves Counties, Texas include oil and natural gas operations, irrigation for agricultural purposes, livestock operations, residential development, and to a lesser extent road construction and maintenance. These activities do not occur immediately within the proposed critical habitat areas but do occur in proximity to the proposed designation and thus could impact the hydrologic conditions and water quality within the proposed designation.
68. The social and economic climate surrounding economic and land management activities within Chaves County, New Mexico and Pecos and Reeves Counties, Texas, is discussed below. The economic impacts of managing these activities in consideration of the needs of the four invertebrates and their habitat are discussed in Section 4.

### **3.2.1 Federal, State, and The Nature Conservancy Land Management Activities**

69. All lands proposed for CHD are located on Federal and The Nature Conservancy lands. The Bureau of Land Management (BLM) manages lands beyond the borders of the Bitter Lake National Wildlife Refuge but within the groundwater source zone of the

---

<sup>20</sup> Per capita personal income data from Bureau of Economic Analysis; Unemployment data from U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov/data/>.

proposed CHD. Furthermore, the New Mexico Department of Game and Fish (Department) is currently developing a state Recovery and Conservation Plan for the four invertebrates. This section describes land management and conservation activities implemented by Federal and State agencies and The Nature Conservancy.

### **Bitter Lake National Wildlife Refuge Management (Units 1 and 2)**

70. Units 1 and 2 of proposed CHD lie completely within the boundaries of the Bitter Lake NWR and are managed by the Service. Bitter Lake NWR was created in 1937 to protect and provide habitat for a number of species, including waterfowl and endangered and threatened fish, such as the Pecos bluntnose shiner, the Pecos gambusia, and the Pecos pupfish. As a result, public recreational activity is not permitted in all of proposed unit 1 and only restricted activity is allowed in proposed unit 2. No recreational activities that could disturb aquatic habitat, such as water sports, fishing, or boating are permitted in either unit under current rules. Visitors use the Refuge primarily for wildlife viewing and bird hunting. Private vehicles are required to remain on established roads, and access to the Refuge is limited to the main entrance.
71. Many activities occurring within the Bitter Lake NWR will be undertaken in the interest of the four invertebrates. Bitter Lake NWR activities include salt cedar control and eradication, controlled burns, fire management, habitat creation and enhancement efforts for the invertebrates and other native species, and water control projects.
- **Oil and Gas Activity.** Both the Federal government and the State of New Mexico own mineral rights at the Bitter Lake NWR. However, Refuge personnel indicate that New Mexico has expressed no recent interest in developing its mineral rights. There are three active oil wells and two natural gas wells on the Refuge. The three oil wells are located down slope on the water gradient from the proposed critical habitat units. The two gas wells are located near the four invertebrates habitat and one of these wells is not in production.<sup>21</sup>
  - **Federally Reserved Water Rights.** Units 1 and 2 of proposed critical habitat lie just west of the Pecos River, an important water source in both New Mexico and Texas. Bitter Lake NWR gained legal assurance of sufficient water in its aquatic habitats in 1996. Bitter Lake is currently in negotiations with the New Mexico Interstate Stream Commission, a State agency responsible for administering New Mexico's water resources, to quantify these reserved rights.

### **BLM Roswell Resource Area Management (Units 1 and 2)**

72. While the BLM does not manage any land within the proposed critical habitat units, it does manage almost 1.5 million acres within its Roswell, New Mexico, Resource Area, including significant lands west of units 1 and 2. This situation is exclusive to units 1 and 2, because BLM does not manage any land in Texas, where units 3 and 4 are proposed. A recent study by Balleau et al. (1999) reported that these lands act as a source

---

<sup>21</sup> Ibid.

area for spring water in the Bitter Lake NWR.<sup>22</sup> Because these species are sensitive to oxygen levels, water temperature, sediments, and contaminants, existing regulations addressing potential water contamination in this source area are relevant to this analysis.<sup>23</sup>

73. The 1999 Balleau study reported that water expected to emerge from Bitter Lake NWR springs over the next 10 to 500 years will come from a broad source area beginning west of Roswell near Eightmile Draw, extending northeast to Salt Creek, and southeast to the Refuge. This broad area sits within a portion of the Roswell Basin and contains a mosaic of Federal, State, and private lands with multiple land uses that include expanding urban development, ranching, commercial farming, and recreation. There have also been extensive oil and gas extraction activities in the area surrounding the Refuge, including at least 190 oil wells. Since this area delineates the groundwater source area of surface water on the Refuge, it likewise could serve as a source for contaminants entering the species' habitat.

74. All of the Federal lands within this area are managed and regulated by the BLM, under the rules and regulations stipulated in the 1997 *Roswell Approved Resource Management Plan*.

- **Bitter Lake Habitat Protection Zone.**<sup>24</sup> Revisions to the *Roswell Approved Resource Management Plan* made by BLM in 1997 prompted a formal section 7 consultation with the Service regarding the endangered Pecos gambusia, which resides on Bitter Lake NWR. As part of this consultation, the Service provided “reasonable and prudent alternatives” to the proposed management plan in order to protect the ground and surface waters that feed the Bitter Lake NWR and Pecos gambusia habitat. In particular, the Service recommended that BLM:
  - “Use the best available hydrologic information to map the movement of water that supplies springs occupied by Pecos gambusia on the Bitter Lake NWR and the Salt Creek Wilderness. Close the lands within the mapped area to oil and gas leasing unless or until the BLM can demonstrate that mandatory protective measures will ensure no aquifer contamination.”
  - “For existing leases within the mapped area, apply appropriate measures taken from BLM’s ‘Practices for Oil and Gas Drilling and Operations in Cave and Karst Areas’ and any other appropriate measures to ensure no contamination of water that supplies springs occupied by the Pecos gambusia on the Bitter Lake NWR and the Salt Creek Wilderness. Use monitoring procedures that will detect

---

<sup>22</sup> Balleau Groundwater, Inc. 1999. Source-water protection zones for Bitter Lake National Wildlife Refuge. A report prepared for the U.S. Fish and Wildlife Service. 42 pp.

<sup>23</sup> Ibid.

<sup>24</sup> Personal communication with Dan Baggao, Wildlife Biologist and Howard Parmenter Bureau of Land Management, Roswell Field Office, November 17, 2004.

any surface or subsurface accidents soon enough that they can be discovered and corrected before significant harm to the aquifer occurs.”<sup>25</sup>

75. In accordance with this recommendation and in the interest of general water quality, the BLM has developed a Habitat Protection Zone (HPZ) plan for 12,585 acres of the Federal mineral estate and 9,945 acres of the Federal surface estate that are within the water source area for the Bitter Lake NWR, as specified in the Balleau study. The Bitter Lake HPZ was established in October of 2002 and is managed to protect the ground and surface water resources of Bitter Lake NWR for the next ten to fifteen years.<sup>26</sup> The HPZ includes less than one percent of the 1.49 million surface acres and less than 0.2 percent of the 8.4 million subsurface mineral estate managed by BLM in the Roswell Resource Area.

**State of New Mexico Recovery and Conservation Plan for Four Invertebrate Species<sup>27</sup> (Units 1 and 2)**

76. The Department, under direction of the New Mexico Wildlife Conservation Act amendments of 1995, is currently in the process of developing a State Recovery and Conservation Plan for the Four Invertebrates Species. The four-fold purpose of the recovery plan is to:

- Restore and maintain viable populations of the species and their habitat;
- Mitigate adverse social or economic impacts resulting from recovery actions;
- Identify social or economic benefits and opportunities; and
- Use existing resources and funding sources, to the extent possible, to implement the plan.

77. The Department has noted that it has minimal jurisdiction over the lands that the four species occupy and that recovery efforts will occur in collaboration with other State, Federal, and local government entities as well as with private landowners. The Department has developed the plan concurrently with the Interstate Stream Commission. The State Recovery Plan also proposes specific conservation, restoration, and protection actions under its strategy, including restoring viable populations of the four invertebrates in suitable habitat at two or more sites within their known historic range. To implement the recovery effort the Department has stated that it must establish cooperative working relationships with other state, Federal, and local government entities and private

---

<sup>25</sup> Bureau of Land Management, Roswell Approved Resource Management Plan and Record of Decision, October, 1997.

<sup>26</sup> Ibid.

<sup>27</sup> New Mexico Department of Game and Fish, Draft Recovery and Conservation Plan for Four Invertebrate Species, November 4, 2004; Personal communication with Brian Lang, Endangered Invertebrates Biologist, New Mexico Department of Game and Fish, November 11, 2004 and November 22, 2004; Personal communication with Dan Rubin, Representative, Interstate Stream Commission, December 1, 2004.

landowners.<sup>28</sup> Costs related to developing the State Recovery and Conservation Plan are examined in Section 4.<sup>29</sup>

### **The Nature Conservancy Management (Units 3 and 4)**<sup>30</sup>

78. Units 3 and 4 are within Diamond Y Springs Preserve and Sandia Springs Preserve, which are both owned and managed by The Nature Conservancy. These preserves are managed for long term habitat conservation and protection of the functional integrity of surface water systems to benefit rare aquatic species and communities within the preserves. Projects occurring on Diamond Y Springs and Sandia Springs include ongoing salt cedar and mesquite eradication, habitat enhancement projects, the building of fire breaks, biological inventory and monitoring, and coordination efforts with oil and gas companies to reduce and prevent the likelihood of groundwater contamination within the springs.
79. The Nature Conservancy does not own the mineral rights at units 3 and 4. The companies that own or lease these rights have generally worked with The Nature Conservancy to protect these lands, but their rights to drill for minerals remain dominant over surface ownership rights.

### **3.2.2 Water Use Overview in Proposed CHD Regions**

80. Within southeastern New Mexico the shallow aquifer of the Roswell Artesian Basin, a source of water to the Pecos River, is the principal source of water for irrigation and municipal water supply. The basin is fully appropriated and has been closed to new appropriations since 1937.<sup>31</sup> In Chaves County, groundwater is the primary water source for irrigated agriculture and municipal use. Exhibit 3-4 presents water use data by category of use within Chaves County.

---

<sup>28</sup> New Mexico Department of Game and Fish, Draft Recovery and Conservation Plan for Four Invertebrate Species, November 4, 2004.

<sup>29</sup> Future costs associated with implementing the State Recovery and Conservation Plan will be incurred pending completion and approval by the state of New Mexico.

<sup>30</sup> Karges, J. 2003. Aquatic conservation and The Nature Conservancy in West Texas. Pp. 145-150 In Garrett, G. P. and N. L. Allan (eds.) Aquatic fauna of the Northern Chihuahuan Desert. Special Publication 46. The Museum of Texas Tech University; Personal communication with John Karges, Conservation Biologist, The Nature Conservancy, West Texas Office, December 3, 2004.

<sup>31</sup> Personal communication with Dan Rubin, Representative, Interstate Stream Commission, December 1, 2004.

Exhibit 3-4				
SUMMARY OF WATER USE IN CHAVES COUNTY (ACRE-FEET, 2000)				
Category	Surface Water Withdrawal	Groundwater Withdrawal	Total Withdrawals	% of Total Withdrawals
Public Water Supply	-	18,205	18,205	4.9%
Domestic (self-supplied)	-	1,040	1,040	0.3%
Irrigated Agriculture	24,162	313,305	337,467	91.3%
Livestock (self-supplied)	238	10,196	10,433	2.8%
Commercial (self-supplied)	-	1,596	1,596	0.4%
Industrial (self-supplied)	-	546	546	0.1%
Mining (self-supplied)	-	169	169	0.0%
Power (self-supplied)	-	-	-	0.0%
Reservoir Evaporation	-	-	-	0.0%
<b>TOTAL:</b>	24,400	345,056	369,456	100.0%
<b>Source:</b> New Mexico Water Use Data 2000 by County, accessed at <a href="http://www.seo.state.nm.us/water-info/water-use/county00/chaves.html">http://www.seo.state.nm.us/water-info/water-use/county00/chaves.html</a>				

81. Groundwater pumping has historically reduced inflows from the Roswell Artesian Basin. Due to a court ruling that requires New Mexico to ensure that more water reaches downstream riparian zones and other users in Texas to meet Pecos River Compact obligations, the New Mexico Interstate Stream Commission (ISC) is purchasing 18,000 acres and associated water rights of irrigated farmland around Roswell and Carlsbad. The ISC is retiring water rights in the Pecos Valley and plans to transfer water downstream to ensure water deliveries to Texas.<sup>32</sup> No hydrologic models currently exist to determine the impact of these plans on the springs at the Bitter Lake NWR.<sup>33</sup>
82. Bitter Lake NWR is located at the juncture between the Roswell Artesian Basin and the Pecos River. Groundwater levels and the nature and timing of flows within the Pecos River are important components for maintaining aquatic habitat within the Refuge. In 1996, Bitter Lake NWR gained legal assurance of sufficient water in its aquatic

<sup>32</sup> Personal communication with Dan Rubin, Representative, Interstate Stream Commission, December 1, 2004.

<sup>33</sup> A comment on the draft version of this analysis provided by the New Mexico Interstate Stream Commission states that a recent report prepared by the New Mexico Office of the State Engineer provides the most recent information regarding the hydrology of the Roswell Artesian Basin. The report concludes that, "an extended, extreme drought, and not groundwater depletion through human activity, would potentially threaten the future supply of water for the proposed critical habitat located within the BLNWR." (New Mexico Office of the State Engineer, Roswell Basin Guidelines for Review of Water Right Applications, Adopted February 9, 2005.) This information does not change the quantitative results presented in this analysis.

habitats. The Service has stated that this acquisition should ensure minimum surface water discharge of Bitter Creek.<sup>34</sup>

83. Within the Texas portion of the proposed CHD, groundwater is pumped predominantly to meet the needs for irrigated agriculture. Irrigated agriculture accounts for 92 percent of water use in Pecos County, and 96 percent of water use in Reeves County. Groundwater withdrawals for irrigated agriculture could potentially impact the hydrological conditions within Units 3 and 4. However, further hydrological studies are necessary to determine the impact of groundwater pumping on surface and groundwater levels at Diamond Y Spring and Sandia Springs Preserves. Exhibit 3-5 summarizes water use data within Pecos and Reeves Counties, Texas.

<b>Exhibit 3-5</b>				
<b>SUMMARY OF WATER USE IN PECOS AND REEVES COUNTIES, TEXAS (ACRE-FEET, SURFACE AND GROUNDWATER, 2002)</b>				
<b>Category</b>	<b>Pecos County</b>	<b>% of Total</b>	<b>Reeves County</b>	<b>% of Total</b>
Municipal	4,662	6.8%	1,034	1.6%
Manufacturing	2	0.0%	640	1.0%
Mining	163	0.2%	88	0.1%
Irrigation	62,505	91.6%	63,640	96.2%
Livestock	913	1.3%	751	1.1%
<b>Total</b>	<b>68,245</b>	<b>100.0%</b>	<b>66,153</b>	<b>100.0%</b>
<b>Source:</b>				
Texas Water Development Board, 2002 Water Use Survey Summary Estimates, accessed at <a href="http://www.twdb.state.tx.us/data/popwaterdemand/2003Projections/HistoricalWaterUse/2002WaterUse/HTML/2002County.htm">http://www.twdb.state.tx.us/data/popwaterdemand/2003Projections/HistoricalWaterUse/2002WaterUse/HTML/2002County.htm</a>				

### 3.2.3 Oil and Gas Development Activities

84. New Mexico ranks second in the U.S. for natural gas production and third in proven gas reserves of all producing U.S. states. The State also ranks fifth in crude oil production and fourth in proven oil reserves. In 2002, Chaves County ranked fifth in the state of New Mexico for both natural gas and oil production. That year Chaves County produced 748 thousand barrels of oil and 31.1 million cubic feet of natural gas.<sup>35</sup> There are currently over 2,600 oil and gas wells within Chaves County.<sup>36</sup>
85. Texas ranks first in the nation for both crude oil and natural gas production. In 2003 operations within Pecos County produced 9.3 million barrels of oil and 160 million cubic feet of natural gas. Reeves County produced over 740,000 barrels of oil and 31.8 million cubic feet of natural gas. A total of 6,728 oil and 1,425 natural gas wells

<sup>34</sup> U.S. Fish and Wildlife Service, *Endangered and Threatened Wildlife and Plants; Listing Roswell springsnail, Koster's tryonia, Pecos assiminea, and Noel's amphipod as Endangered With Critical Habitat*, Federal Register, Vol. 67, No. 29, February 12, 2002.

<sup>35</sup> New Mexico Energy, Minerals and Natural Resources Department, *New Mexico's Natural Resources 2002*, accessed at <http://www.emnrd.state.nm.us/Mining/resrpt/3Extract.pdf> on November 15, 2004.

<sup>36</sup> Go-Tech Data, accessed at <http://octane.nmt.edu/data/ongard/county.asp> on December 10, 2004.

currently exist within Pecos and Reeves Counties.<sup>37</sup> Exhibit 3-6 presents oil and natural gas statistics for the three counties.

<b>Exhibit 3-6</b>			
<b>SUMMARY OF OIL AND NATURAL GAS PRODUCTION IN COUNTIES CONTAINING PROPOSED CRITICAL HABITAT, 2004</b>			
	<b>Chaves County, NM</b>	<b>Pecos County, TX</b>	<b>Reeves County, TX</b>
<b>Oil Production (barrels)</b>	748,000	9,557,075	707,206
% State	1%	2.7%	0.2%
Number of Wells	783	5,594	1,124
<b>Natural Gas Production (thousand cubic feet)</b>	31,882,632	143,363,299	27,833,789
% State	2.0%	3.0%	0.6%
Number of Wells	1,507	1,139	304
<b>Source:</b> New Mexico Energy, Minerals and Natural Resource Department, New Mexico's Natural Resources 2003, accessed at <a href="http://www.emnrd.state.nm.us/Mining/resrpt/3Extract.pdf">http://www.emnrd.state.nm.us/Mining/resrpt/3Extract.pdf</a> ; Go-Tech Production Data, <a href="http://octane.nmt.edu/data/ongard">http://octane.nmt.edu/data/ongard</a> ; Railroad Commission of Texas, Oil & Gas Production Data Query, accessed at <a href="http://webapps.rrc.state.tx.us/PDQ/home.do">http://webapps.rrc.state.tx.us/PDQ/home.do</a> , <a href="http://www.rrc.state.tx.us/divisions/og/information-data/stats/ogowlct.pdf">http://www.rrc.state.tx.us/divisions/og/information-data/stats/ogowlct.pdf</a> , <a href="http://www.rrc.state.tx.us/divisions/og/information-data/stats/ogowlct.pdf">http://www.rrc.state.tx.us/divisions/og/information-data/stats/ogowlct.pdf</a> .			

### 3.2.4 Agriculture Activities

86. Livestock operations remain an important economic activity within Chaves County, New Mexico. Within Pecos and Reeves Counties, irrigated crop production is a large component of the regional economy. Exhibit 3-7 summarizes agricultural production and market value data for the three counties.
87. Chaves County ranks first in New Mexico for agricultural production, with over \$280 million in agricultural output generated in 2002. Livestock sales accounted for nearly 90 percent of the total value of agricultural output. The dairy industry, which proliferated during the 1990s, ranks as the top livestock commodity. Other top livestock commodities include beef cattle, sheep and angora goats.
88. Pecos County generated \$38.2 million in agricultural output in 2002, with crop production accounting for over 60 percent of sales. Reeves County produced \$18.6 million in agricultural output, with livestock sales accounting for 60 percent of total production.
89. Agricultural landowners within New Mexico and Texas typically own water rights along with their land. Irrigated agriculture within Chaves County accounted for 91 percent of groundwater withdrawals and 80 percent of all groundwater depletion in 2000.<sup>38</sup> In 2002, irrigated agriculture accounted for 92 percent of total water use in Pecos

<sup>37</sup> Railroad Commission of Texas, Oil & Gas Production Data Query, accessed at <http://webapps.rrc.state.tx.us/PDQ/home.do> on December 10, 2004.

<sup>38</sup> New Mexico Water Use Data 2000 by County, accessed at <http://www.seo.state.nm.us/water-info/water-use/county00/chaves.html>.

County and 96 percent in Reeves County.<sup>39</sup> Irrigated agricultural operators within all three counties engage in water conservation strategies, such as installing underground pipelines as opposed to relying upon open canals.<sup>40</sup>

<b>Exhibit 3-7</b>			
<b>AGRICULTURAL PROFILE OF COUNTIES SURROUNDING THE PROPOSED CHD</b>			
<b>Item</b>	<b>Chaves County, NM</b>	<b>Pecos County, TX</b>	<b>Reeves County, TX</b>
Number of farms	604	270	160
% 1997-2002	-12%	-16%	-20%
Land in farms (acres)	2,515,660	2,916,070	1,009,877
Average Size of farm (acres)	4,165	10,800	4,974
Market Value of Production	\$283,949,000	\$38,218,000	\$18,563,000
Crops	\$29,989,000	\$23,633,000	\$7,330,000
Livestock sales	\$253,960,000	\$14,585,000	\$11,233,000
Average per farm	\$470,115	\$141,547	\$111,824
State Rank	1	102	161
Top five livestock inventory items (number)	Cattle and calves 179,494	Sheep and lambs 64,672	Cattle and calves 16,120
	Sheep and lambs 36,930	Cattle and calves 34,685	Horses and ponies 400
	Horses and ponies 1,947	All goats 19,144	Layers 20 weeks and older 205
	Layers 20 weeks old and older 1,181	Horses and ponies 1,121	Deer (D)
	All Goats 1,090	Deer (D)	Goats 29
Top five crop items (acres)	Forage 37,237	Forage 7,320	Forage 4,805
	Corn for silage 16,754	All Cotton 5,740	All Cotton 2,111
	Pecans 3,903	Pecans (D)	Sorghum for silage 1457
	Sorghum for silage 2,560	All vegetables harvested 1,873	All wheat for grain 940
	All wheat for grain 2,169	All wheat for grain (D)	All vegetables harvested 719
<b>Notes:</b> (D) Cannot be disclosed.			
<b>Source:</b> USDA, NASS, 2002 Census of Agriculture County Profile, accessed at <a href="http://www.nass.usda.gov/census/census02/profiles/">http://www.nass.usda.gov/census/census02/profiles/</a> on December 1, 2004.			

<sup>39</sup> Texas Water Development Board, 2002 Water Use Survey Summary Estimates, accessed at

<http://www.twdb.state.tx.us/data/popwaterdemand/2003Projections/HistoricalWaterUse/2002WaterUse/HTML/2002County.htm>.

<sup>40</sup> Personal communication with Terry Whigman, Conservationist, Natural Resource Conservation Service, December 12, 2004.

### 3.2.5 Residential Development

90. Chaves County is projected to experience moderate growth over the next twenty years. The County is currently developing a comprehensive plan to guide development activities. According to the Planning and Zoning Department, the County has assessed groundwater capabilities and has determined that there is enough water within the shallow Artesian aquifer to support an additional 100,000 residents.<sup>41</sup> New subdivision and housing developments within the Chaves County area rely upon domestic wells for water supply. Domestic wells are typically required in areas where community water systems are not available, and are generally relied upon in suburban and semi-rural areas. Exhibit 3-8 and 3-9 provide population projections and housing construction data for Chaves County.

<b>Exhibit 3-8</b>		
<b>CHAVES COUNTY POPULATION PROJECTIONS: 2000-2025</b>		
	<b>Population</b>	<b>% Increase</b>
2000	61,453	-
2005	63,295	3.0%
2010	64,864	2.5%
2015	66,311	2.2%
2020	67,591	1.9%
2025	68,560	1.4%

**Source:** Bureau of Business and Economic Research (BBER), University of New Mexico, <http://www.unm.edu/~bber/demo/table1.htm>

<b>Exhibit 3-9</b>			
<b>CHAVES COUNTY HOUSING CONSTRUCTION: 1990-2002</b>			
	<b>Housing Units</b>	<b>% Change</b>	<b>Housing units authorized</b>
1990	23,386	-	n/a
2000	25,647	10%	30
2002	25,948	1%	29

**Source:** U.S. Census Bureau

91. Pecos County is projected to experience growth over the next twenty years. Municipal water demand for the city of Fort Stockton, located approximately eight to 12 miles south of Unit 3 (Diamond Y Springs), is projected to increase by 6.7 percent

<sup>41</sup> Personal communication with Grant Pinkerton, Director, Chaves County Planning and Zoning Department, December 9, 2004.

between 2000 and 2020 (from 2,892 acre-feet to 3,086 acre-feet).<sup>42</sup> Water demand after 2020 is anticipated to experience minimal growth, with total demand between 2000 and 2050 projected to increase by 7.5 percent. Currently municipal water is obtained from the Edwards-Trinity Aquifer, an aquifer separate from the aquifer supporting Unit 3. Reeves County experienced a 17 percent population decrease between 1990 and 2000 and expanding urban development is not anticipated in areas adjacent to Unit 4. Groundwater quality and depletion concerns within Units 3 and 4 are more directly related to oil and gas exploration activities and irrigated agricultural production than to municipal development.<sup>43</sup>

---

<sup>42</sup> Turnert Collie & Braden Inc, 2004 Middle Pecos Groundwater Conservation District Water Management Plan, prepared for Middle Pecos Groundwater Conservation District, Pecos County, Texas, June 2004.

<sup>43</sup> Personal communication with John Karges, Conservation Biologist, West Texas Program Office, December 3, 2004.

- 
92. This section considers the economic impacts of actions taken to protect the four invertebrates and their habitat. It quantifies the economic effects of the proposed critical habitat designation, as well as protective measures taken as a result of the species' proposed listing or other Federal, State, and local laws that aid habitat conservation in the areas proposed for designation. First, it provides a discussion of *pre-designation impacts*, as the impacts associated with species and habitat conservation efforts in place from the time of the proposed listing and designation of critical habitat to listing and final designation of critical habitat. Impacts associated with these management efforts may be on-going until the time of final designation. Second, this section provides estimates of *post-designation impacts*; potential future impacts associated with the critical habitat designation as proposed and other species and habitat conservation management efforts related to the four invertebrates.
93. This analysis focuses on quantifying impacts to activities most likely to be affected by the proposed critical habitat designation for the four invertebrates. These activities include:
- Oil and gas development within BLM's Bitter Lake Habitat Protection Zone in Chaves County, New Mexico;
  - Livestock operations within Chaves County, NM; and
  - Federal, State, and The Nature Conservancy management activities within Chaves County, NM and Pecos and Reeves Counties, TX.
94. This analysis also examines activities that have the potential to be impacted by the proposed designation. However, given uncertainties as to the scale of these impacts and future management directions, this analysis does not provide a quantitative estimate of these impacts. These activities include:
- Oil and gas development on private lands in New Mexico and Texas;
  - Irrigated agricultural production within New Mexico and Texas; and
  - Expanding urban development within Chaves County, NM.

95. The total pre-designation costs associated with four invertebrates conservation are estimated at approximately **\$336,000 to \$494,000** in present value terms (2002 through 2004, assuming a seven percent discount rate). Total post designation costs are approximately **\$3.8 million to \$7.5 million** in present value terms from 2005-2025 (assuming a discount rate of seven percent), or an annualized cost of \$352,000 to \$691,000. Note, all costs are presented in present value terms unless otherwise stated.
96. Approximately 91 percent of forecast costs are related to activities occurring within and adjacent to Units 1 and 2 in Chaves County. The remaining nine percent of estimated costs are related to activities occurring within and adjacent to Units 3 and 4 in Pecos and Reeves Counties.
97. Of all the activities that may be affected by the proposed designation, oil and gas drilling operations occurring within BLM's Bitter Lake Habitat Protection Zone are anticipated to generate 81 percent of total costs. Federal, State and The Nature Conservancy management activities are expected to generate 15 percent of total forecast costs. Private entities are anticipated to bear the majority of forecast costs (80 percent). BLM is anticipated to bear two percent of the total costs of four invertebrates conservation, the Service five percent, the State of New Mexico State four percent, and The Nature Conservancy, nine percent.
98. The impacts associated with potential future species and habitat management efforts are manifested in economic efficiency effects (i.e., social welfare) as outlined below.
- Administrative Costs: Costs associated with engaging in section 7 consultation, including time spent attending meetings, preparing letters and biological assessments, and in the case of formal consultations, the development of a Biological Opinion by the Service are quantified as administrative costs. Section 7 consultation can require substantial administrative effort on the part of all participants. These impacts are measured as the cost of labor required to fulfill these managerial duties. Estimates of per-effort costs associated with informal and formal consultations are presented in Exhibit 4-1. Costs of the biological assessment are typically borne by the Action agency. Unless otherwise stated, this table is used to develop total administrative costs for consultations associated with activities within the proposed CHD for the four invertebrates.
  - Project Modification Costs: Species and habitat management efforts that involve project consultation activity are likely to result in project modifications to comply with the goals of the management efforts. Costs of implementing these modifications are associated with changes in labor or material requirements that may occur at one point in time and/or be ongoing.

<b>Exhibit 4-1</b>				
<b>ESTIMATED ADMINISTRATIVE COSTS OF CONSULTATION AND TECHNICAL ASSISTANCE EFFORTS FOR THE FOUR INVERTEBRATES (PER EFFORT)<sup>a</sup></b>				
<b>Consultation Type</b>	<b>Service</b>	<b>Action Agency</b>	<b>Third Party</b>	<b>Biological Assessment</b>
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
Programmatic Consultation	\$11,500 - \$16,100	\$9,200 - \$13,800	N/A	\$5,600

<sup>a</sup> 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, a review of consultation records from several Service field offices across the country.

99. This analysis measures impacts of conservation measures associated with the four invertebrates pre-listing and designation of critical habitat. Section 4.1 discusses pre-designation impacts associated with species and habitat management efforts, including all management efforts that have occurred since the time of the proposed listing of the four invertebrates in February 2002, and are expected to continue to occur through the time period when critical habitat designation is anticipated to be finalized in August 2005. Section 4.2 discusses post-designation impacts forecast from 2005 through 2025.

100. Appendix A presents a screening level analysis of the potential effects of proposed critical habitat designation on small entities (i.e., small businesses, small organizations, and small government jurisdictions) to satisfy the requirements of the Regulatory Flexibility Act as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996.<sup>44</sup> Finally, pursuant to Executive Order No. 13211, Appendix A reports the potential impacts the proposed critical habitat designation is likely to have on the energy industry.

**4.1 Pre-Designation Impacts (2002-2005)**

101. Pre-designation impacts include all management efforts that have occurred since the time of listing. The four invertebrates have not been listed but were proposed for listing in February 2002. Since the proposed listing of the four invertebrates species, there have been specific conservation actions implemented that have taken into account the protection of the species.

102. Federal projects occurring on Bitter Lake NWR have factored in the location and proposed listing of the four invertebrates. Moreover, the Department and other State agencies have collaborated to create a draft Recovery and Conservation Plan for the invertebrate species. Past costs (subsequent to the proposed listing in 2002) have included the following activities:

<sup>44</sup> Regulatory Flexibility Act, 5 U.S.C. 601 et. seq.

- **Federal and State Lands Management.** As of 2002, Bitter Lake NWR has engaged in approximately six low effort informal IntraService Section 7 consultations on Refuge projects potentially impacting or benefiting the species.<sup>45</sup> These projects have included salt cedar control and eradication measures, controlled burns, water control structures, and habitat creation projects.<sup>46</sup> Many of these projects were implemented as a result of an emergency Section 7 consultation related to a Burned Area Rehabilitation Plan for the Sandhill Fire in 2000. For example, between 2000 and 2002, the Department conducted an extensive macroinvertebrate and aquatic habitat monitoring program within the Bitter Lake NWR.<sup>47</sup> At the time, the four invertebrates were candidate species for listing. Data and research collected during monitoring program will likely minimize the need for future species and habitat studies. This analysis therefore considers costs associated with these pre-listing monitoring efforts. The present value of administrative costs related past section 7 consultation and project costs associated monitoring invertebrate habitat are estimated at \$206,000 to \$238,000 (assuming a seven percent discount rate).<sup>48</sup>
- **State Recovery and Conservation Plan.** The Department initiated working on a State *Recovery and Conservation Plan for Four Invertebrates* in 2002. Currently, the State is reviewing the draft plan. Past costs related to developing the recovery plan have included monitoring the four invertebrates habitat, consultant fees, and staff time devoted to developing the plan. Past efforts are estimated to range from \$161,000 to \$255,000, in present value terms (assuming a discount rate of seven percent), and have been incurred by the Department and the New Mexico Interstate Stream Commission.<sup>49</sup>

103. Pre-designation costs incurred by Federal and State agencies related to conservation measures and recovery plan development for the four invertebrates are estimated to range from \$366,000 to \$494,000 in present value terms (assuming a discount rate of seven percent).

---

<sup>45</sup> Personal communication with Gordon Warrick, Wildlife Biologist, Bitter Lake National Wildlife Refuge, November 11, 2004.

<sup>46</sup> Many management actions within and adjacent to the proposed CHD (e.g., salt cedar control and eradication) will be directed towards multi-species recovery and protection. In each instance, this analysis attempts to identify costs specifically related to conservation of the four invertebrates. Where data are not available to accurately capture costs specific to four invertebrates conservation efforts, this analysis includes the full costs and notes the multiple considerations that may contribute to the undertaking of the particular management action.

<sup>47</sup> U.S. Fish and Wildlife Service, Bitter Lake National Wildlife Refuge, Sandhill Fire Burned Area Emergency Rehabilitation (BAER) Plan, March 24, 2000.

<sup>48</sup> Monitoring program cost data were obtained from the Sandhill Fire Burned Area Emergency Rehabilitation Plan, March 24, 2000.

<sup>49</sup> Personal communication with Jim Stuart, Endangered Species Recovery Plan Biologist, New Mexico Department of Game and Fish, November 11, 2004; Brian Lang, Endangered Invertebrates Biologist, New Mexico Department of Game and Fish, November 11, 2004; Dan Rubin, Representative, Interstate Stream Commission, December 1, 2004.

## **4.2 Post-Designation Impacts (2005-2025)**

104. This section forecasts costs that may occur after the designation is finalized in August 2005 through 2025. It discusses future management actions involving species and habitat protection, including a discussion of the types of economic impacts associated with each component of these management actions.

### **4.2.1 Oil and Gas Development**

105. The following sections examine potential economic impacts to oil and gas activities in both the New Mexico and Texas portions of the proposed CHD. First, this analysis quantifies the economic impact of conservation activities for the four invertebrates associated with oil and gas development located within the Bitter Lake groundwater resource area. Second, this analysis considers but does not quantify potential impacts to oil and gas development occurring on private lands within New Mexico and Texas.
106. Economic impacts to oil and gas development activities are estimated at 81 percent of the total post-designation impacts, or \$2.7 million to \$6.1 million from 2005-2025 (an annualized cost of \$246,000 to \$561,000). These costs are associated with drilling modifications in complying with BLM Bitter Lake Habitat Protection Zone stipulations to prevent groundwater contamination within the aquifer on which the four invertebrates depend in Units 1 and 2. A maximum of 63 wells within the Bitter Lake Habitat Protection Zone will be required to comply with additional drilling modifications. While these project modifications may increase drilling costs by up to 20 percent per well, the total number of impacted wells represents under about percent of the total Federal, state, and private natural gas wells in Chaves County and under 0.2 percent of total producing natural gas wells within the State of New Mexico. Thus, overall impacts to the regional oil and gas economy are likely to be small.

### **Units 1 and 2**

107. As a direct result of a 1997 section 7 consultation with the Service regarding the endangered Pecos gambusia, BLM created the Bitter Lake Habitat Protection Zone (HPZ) plan to manage activities on 12,585 acres of Federal mineral estate within the water resource area for the Bitter Lake Refuge. As a result, mineral lease owners who apply for permits to drill for natural gas in the HPZ are required to apply appropriate protective measures and design features to ensure aquifer protection. BLM developed and implemented the HPZ plan for the Pecos gambusia prior to the proposed listing and designation of the invertebrate species. However, as similar groundwater protection measures for oil and gas drilling activities would be required for the four invertebrates, this analysis considers the costs to operators in complying with HPZ stipulations.<sup>50</sup>

---

<sup>50</sup> Personal communication with Dan Baggao, Wildlife Biologist, Bureau of Land Management, Roswell Field Office, December 14, 2004.

108. There are currently 17 oil and gas leases within the HPZ that are operated by seven companies. A total of 20 natural gas wells currently exist on these leases. BLM has estimated a maximum potential development of 66 additional wells within the HPZ according to well spacing requirements established by the New Mexico Oil Conservation Division.<sup>51</sup> BLM anticipates that it could receive a maximum of three applications to drill (APDs) for natural gas wells in the HPZ each year over the next ten to fifteen years.<sup>52</sup> This analysis assumes that this rate of three APDs per year will apply throughout the period of study, for a total of 63 APDs anticipated over twenty years.

#### Impacts to Oil and Gas Operators on Federal Lands

109. To comply with groundwater protection permit requirements in the HPZ, operators will have to spend more time drilling, casing, cementing and developing facilities, depending on well-location and depth. Significant drilling modifications to ensure groundwater protection are stipulated in the Habitat Protection Zone (HPZ) plan as follows:<sup>53</sup>

- **Steel tanks for drilling in lieu of reserve pits.** To prevent potential contaminants from leaching into the groundwater, operators drilling in the HPZ are required to use above ground steel tanks in lieu of lined earthen reserve pits to store drilling muds. Steel tanks are required to be located within the perimeter of the well pad and drilling wastes are required to be removed from the Habitat Protection Zone, rather than remaining within the pits indefinitely.<sup>54</sup>

Additional expenses incurred by drilling operators in implementing this project modification are related to labor, materials, equipment, transporting costs, and time delays. For example, the process may delay drilling completion by half a day and transporting and disposing wastes can be costly, depending on the distance to travel. Transporting costs may not be high within the HPZ as a landfill exists within the Roswell area.<sup>55</sup>

According to an industry estimate (Yates Petroleum Corporation), this project modification, including labor, equipment, materials, transporting costs, and time delay will cost \$75,000 to \$125,000 per well for a 5,000-foot well, the anticipated depth of a natural gas well in the HPZ.<sup>56</sup> A National Parks Service petroleum

---

<sup>51</sup> U.S. Bureau of Land Management, Roswell Field Office, Habitat Protection Zone Environmental Assessment, EA-NM-060-00-030, October 2002.

<sup>52</sup> Personal communication with Dan Baggao, Wildlife Biologist, Bureau of Land Management, Roswell Field Office, December 14, 2004.

<sup>53</sup> U.S. Bureau of Land Management, Roswell Field Office, Habitat Protection Zone Environmental Assessment, EA-NM-060-00-030, October 2002.

<sup>54</sup> According to industry sources, closed-loop systems with offsite disposal of wastes to protect wetlands are becoming a typical environmental precaution mandated by southwestern State and Federal landowners.

<sup>55</sup> Personal communication with Bruce Stubbs, Pecos Petroleum Engineer, December 10, 2004.

<sup>56</sup> Letter from Drilling Engineering Manager, Yates Petroleum Corporation, to Field Manager, Bureau of Land Management, Roswell Field Office, July 18, 2001.

engineer confirmed this as a reasonable high-end estimate for this project modification, but indicated that closed-loop systems may cost less than this and can potentially result in cost savings.<sup>57</sup> Another regional petroleum engineer indicates that these modifications can add additional expenses of \$50,000 per well.<sup>58</sup> This analysis estimates the cost of this project modification to range from \$50,000 to \$125,000 per well.

Assuming that a maximum of three wells are drilled in, or require access through, the Habitat Protection Zone every year, this drilling project modification may result in an economic cost ranging from \$1.7 to \$4.3 million, in present value terms, for the drilling of 63 natural gas wells over 21 years.<sup>59</sup>

- **Well Casing modifications.** The HPZ stipulates that operators must drill a surface hole to a depth sufficient to protect the fresh water aquifers. Operators must set surface casing at this depth, cement in place, and cement must circulate the casing to the surface of the well. Currently, natural gas wells include the cement layer only on the bottom and top portions of the well, with the middle section below the aquifers cased only in steel. BLM has stated that there is a potential in this instance for steel to corrode and cause the well to fail, which would create a risk of groundwater contamination.<sup>60</sup>

Casing modifications may result in additional expenses related to labor, materials, and equipment. Costs are estimated to range from \$20,000 to \$40,000 per well to comply with casing requirements.<sup>61</sup> At a maximum drilling of 63 natural gas wells over 21 years, \$696,000 to \$1.4 million in costs, in present value terms, may be incurred in compliance with this HPZ stipulation.

- **Protection measures and design features for proposed rights-of-ways actions.** There are currently 11 rights-of-way (ROW) authorizations for pipelines on public lands within the HPZ. According to BLM, ROWs for oil and gas operations on existing leases will continue to be approved but will be subject to standard or special stipulations, or both. Based on one industry estimate (Yates Petroleum), special requirements for pipeline access may incur costs of up to \$4,400 per right-of-way.<sup>62</sup> This analysis assumes that the estimated 63 well drilling operations over 21 years

---

<sup>57</sup> Personal communication with Pat O'Dell, Petroleum Engineer, National Parks Service, December 9, 2004.

<sup>58</sup> Personal communication with Bruce Stubbs, Pecos Petroleum Engineer, December 10, 2004.

<sup>59</sup> BLM and petroleum engineers note that operators often develop more than one well at time and that cost savings can be achieved via economies of scale. Moreover, closed-loop systems are associated with potential cost savings to the operator. For example, closed-loop systems can: (1) reduce the footprint of a drilling operation; (2) eliminate the expense of creating an earthen pit; and (3) reduce drilling mud costs. Given uncertainties about potential cost savings and specific operating structures for leaseholders, this analysis assumes that operators will incur the upper-bound estimated cost of this project modification.

<sup>60</sup> Personal communication with Dan Baggao, Wildlife Biologist, Bureau of Land Management, Roswell Field Office, December 14, 2004.

<sup>61</sup> Personal communication with Bruce Stubbs, Pecos Petroleum Engineer, December 15, 2004.

<sup>62</sup> Information provided by BLM regarding pipeline access for Karen Federal #2, #3, & #4.

will require 63 ROWs for pipeline access. An estimated \$153,000 in costs, in present value terms, related to pipeline ROWs may be incurred over 21 years.

110. Petroleum engineers note that testing and monitoring may require operators to shut down well production periodically but that this is not likely to result in a large impact to operations. The main concern, in terms of economic impacts, is the additional drilling modifications that can increase drilling costs by 10 to 20 percent per well.<sup>63</sup> These modifications can potentially increase capital costs or administrative burden up to the point where an operator may decide not to drill a well. A total of three APDs within the HPZ have been appealed or are undergoing the appeal process due to the additional drilling requirements. In one case, an operator has decided not to pursue drilling.<sup>64</sup> 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. Detailed data required to estimate such impacts for wells potentially impacted by four invertebrate conservation measures are not available.
111. The present value of total impacts to oil and gas operators in complying with Habitat Protection Zone plan groundwater protection stipulations are forecast to range from \$2.6 to \$5.9 million over 21 years (assuming a seven percent discount rate).

#### Impacts to BLM

112. BLM is likely to face increased administrative costs in reviewing APDs and monitoring drilling operations within the HPZ to ensure compliance with HPZ plan stipulations. Moreover, as a result of the 1997 consultation on the Pecos gambusia, the BLM removed 11 unleased parcels of Federal minerals from the HPZ. The following costs are anticipated to be incurred by BLM related to implementing the HPZ plan:
- **Application to Drill (APD) Review.** Reviewing APDs for activities within the Bitter Lake HPZ is likely to require additional BLM staff effort. BLM estimates cumulative staff efforts for reviewing APDs and preparing an Environmental Assessment at approximately \$1,250 to \$1,750 per APD, or \$3,750 to \$5,250 per year for reviewing three APDs.<sup>65</sup> Thus a total of \$43,000 to \$61,000 in administrative expenses, in present value terms, may be incurred by BLM to review APDs within the HPZ from 2005-2025.

There are three APDs that are currently undergoing an appeal process by operators due to additional drilling requirements under the HPZ. BLM has noted that regulatory burden dramatically increases when APD environmental assessments are appealed by operators and that the appeal process can stretch over several months. Considering three APDs within the HPZ represent only five percent of total APDs

---

<sup>63</sup> Personal communication with Bruce Stubbs, Pecos Petroleum Engineer, December 15, 2004 and Jim Krogman, Yates Petroleum, December 21, 2004.

<sup>64</sup> Personal communication with Dan Baggao, Wildlife Biologist, Bureau of Land Management, Roswell Field Office, December 14, 2004.

<sup>65</sup> One BLM work month is estimated at \$5,000 to \$7,000.

reviewed by BLM on an annual basis, the appealing process can create significant administrative burden.<sup>66</sup> BLM also anticipates that the appeal process will likely delay proposed drilling operations. Thus the anticipated 63 APDs and assumed 63 natural gas wells sunk within the HPZ represents an upper-bound estimate of potential well drilling activity. Additional staff time required to review appealed Environmental Assessments for APDs is unknown but will likely be a strain on BLM's resources.<sup>67</sup>

- **Section 7 Consultation.** BLM has indicated that section 7 consultation with the Service has been conducted programmatically in recent years, thereby reducing the actual number of consultations. However, given the proposed CHD for the four invertebrates, BLM may consult with the Service on potential impacts to the species of drilling operations within the HPZ.<sup>68</sup> This analysis assumes that BLM will consult informally with the Service once per year to ensure that drilling operations and pipelines access within the HPZ ensure adequate groundwater protection to address four invertebrates concerns. Thus a total of 21 informal consultations are anticipated over from 2005-2025, with potential administrative costs to BLM and the Service of \$27,000 to \$81,000 in present value terms.
- **Monitoring Program.** BLM's HPZ plan specifies that all new wells be accompanied by a monitoring program designed to ensure well integrity. For example, a BLM petroleum engineer technician must monitor the actual circulation of cement around steel casing. Periodic monitoring of operations is also required to detect oil and gas surface and subsurface contamination. BLM estimates efforts by personnel to ensure well integrity at one to five days per well.<sup>69</sup> Thus monitoring efforts for three wells per year could incur costs ranging from \$700 to \$3,500 per year. The total cost, in present value terms, is estimated to range from \$8,000 to \$41,000 to monitor a maximum of 63 wells over 21 years.
- **Removal of Unleased Federal Parcels.** As a direct result of the 1997 section 7 consultation on the Pecos gambusia, BLM has closed 11 unleased parcels, totaling 1,520 acres of Federal mineral estate within the HPZ in order to reduce the threat of

---

<sup>66</sup> A comment submitted on the draft version of this analysis stated that it is inappropriate to include the costs of delays in proposed drilling operations associated with industry appeals because the industry is appealing compliance with environmental protections and therefore burdening themselves (letter from Forest Guardians to U.S. Fish and Wildlife Service, June 3, 2005). Industry appeals regarding drilling applications, however, are a result of the implementation of environmental regulations, including the Act, that recommend additional species and habitat conservation efforts be undertaken with the drilling activity. The economic impacts of delays triggered by appeals concerning these protections are therefore considered relevant in understanding the impact of conservation efforts for the four invertebrate species.

<sup>67</sup> Personal communication with Dan Baggao, Wildlife Biologist, Bureau of Land Management, Roswell Field Office, December 14, 2004.

<sup>68</sup> Ibid.

<sup>69</sup> Estimated workday is derived from an assumed BLM work-month of \$7,000.

groundwater contamination. The unleased Federal minerals amount to 12 percent (1,520 acres) of the total Federal minerals (12,618 acres) within the HPZ.<sup>70</sup>

Removing these parcels from potential development prevents a maximum of nine wells, based on New Mexico regulations requiring at least 160 acres per gas well. The closure of these unleased parcels is likely to result in lost production opportunities, royalties, and job opportunities. However, given the small acreage proposed, impacts would likely be small relative to the total production in the county.

Wells on Federal leases in Chaves County have historically produced millions of dollars of oil and natural gas revenues. In 1999, approximately \$3.7 million in Federal royalties were generated from oil and gas production within the County.<sup>71</sup> Currently, there are approximately 1,230 wells on Federal lands produced oil or gas in Chaves County.<sup>72</sup> BLM has also stated that the 11 parcels removed from the lease market represent under one percent of the total 5,381,274 acres available for lease in the BLM Roswell Resource Area that are believed to have a high hydrocarbon potential.<sup>73</sup> Thus, reducing the total development opportunity in the region by nine wells will likely have a small economic effect over twenty years.

113. Total administrative impacts, in present value terms, to BLM and the Service on oil and gas activities within Bitter Lake HPZ are estimated to range from \$78,000 to \$183,000 over 21 years.

#### Impacts to State and Private Oil and Gas Development<sup>74</sup>

114. Oil and gas drilling activities occur on private and State lands within the Roswell area. There are currently 832 oil and gas wells on State lands and 603 wells on private lands within Chaves County.<sup>75</sup> In the areas surrounding Bitter Lake NWR, there are at least 190 oil wells that are potential sources of contamination. The New Mexico Oil Conservation Division (Division), as part of the New Mexico Energy, Minerals and Natural Resources Department, is the agency responsible for permitting new wells, issuing discharge permits, and monitoring wells. The Division develops and enforces regulations in the oil and gas industry for the protection of fresh waters, public health and the environment. It is possible that the proposed designation for the four invertebrates could increase state regulatory scrutiny over proposed drilling operations. In such a case, operators may be required to implement drilling operations in a manner to ensure well

---

<sup>70</sup> U.S. Bureau of Land Management, Roswell Field Office, Habitat Protection Zone Environmental Assessment, EA-NM-060-00-030, October 2002.

<sup>71</sup> Minerals Management Service, Federal Mineral Revenue Disbursements to States, Identified by County of Origin, accessed at <http://www.mrm.mms.gov/Stats/pdfdocs/cty99.pdf>.

<sup>72</sup> Go-Tech Data, accessed at <http://octane.nmt.edu/data/ongard/county.asp> on December 10, 2004.

<sup>73</sup> BLM, Roswell Approved Resource Management Plan and Record of Decision, October 1997.

<sup>74</sup> Personal communication with New Mexico Oil Conservation District, December 8, 2004.

<sup>75</sup> Go-Tech Data, accessed at <http://octane.nmt.edu/data/ongard/county.asp> on December 10, 2004.

integrity and prevent groundwater contamination.<sup>76</sup> However, currently no additional State protective measures to ensure protection to aquatic species are anticipated.<sup>77</sup>

115. Oil and gas development activities in areas near Units 1 and 2 of the proposed CHD may result in take of the four species after it is listed. In those cases, developers of oil and gas wells may choose to apply for an incidental take permit and Habitat Conservation Plan (HCP) under section 10 of the Endangered Species Act and appropriately mitigate impacts to surface and groundwater resources. For authorized take, an HCP would need to be completed and an incidental take permit issued prior to the impact occurring. The potential for this occurrence is unknown.

### **Units 3 & 4**<sup>78</sup>

116. Units 3 and 4 are located entirely on lands owned and managed by The Nature Conservancy as preserves. However, oil and gas extraction-related activities occurring on private lands outside of Diamond Y Spring may impact surface and groundwater resources. Currently there are no oil and gas activities occurring adjacent to Unit 4 at East Sandia Spring.
117. Diamond Y Spring Preserve is located within the Gomez Field, an actively producing oil and gas field. According to a 1991 report, there were 45 active and plugged oil and gas wells within the Diamond Y Spring Preserve, and 800 to 1,000 wells located within the aquifer throughout the spring basin.<sup>79</sup> While the oil and gas industry does not pose a threat to groundwater levels at Diamond Y, operations may potentially impact surface and groundwater quality within the springs.<sup>80</sup>
118. In addition to hosting Pecos assiminea, Diamond Y Preserve is home to a variety of threatened and endangered species, including the Leon Springs pupfish, the Pecos gambusia, and the Pecos sunflower and rare plants. Diamond Y has also been designated as critical habitat for the Leon Springs pupfish.<sup>81</sup> Oil and gas developers have voluntarily implemented safeguards to protect surface waters within the preserve from the potential of contamination. Measures in the past have included:

---

<sup>76</sup> Personal communication with Wayne Price, Environmental Bureau, New Mexico Oil Conservation Division, December 8, 2004.

<sup>77</sup> Personal communication with Dan Rubin, Interstate Stream Commission, February 24, 2005.

<sup>78</sup> Information for this section was obtained from personal communication with John Karges, Conservation Biologist, The Nature Conservancy, West Texas Office, December 3, 2004.

<sup>79</sup> Veni, G., and Associates. 1991. Delineation and preliminary hydrogeologic investigation of the Diamond Y Spring, Pecos County, Texas. Final Report to The Nature Conservancy, San Antonio, TX.

<sup>80</sup> Karges, J. 2003. Aquatic conservation and The Nature Conservancy in West Texas. Pp. 145-150 In Garrett, G. P. and N. L. Allan (eds.) Aquatic fauna of the Northern Chihuahuan Desert. Special Publication 46. The Museum of Texas Tech University.

<sup>81</sup> 45 FR 54678, August 15, 1980.

- Constructing a protective dike around the head pool of Diamond Y Spring to reduce the likelihood of potential spills from upslope facilities reaching the area;
- Decommissioning buried corrosible metal pipelines in areas adjacent to vulnerable aquatic habitats and replacing pipelines with synthetic surface lines that are more easily monitored and repaired if necessary;
- Installing emergency shut-off valves at both sides of any creek crossings; and
- Berming oil well pads at production sites to sufficiently contain any potential contaminant spill volume prior to detection.

119. A matching grant in the mid-1990s from an oil and gas company and the National Fish and Wildlife Foundation provided funds to remove abandoned well pad sites and raised access roads within Diamond Y which had previously impeded surface flow.

120. In 1992 there was a crude oil spill from a breached pipeline into Leon Creek upstream from Diamond Y Spring. To curb the flow of contaminants into Leon Creek, the responsible parties dug a trench network down slope of the spill to produce a barrier to migration of contaminants. According to the Railroad Commission of Texas, the agency responsible for permitting oil and gas activities within Texas, trench network maintenance efforts continue to occur at the site.<sup>82</sup>

121. In addition, a natural gas plant occurs within 1 kilometer of the Diamond Y Spring head pool. A plume of natural gas that exists at this plant has been fully delineated and operators have installed approximately 44 sentinel monitoring wells down gradient to prevent the migration of contaminants towards the preserve. According to the Railroad Commission of Texas Operator Cleanup Program, the migration has been controlled by the wells and the plume is currently stable and does not pose a threat to Diamond Y Springs.<sup>83</sup>

122. Past conservation costs have been tied to voluntary projects from energy companies and remediation measures tied to the Leon Creek oil spill. Information related to costs in implementing partnership projects is not available, although The Nature Conservancy and Railroad Commission personnel have indicated that spill remediation measures and the replacement of metal pipelines with synthetic lines have likely incurred significant expenses.<sup>84</sup>

---

<sup>82</sup> Personal communication with Bill Renfro, Senior Technical Coordinator, Operator Cleanup Program, Railroad Commission of Texas, December 13, 2004.

<sup>83</sup> Personal communication with Bill Renfro, Senior Technical Coordinator, Operator Cleanup Program, Railroad Commission of Texas, February 18, 2005.

<sup>84</sup> Personal communication with John Karges, Conservation Biologist, The Nature Conservancy, West Texas Office, December 3, 2004 and December 17, 2004; Bill Renfro, Senior Technical Coordinator, Operator Cleanup Program, Railroad Commission of Texas, December 13, 2004.

123. Future costs to oil and gas activities within Unit 3 are anticipated to be related to continued partnership projects between The Nature Conservancy and regional oil and gas companies. Moreover, in the case of another spill, remediation efforts will likely factor in habitat concerns for invertebrates and other aquatic species inhabiting the springs.
124. Subsurface drilling, or similar oil and gas development activities in areas near the Unit 3 element of the proposed CHD may result in take of the Pecos assimineia after it is listed. In those cases, developers of oil and gas wells may choose to apply for an incidental take permit and Habitat Conservation Plan (HCP) under section 10 of the Endangered Species Act and appropriately mitigate impacts to surface and groundwater resources within the springs. For authorized take, an HCP would need to be completed and an incidental take permit issued prior to the impact occurring. The potential for this occurrence is unknown.

#### **4.2.2 Agricultural Activities**

125. This analysis examines the potential economic impact of the proposed CHD for the four invertebrates on irrigated agriculture and livestock operations. In present value terms an estimated \$91,000 to \$257,000 in total potential costs to agricultural activities are anticipated to be related to four invertebrates protective measures over twenty years. Costs are anticipated to be incurred as a result of section 7 consultation on Concentrated Animal Feeding Operations (CAFOs) within Chaves County, New Mexico. Currently, impacts to groundwater withdrawals for irrigated agriculture within the regions surrounding the proposed designation are not anticipated. Within New Mexico, conservation management techniques are currently in place that will ensure minimum surface water discharge at Units 1 and 2. Within Texas, further hydrological studies are necessary to determine the impact of groundwater pumping on surface and groundwater levels at Units 3 and 4. Thus, impacts to irrigated agriculture on private lands may occur but are unlikely given present conditions.

#### **Groundwater Quality Impacts**

126. Groundwater contamination associated with agricultural activities occurring on private lands outside of the proposed critical habitat units may occur as a result of wastewater runoff from concentrated animal areas (i.e. dairies, feed lots, and chicken farms). Wastewater runoff may contribute to nitrate levels in surface and underground water sources on which the four invertebrates depend. The Service has noted that nitrate levels in the underground aquifer near Roswell are high.<sup>85</sup>
127. National Pollutant Discharge Elimination System (NPDES) permits are required by EPA in New Mexico and Texas for the discharge of wastewater from eligible CAFOs. EPA is currently proposing to reissue General NPDES permits for discharges from CAFOs in New Mexico. The NPDES permit proposal adds additional requirements to all

---

<sup>85</sup> U.S. Fish and Wildlife Service, *Endangered and Threatened Wildlife and Plants; Listing Roswell springsnail, Koster's tryonia, Pecos assimineia, and Noel's amphipod as Endangered With Critical Habitat*, Federal Register, Vol. 67, No. 29, February 12, 2002.

existing facilities meeting the definition of CAFO within New Mexico. Permitted facilities will be allowed to discharge to waters of the U.S. in the event of a chronic or catastrophic storm if facilities are properly designed, constructed, and operated to contain all process-generated wastewater and runoff from a 25-year/24-hour storm event. Facilities will be required to submit a notice of intent for coverage and determine whether their operations satisfy requirements as described in EPA's "Proposed National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from CAFOs in New Mexico, Oklahoma, and on Indian lands in New Mexico and Oklahoma".<sup>86</sup>

128. EPA Region 6 is currently consulting with the Service on the general permit to geographically designate areas of concern for endangered and threatened species and critical habitat. If a CAFO, or the point where authorized discharges reach waters of the U.S., is located within a designated area of concern, operations would be required to "meet conditions and measures to avoid or eliminate adverse effects to listed species or critical habitat that were caused by authorized discharges".<sup>87</sup>

129. According to the New Mexico Environmental Department of Surface Water Quality, there are currently 47 CAFOs within Chaves County related primarily to dairy and to a lesser extent beef cow operations.<sup>88</sup> The Surface Water Quality Bureau does not anticipate additional CAFO facilities within the region.<sup>89</sup> Under the proposed general permit, EPA may consult on the effect of CAFOs on the four invertebrate species and their habitat. Limited data exists on whether all regional CAFOs are operating within designated areas of concern. The analysis of impacts to CAFO facilities include:

- **Section 7 Consultation.** This analysis assumes that every CAFO facility within Chaves County will need to ensure that operational discharges avoid or eliminate impacts to the four invertebrates and their habitat. This will most likely be ensured associated with the facility's securing of a wastewater discharge permit through either through EPA or that State.<sup>90</sup> A total of \$91,000 to \$257,000 in administrative costs, in present value terms, is anticipated over 21 years.
- **Project Modifications.** Operators may implement additional protective measures to avoid or eliminate impacts to listed species or critical habitat. Currently, limited data are available to accurately capture potential costs to CAFO operators.

---

<sup>86</sup> U.S. Environmental Protection Agency, 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 (NMG010000 and OKG010000), accessed at <http://www.epa.gov/region6/6wq/npdes/genpermt/cafoguidance.pdf> on December 1, 2004.

<sup>87</sup> Ibid.

<sup>88</sup> Personal communication with Richard Powell, Environmental Scientist/Specialist, New Mexico Environmental Department Surface Water Quality Bureau, December 14, 2004.

<sup>89</sup> Ibid.

<sup>90</sup> The State of New Mexico is currently pursuing authorization for primacy for the NPDES permit program from EPA, New Mexico Environmental Department of Surface Water Quality, accessed at <http://www.nmenv.state.nm.us/swqb/NPDES>.

130. According to the Texas Commission on Environmental Quality (TCEQ), CAFO facilities do not occur in Pecos County or in Reeves County within 60 miles of the proposed critical habitat units 3 and 4. Moreover, according to the TCEQ, there are no facilities in Pecos or Reeves Counties that require wastewater discharge permits.<sup>91</sup> As such, this analysis does not anticipate impacts to CAFOs within Pecos and Reeves Counties.<sup>92</sup>

### **Groundwater Withdrawal Impacts**

131. Extensive groundwater pumping associated with irrigation for agricultural activities may impact the groundwater resource areas on which the four invertebrates depend within New Mexico and Texas. Currently, the state of New Mexico is in the process of retiring water rights of irrigated farmland adjacent to Units 1 and 2 to ensure water compact deliveries to Texas. Moreover, Federally reserved water rights within Bitter Lake NWR will likely ensure minimum surface water discharge at Units 1 and 2. Within Texas, further hydrological studies are necessary to determine the impact of groundwater pumping on surface and groundwater levels at Units 3 and 4. Thus, this analysis does not forecast impacts of the proposed CHD on irrigated agriculture activities.

#### Units 1 & 2 (Chaves County, New Mexico)

132. Currently, irrigated agriculture accounts over 90 percent of total groundwater withdrawals within Chaves County. Chaves County farmers generally own water rights along with their land. Due to the Pecos River Compact lawsuit settlement that places limits on the quantity of water that can be pumped from Pecos Valley wells to ensure adequate deliveries to Texas, agricultural operators within the Pecos Valley have modified irrigation practices to conserve water. For example, operators have installed individual use-meters to monitor and conserve water used for crops and have replaced open dirt canals with underground water pipelines.
133. As discussed in Section 3.2.2, the New Mexico Interstate Stream Commission (ISC) is currently purchasing water rights of irrigated farmland around the Roswell area to meet Pecos River Compact obligations. The ISC plans to retire water rights in the Pecos Valley and transfer water to well fields downstream to increase water deliveries to Texas. Federal water rights for the Bitter Lake NWR were secured in 1996. The Service has determined that Federally reserved water rights for Bitter Lake NWR will ensure minimum surface water discharge of Bitter Creek. The Service is currently in negotiations with the State of New Mexico to quantify these rights.<sup>93</sup>

---

<sup>91</sup> Texas Natural Resource Conservation Commission, "Wastewater Facilities" and "Wastewater Flow Databases," 2002, accessed at [http://www.texasep.org/html/cnty/county\\_main.html](http://www.texasep.org/html/cnty/county_main.html).

<sup>92</sup> Personal communication with Greg Larson, Texas Commission on Environmental Quality, Region 7, Midland office, December 8, 2004.

<sup>93</sup> Personal communication with Paul Tashjian, Hydrologist, U.S. Fish and Wildlife Service, November 9, 2004; Dan Rubin, Representative, Interstate Stream Commission, November 9, 2004.

134. Current conditions within Bitter Lake NWR are considered suitable for the spring habitats.<sup>94</sup> However, any reduction in current groundwater levels will likely impact the four invertebrates and their habitat. Thus, groundwater pumping to the extent that it causes a significant reduction in the quantity of water in areas occupied by the species could potentially result in taking of the species. Private landowners may choose to apply for an incidental take permit and may develop and implement Habitat Conservation Plans. Given the likelihood of adequate groundwater levels from Federally reserved water rights, potential impacts of the proposed CHD on groundwater withdrawals for irrigated agricultural purposes are not anticipated.

Units 3 & 4 (Pecos and Reeves Counties, Texas)

135. Within Diamond Y Springs and Sandia Springs, groundwater availability and spring discharge remain issues of concern. In Pecos and Reeves Counties, and in areas adjacent to the proposed units, irrigated crop production operations primarily obtain groundwater from aquifers separate from those on which the springs depend.<sup>95</sup> The Nature Conservancy has noted that groundwater depletion within other aquifers can potentially impact recharge within the springs, although currently the interactions between aquifers and zones are imperfectly defined for the region. Potential future measures to maintain spring discharge within the springs will require further hydrological studies to determine subterranean impacts of withdrawals from other aquifers. The Nature Conservancy has stated that additional research on the delineation of watersheds is crucial to the sustainable, long-term conservation of the springs.<sup>96</sup> If hydrological studies determine a link between the various aquifers, the Service may work with private landowners on a volunteer basis to assure that irrigation practices minimize groundwater impacts to the Pecos assiminea.
136. According to the Natural Resource Conservation Service, a number of agricultural operators within the two counties currently engage in water conservation practices, including the use of irrigation pipelines.<sup>97</sup> According to projected water demand trends in the 2004 Middle Pecos Water Management Plan, water needs for irrigation purposes are not anticipated to increase over the next fifty years.<sup>98</sup>
137. Current conditions within Diamond Y Spring and East Sandia Spring are considered suitable for the spring habitats to support Pecos assiminea. However,

---

<sup>94</sup> Personal communication with Paul Tashjian, Hydrologist, U.S. Fish and Wildlife Service, November 9, 2004.

<sup>95</sup> Personal communication with Terry Whigman, Conservationist, Natural Resource Conservation Service, December 12, 2004.

<sup>96</sup> Karges, J. 2003. Aquatic conservation and The Nature Conservancy in West Texas. Pp. 145-150 In Garrett, G. P. and N. L. Allan (eds.) Aquatic fauna of the Northern Chihuahuan Desert. Special Publication 46. The Museum of Texas Tech University; Personal communication with John Karges, Conservation Biologist, The Nature Conservancy, West Texas Office, December 3, 2004.

<sup>97</sup> Personal communication with Terry Whigham, Conservationist, Natural Resource Conservation Service, December 12, 2004.

<sup>98</sup> Turnert Collie & Braden Inc, 2004 Middle Pecos Groundwater Conservation District Water Management Plan, prepared for Middle Pecos Groundwater Conservation District, Pecos County, Texas, June 2004.

reduction in current groundwater levels could impact the species and its habitat. Thus, groundwater pumping to the extent that a significant reduction in the quantity of water in areas occupied by the species could potentially result in taking Pecos assiminea. Private landowners may choose to apply for an incidental take permit and may develop and implement Habitat Conservation Plans. Given uncertainties as to the potential impacts of irrigation-related groundwater withdrawals on surface and groundwater levels and recharge zones within Units 3 and 4, this analysis does not forecast future economic impacts to agricultural production activities.

### **4.2.3 Residential Development**

138. All proposed critical habitat areas for the four invertebrates are located on Federal lands and The Nature Conservancy lands managed as preserves. As such, no development activities may take place within the proposed boundaries of the CHD. However, groundwater contamination associated with expanding urban development within Chaves County may impact groundwater quality within the Roswell Basin source area. Moreover, within New Mexico, the aquifer supporting the invertebrates is also a source for municipal water in the region.

### **Groundwater Quality Impacts**

139. Expanding urban development includes the installation of subsurface septic tanks, which can be a source of groundwater contamination in Chaves County. Most subdivision developments in Chaves County require the installation of septic tanks, as developed areas are not connected to sewage systems.
140. Subdivision developers must apply for liquid waste permits from the New Mexico Department of Environment (NMED). NMED is currently revising its Liquid Waste (Septic Tank) Program to address aquifer and surface water segments that are vulnerable to contamination from septic tanks and other on-site systems. NMED is currently in the process of mapping areas of concern at the county level. These “Areas of Concern” include:
- “water-table aquifers with a vadose zone thickness of 100 foot or less containing no soil or rock formation that would act as a barrier to saturated or unsaturated wastewater flow; sites within one mile of a known ground-water plume of anthropogenic anoxic or nitrate contamination within an aquifer, provided that the site overlies the same aquifer; an aquifer overlain by fractured bedrock; an aquifer in karst terrain; or an alluvial aquifer that discharges to a gaining stream located within 200 feet of the proposed disposal-field or seepage-pit location.”<sup>99</sup>
141. Liquid waste permit applications for conventional septic systems on lots smaller than three-quarters of an acre within Area of Concerns will receive greater scrutiny in order to protect public health and prevent degradation of a body of water. Chaves County

---

<sup>99</sup> New Mexico Environment Department, Liquid Waste (Septic Tank) Program Guidance, accessed at <http://www.nmenv.state.nm.us/fod/LiquidWaste/guidance.html> on December 9, 2004.

Planning and Zoning ordinances, however, currently require that lands within the western side of Roswell be subdivided into no less than 5-acre parcels in order to minimize the number of septic tanks constructed and thereby minimize potential groundwater contamination related to public health concerns.<sup>100</sup>

142. While the potential for groundwater contamination from septic tanks remains a concern, it is unknown whether the state of New Mexico will require additional construction modifications to provide protection for the four invertebrates.<sup>101</sup> Therefore, potential impacts of the proposed designation on residential development activity are currently unknown.

### **Groundwater Withdrawal Impacts**

143. Within New Mexico, the Roswell aquifer supporting the invertebrates is also a source for municipal water in the region. Chaves County has assessed groundwater capabilities and has determined that there is enough water in the aquifer to support additional 100,000 residents.<sup>102</sup> As the Service has determined that Federally reserved water rights for Bitter Lake NWR will ensure minimum surface water discharge at Bitter Lake NWR, this analysis does not anticipate future impacts to municipal groundwater demands. Four invertebrate concerns within Bitter Lake NWR, as examined above, are more directly related to groundwater contamination from septic tanks.

144. Land use activities surrounding the proposed critical habitat areas in Pecos and Reeves Counties, Texas are predominantly related to oil and gas development and irrigated crop production. Regional groundwater pumping concerns are therefore more directly related to irrigated agriculture than to municipal water needs. Fort Stockton, the nearest town to Diamond Y Draw Complex (Unit 1) obtains municipal water from the Edward-Trinity aquifer, which is likely located in a separate aquifer from those that feed the springs.<sup>103</sup> As noted in Section 4.2.2, the interactions between numerous aquifers and recharge zones in the region are currently undefined in the region. There is a potential, however, that municipal water withdrawals may impact the hydrology at the springs. However, given that growth in municipal water demand within the region is projected to be minimal (See Section 3.2.4), this analysis does not anticipate impacts to urban development within Pecos and Reeves Counties.<sup>104</sup>

---

<sup>100</sup> Personal communication with Grant Pinkerton, Directory, Chaves County Planning and Zoning Department, December 9, 2004.

<sup>101</sup> Ibid.

<sup>102</sup> Ibid.

<sup>103</sup> Personal communication with Terry Whigman, Conservationist, Natural Resource Conservation Service, NRCS Conservationist, December 14, 2005.

<sup>104</sup> Personal communication with John Karges, Conservation Biologist, The Nature Conservancy, West Texas Office, December 3, 2004 and December 17, 2004; Terry Whigman, Conservationist, Natural Resource Conservation Service, NRCS Conservationist, December 14, 2005.

#### 4.2.4 Federal Lands Management

145. Many activities occurring within the vicinity of the proposed CHD within Bitter Lake NWR will be undertaken in the interest of the four invertebrates. Bitter Lake NWR activities include salt cedar control and eradication, controlled burns, fire management, habitat creation efforts for invertebrates, and water control projects. Costs are anticipated to be incurred related to the following activities:<sup>105</sup>

- **Dike rehabilitation.** Dike rehabilitation will create additional habitat for the invertebrates. Costs are budgeted at \$60,000 to implement this specific project.<sup>106</sup>
- **Salt cedar control and eradication.** Bitter Lake NWR efforts to control the re-invasion of salt cedar to increase water flows are likely to occur on an annual basis. Based on estimates provided within the Sandhill Fire Burned Area Emergency Rehabilitation Plan, salt cedar control and eradication measures within the two units are likely to incur costs of up to \$6,000 per year. The present value of these costs is estimated to be \$70,000.<sup>107</sup>
- **Monitoring efforts.** Future monitoring efforts are estimated to range from \$23,000 to \$32,000 in present value terms from 2005-2025.<sup>108</sup>
- **IntraService Consultation.** Bitter Lake NWR personnel will likely engage in low effort informal IntraService section 7 consultations on an annual basis to address impacts of activities on the four invertebrates. Potential project modifications are likely to be minimal, given the beneficial nature of Bitter Lake NWR projects and activities. The present value of costs associated with future consultations are anticipated to range from \$31,000 to \$116,000 over 21 years.

146. The present value of total costs anticipated to be incurred by Bitter Lake NWR in engaging in Section 7 consultation and implementing projects that will benefit the four invertebrates are forecast to range from \$182,000 to \$278,000 over 21 years.

---

<sup>105</sup> Many management actions within and adjacent to the proposed CHD (e.g., salt cedar control and eradication) will be directed towards multi-species recovery and protection. In each instance, this analysis attempts to identify costs specifically related to conservation of the four invertebrates. Where data are not available to accurately capture costs specific to four invertebrates conservation efforts, this analysis includes the full costs and notes the multiple considerations that may contribute to the undertaking of the particular management action.

<sup>106</sup> Personal communication with Gordon Warrick, Wildlife Biologist, Bitter Lake National Wildlife Refuge, November 11, 2004; Brian Lang, Endangered Invertebrates Biologist, New Mexico Department of Game and Fish, November 11, 2004.

<sup>107</sup> U.S. Fish and Wildlife Service, Bitter Lake National Wildlife Refuge, Sandhill Fire Burned Area Emergency Rehabilitation (BAER) Plan, March 24, 2000.

<sup>108</sup> Personal communication with Gordon Warrick, Wildlife Biologist, Bitter Lake National Wildlife Refuge, November 11, 2004 and Brian Lang, New Mexico Department of Game and Fish, December 20, 2004.

#### 4.2.5 The Nature Conservancy Lands Management<sup>109</sup>

147. The Nature Conservancy manages Diamond Y Springs Preserve and Sandia Springs for long term habitat conservation and protection of the functional integrity of surface water systems to benefit rare aquatic species and communities within the preserves. Projects occurring on Diamond Y Springs and Sandia Springs that benefit Pecos assimineia and its habitat include ongoing salt cedar and mesquite eradication to control the re-invasion of salt cedar via manual or prescribed fire methods, building of fire breaks, biological inventory and monitoring, habitat enhancement projects and coordination efforts with oil and gas companies to reduce and prevent the likelihood of groundwater contamination within the springs. These efforts have been undertaken to enhance and restore wetland and stream flows to benefit the Federally endangered Leon Springs pupfish, Pecos gambusia, and the threatened Pecos sunflower.<sup>110</sup> Future activities will likely also address the invertebrates and their habitat. For instance, The Nature Conservancy is proposing to manipulate bank sides of pools to create additional habitat for the Leon Springs pupfish. This project will likely be planned to minimize potential disturbance to Pecos assimineia.
148. The Nature Conservancy has also indicated the potential for creating a conservation plan to formally assess conservation elements and future management actions within Units 3 and 4. The proposed plan will likely include targeted management actions for the Pecos assimineia.
149. Limited data are available to estimate the costs of future management activities within Units 3 and 4. Based on estimated costs of past habitat enhancement projects, this analysis assumes that approximately \$61,000 could be incurred on an annual basis to benefit aquatic habitat at the springs for various threatened and endangered species, including the Pecos assimineia. The present value of the total costs are anticipated to be \$707,000.<sup>111</sup> The Nature Conservancy notes that funds for projects are derived from a variety of sources, including state grants and private donations.<sup>112</sup>
150. These costs are related to conservation efforts implemented by The Nature Conservancy to benefit the ecosystem of the springs and are consistent with the mission of the organization. Data are not available to accurately capture costs specific to Pecos assimineia conservation efforts as the relative level of consideration for this species among the multiple species considered is unclear. This analysis therefore captures the full costs and caveats that because these conservation efforts are undertaken for multiple

---

<sup>109</sup> Information obtained from personal communication with John Karges, Conservation Biologist, The Nature Conservancy, West Texas Office, December 3, 2004 and December 17, 2004.

<sup>110</sup> Ibid.

<sup>111</sup> In the past, mechanical, chemical, and prescribed burn salt cedar and invasive species control efforts have incurred costs of up to \$61,000 for a year of efforts within both Diamond Y Draw and Sandia Springs, Supplemental Environment Project Agreement between The Nature Conservancy and the Texas Commission on Environmental Quality, accessed at <http://www.tceq.state.tx.us/assets/public/legal/sep/natureconservancy.PDF>.

<sup>112</sup> Personal communication with John Karges, Conservation Biologist, The Nature Conservancy, West Texas Office, December 3, 2004 and December 17, 2004.

reasons, including the full costs likely overstates the costs related to Pecos assiminea conservation.

#### 4.2.5 State Recovery and Conservation Plan<sup>113</sup>

151. The Department of Game and Fish State Recovery and Conservation Plan for the Four Invertebrates is currently in the draft planning stage. As such, information on the complete costs of implementing potential conservation measures is not yet available. Potential costs of the strategy are expected to be undertaken by the Department and include, but are not limited to, the following:

- **Genetic Studies.** Conducting genetic studies for the invertebrates is estimated at \$27,000 annually over four years. The present value of total costs is estimated to be \$98,000.
- **Population Ecology Studies.** Costs associated with implementing these studies are budgeted at \$14,000 annually over four years. The present value of total costs is estimated to be \$51,000.
- **Monitoring and data entry.** The Department anticipates three months full time of data entry, estimated at \$15,000 to \$21,000.

152. Thus, a total of \$164,000 to \$170,000 in costs, in present value terms, are anticipated be incurred in developing and implementing the State Recovery and Conservation Plan. As noted, this estimate does not include all future potential projects but incorporates the best available information to date.

---

<sup>113</sup> Recovery and Conservation Plan cost information obtained from New Mexico Department of Game and Fish, November 10, 2004 and December 14, 2004.

## REFERENCES

5 U.S.C. § 601 *et seq.*

16 U.S.C. 1533.

16 U.S.C. §1533(b)(2).

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.

Pub Law No. 104-121.

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

U.S. 240-R-00-003. September 2000. Available at <http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/Guidelines.html>.

Balleau Groundwater, Inc. 1999. Source-water protection zones for Bitter Lake National Wildlife Refuge. A report prepared for the U.S. Fish and Wildlife Service. 42 pp.

Energy Information Administration. New Mexico Natural Gas Summary. Accessed at [http://tonto.eia.doe.gov/dnav/ng/ng\\_sum\\_lsum\\_dcu\\_SNM\\_a.htm](http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_SNM_a.htm)

Go-Tech Data. Accessed at <http://octane.nmt.edu/data/ongard/county.asp> on December 10, 2004.

Gramlich, Edward M. 2000. *A Guide to Benefit-Cost Analysis (2<sup>nd</sup> Ed.)*, Prospect Heights, Illinois: Waveland Press, Inc., 1990.

Karges, J. 2003. Aquatic conservation and The Nature Conservancy in West Texas. Pp. 145-150 In Garrett, G. P. and N. L. Allan (eds.) *Aquatic fauna of the Northern Chihuahuan Desert*. Special Publication 46. The Museum of Texas Tech University.

Letter from Drilling Engineering Manager, Yates Petroleum Corporation, to Field Manager, Bureau of Land Management, Roswell Field Office, July 18, 2001.

Minerals Management Service. Federal Mineral Revenue Disbursements to States, Identified by County of Origin. Accessed at <http://www.mrm.mms.gov/Stats/pdfdocs/cty99.pdf>

New Mexico Department of Game and Fish. 2004. Draft Recovery and Conservation Plan for Four Invertebrate Species. November 4.

New Mexico Department of Labor. Accessed at <http://www.dol.state.nm.us/wordtext/taled.xls>

New Mexico Energy, Minerals and Natural Resources Department. 2002. New Mexico's Natural Resources 2002. Accessed at <http://www.emnrd.state.nm.us/Mining/resrpt/3Extract.pdf> on November 15, 2004.

New Mexico Environment Department. Liquid Waste (Septic Tank) Program Guidance. Accessed at <http://www.nmenv.state.nm.us/fod/LiquidWaste/guidance.html> on December 9, 2004.

New Mexico Oil and Gas Association. Accessed at <http://www.nmoga.org/index2.html>.

Railroad Commission of Texas. Oil & Gas Production Data Query. Accessed at <http://webapps.rrc.state.tx.us/PDQ/home.do> on December 10, 2004.

Sandhill Fire Burned Area Emergency Rehabilitation (BAER) Plan. March 24, 2000

State of New Mexico. New Mexico Water Use Data 2000 by County. Accessed at <http://www.seo.state.nm.us/water-info/water-use/county00/chaves.html>

State of New Mexico, Energy, Minerals and Natural Resource Department. New Mexico's Natural Resources 2003. Accessed at <http://www.emnrd.state.nm.us/Mining/resrpt/3Extract.pdf>.

Supplemental Environment Project Agreement between The Nature Conservancy and the Texas Commission on Environmental Quality. Accessed at <http://www.tceq.state.tx.us/assets/public/legal/sep/natureconservancy.PDF>

Texas Natural Resource Conservation Commission. 2002. "Wastewater Facilities" and "Wastewater Flow Databases."

Texas State Data Center. Population Estimates and Projections. Accessed at <http://txsdc.utsa.edu/cgi-bin/prj2004totnum.cgi>.

Texas Water Development Board. 2002 Water Use Survey Summary Estimates. Accessed at <http://www.twdb.state.tx.us/data/popwaterdemand/2003Projections/HistoricalWaterUse/2002WaterUse/HTML/2002County.htm>

Texas Workforce Commission. Labor Market Information. Accessed at [http://www.tracer2.com/admin/uploadedPublications/1237\\_coveredemployment2003.xls](http://www.tracer2.com/admin/uploadedPublications/1237_coveredemployment2003.xls)

Turnert Collie & Braden Inc. 2004. Middle Pecos Groundwater Conservation District Water Management Plan, prepared for Middle Pecos Groundwater Conservation District, Pecos County, Texas, June.

University of New Mexico, Bureau of Business and Economic Research (BBER). Revised Population Projections for New Mexico and Counties. Accessed at <http://www.unm.edu/~bber/demo/table1.htm>.

U.S. Bureau of Economic Analysis. Unemployment data from U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov/data/>

U.S. Bureau of Land Management. 1997. *Roswell Approved Resource Management Plan and Record of Decision*. October, page ROD-1.

U.S. Bureau of Land Management, Roswell Field Office. 2002. Habitat Protection Zone Environmental Assessment, EA-NM-060-00-030, October.

U.S. Census Bureau. State & County QuickFacts. Accessed at <http://quickfacts.census.gov/qfd/>

U.S. Census Bureau. 2002 County Business Patterns. Accessed at <http://www.census.gov/epcd/cbp/view/cbpview.html>

U.S. Department of Agriculture, NASS. 2002. Census of Agriculture County Profile. Accessed at <http://www.nass.usda.gov/census/census02/profiles/> on December 1, 2004.

U.S. Environmental Protection Agency. 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 (NMG010000 and OKG010000). Accessed at <http://www.epa.gov/region6/6wq/npdes/genpermt/cafoguidance.pdf> on December 1, 2004.

U.S. Fish and Wildlife Service. “Endangered Species and Habitat Conservation Planning.” From: <http://endangered.fws.gov/hcp/>, as viewed on August 6, 2002.

U.S. Fish and Wildlife Service. 2002. *Endangered and Threatened Wildlife and Plants; Listing Roswell springsnail, Koster’s tryonia, Pecos assiminea, and Noel’s amphipod as Endangered With Critical Habitat*. Federal Register, Vol. 67, No. 29, February 12.

U.S. Fish and Wildlife Service, Bitter Lake National Wildlife Refuge. 2000. Sandhill Fire Burned Area Emergency Rehabilitation (BAER) Plan, March 24.

U.S. Office of Management and Budget. 2000. “Appendix 4: Guidelines to Standardize Measure of Costs and Benefits and the Format of Accounting Statements,” in *Report to Congress on the Costs and Benefits of Federal Regulations*, March 22.

U.S. Office of Management and Budget. 2001. Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance For Implementing E.O. 13211, M-01-27. July 13. Accessed at <http://www.whitehouse.gov/omb/memoranda/m01-27.html>.

U.S. Office of Management and Budget. 2003. “Circular A-4,” September 17, 2003. Available at <http://www.whitehouse.gov/omb/circulars/a004/a-4.pdf>.

U.S. Office of Management and Budget. 2003. “Draft 2003 Report to Congress on the Costs and Benefits of Federal Regulations; Notice,” 68 *Federal Register* 5492, February 3.

U.S. Office of Personnel Management. 2002. Federal Government General Schedule Rates.

U.S. Small Business Administration. SBA's Table of Small Business Size Standards based on NAICS 2002. Accessed at <http://www.sba.gov/size/sizetable2002.html>.

Veni, G., and Associates. 1991. Delineation and preliminary hydrogeologic investigation of the Diamond Y Spring, Pecos County, Texas. Final Report to The Nature Conservancy, San Antonio, TX.

**Personal communication with:**

Bill Renfro, Senior Technical Coordinator, Operator Cleanup Program, Railroad Commission of Texas, December 13, 2004 and February 18, 2005.

Brian Lang, Endangered Invertebrates Biologist, New Mexico Department of Game and Fish, November 11, 2004 and November 22, 2004.

Bruce Stubbs, Pecos Petroleum Engineer, December 10, 2004.

Dan Baggao, Wildlife Biologist, Bureau of Land Management, Roswell Field Office, November 17, 2004 and December 14, 2004.

Dan Rubin, Representative, Interstate Stream Commission, November 9, 2004, December 1, 2004, December 12, 2004 and February 24, 2005.

Gary Beatty, Liquid Waste Specialist, New Mexico Environmental Department, December 9, 2004.

Gordon Warrick, Wildlife Biologist, Bitter Lake National Wildlife Refuge, November 11, 2004.

Grant Pinkerton, Director, Chaves County Planning and Zoning Department, December 9, 2004.

Greg Larson, Texas Commission on Environmental Quality, Region 7, Midland office, December 8, 2004.

Howard Parmenter Bureau of Land Management, Roswell Field Office, November 17, 2004.

Jim Krogman, Yates Petroleum, December 21, 2004.

Jim Stuart, Endangered Species Recovery Plan Biologist, New Mexico Department of Game and Fish, November 11, 2004.

John Karges, Conservation Biologist, The Nature Conservancy, West Texas Office, December 3, 2004 and December 17, 2004.

New Mexico Department of Game and Fish, November 10, 2004 and December 14, 2004.

New Mexico Oil Conservation District, December 8, 2004.

Pat O'Dell, Petroleum Engineer, National Parks Service, December 9, 2004.

Paul Tashjian, Hydrologist, U.S. Fish and Wildlife Service, November 9, 2004.

Pecos Petroleum Engineer, December 15, 2004.

Richard Powell, Environmental Scientist/Specialist, New Mexico Environmental Department  
Surface Water Quality Bureau, December 14, 2004.

Terry Whigman, Conservationist, Natural Resource Conservation Service, NRCS  
Conservationist, December 12, 2004 and December 14, 2004.

Wayne Price, Environmental Bureau, New Mexico Oil Conservation Division, December 8,  
2004.

## APPENDIX A:

### ANALYSIS OF IMPACTS TO SMALL ENTITIES AND ENERGY MARKETS

1. This appendix considers the extent to which the analytic results presented in this analysis reflect impacts to small businesses or energy markets. The analysis of the effect of four invertebrates conservation efforts on small entities is conducted pursuant to the Regulatory Flexibility Act (RFA), as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) in 1996. The energy analysis is required by Executive Order No. 13211.

#### A.1 SBREFA Analysis

3. This section considers the extent to which the analytic results presented above reflect impacts to small businesses. The small business analysis presented in this section is based on information gathered from the Small Business Administration (SBA), U.S. Census Bureau, and U.S. Department of Agriculture and comparisons with the results of the economic analysis. The following summarizes the sources of potential future impacts on small businesses as a result of future conservation efforts for the four invertebrates.
4. Lands proposed for critical habitat designation include only Federal and The Nature Conservancy lands. The majority, 81 percent, of total forecast economic impacts is anticipated to be associated with oil and gas production. Specifically, these impacts are the result of modifications to oil and gas companies operating within the BLM Bitter Lake Habitat Protection Zone in Chaves County, New Mexico. These economic costs may translate into impacts to small oil and gas entities. While oil and gas production also occurs in Unit 3 of the proposed critical habitat in Pecos County, Texas, this analysis does not quantify any modification to those operations as a result of conservation efforts for the invertebrate species.
5. Of the remaining impacts forecast in this analysis costs, 15 percent will be borne by Federal agencies and The Nature Conservancy for implementing conservation efforts in their land management activities that benefit the four invertebrates. The remaining approximately four percent of forecast costs are associated with potential consultation on CAFOs within Chaves County, New Mexico.
6. Activities anticipated to occur within the next 20 years within or adjacent to the proposed critical habitat for the four invertebrates that potentially effect small businesses include:
  - Oil and gas production;
  - Irrigated agricultural production; and
  - Livestock operations.

7. The Small Business Administration size standards for various types of businesses likely to be affected, and the geographic region used in this small business analysis, for each of these industries, are provided in Exhibit A-1. As highlighted, all businesses related to oil and gas production, irrigated agricultural production, and livestock operations within Chaves County, New Mexico and Pecos and Reeves Counties, Texas are considered small. As a result, this analysis assumes that the all revenue and expenditures associated with these activities are related to or are incurred by small entities. Exhibit A-1 reports the total number of businesses in Chaves County, New Mexico and Pecos and Reeves Counties, Texas that may be associated with these expenditures, by NAICS (North American Industry Classification System) code. Information on small entities within the agriculture industry is gathered from the 2002 Census of Agriculture. Information on small entities within the oil and gas extractive industry is gathered from 2002 U.S. Census Bureau County Business Patterns.

<b>Exhibit A-1</b>			
<b>SMALL BUSINESS SIZE STANDARDS AND APPLICABLE GEOGRAPHIC REGION FOR SMALL BUSINESS IMPACTS ANALYSIS</b>			
<b>NAICS Code/Industry and Small Business Size Standards</b>	<b>Number of Business</b>		
	<b>Chaves County, NM</b>	<b>Pecos County, TX</b>	<b>Reeves County, TX</b>
Subsector 211 - Oil and Gas Extraction (500 Employees)	35	11	2
Subsector 111 - Crop Production (\$750,000)	374	105	118
Subsector 112 - Animal Production (including dairy cattle and milk production, sheep and goat farming) (\$750,000)	301	N/A	N/A
Source: Size standards based on SBA's Table of Small Business Size Standards based on NAICS 2002, <a href="http://www.sba.gov/size/sizetable2002.html">http://www.sba.gov/size/sizetable2002.html</a> . 2002 Census of Agriculture and 2002 County Business Patterns.			

The following discussion of small business impacts considers impacts that may result from restrictions on these activities for the benefit of the four invertebrates.

### **A.1.1 Oil and Gas Development**

8. Impacts to oil and gas companies resulting from conservation efforts for the four invertebrates have the potential to affect some small business operating adjacent to the proposed CHD in Units 1 and 2 in Chaves County, New Mexico. As discussed in Section 4.2.1, expected future impacts on the oil and gas industry include administrative costs, project modification costs, and delay impacts associated with complying with BLM stipulations in the Bitter Lake Habitat Protection Zone plan. BLM developed and implemented the plan for the Pecos gambusia prior to the proposed listing and designation of the four invertebrate species. However, as similar groundwater protection measures for oil and gas drilling activities would be required for the four invertebrates,

this analysis considers the costs to operators in complying with Habitat Protection Zone stipulations.

9. Estimated impacts to natural gas extraction related to project modifications and administrative efforts are likely to increase drilling costs by approximately 10 to 20 percent, or by as much as \$150,000 per natural gas well. An estimated 63 wells will require additional project modifications to ensure well integrity and prevent the opportunity for groundwater contamination. These modifications can potentially increase capital costs or administrative burden up to the point where an operator may decide not to drill a well. A total of three APDs within the HPZ have been appealed or are undergoing the appeal process due to the additional drilling requirements. In one case, an operator has decided not to pursue drilling.<sup>114</sup> Given the size of the companies operating within the Habitat Protection Zone and the large amount of available minerals within the Roswell area, it is likely that producers will be able to shift production to other locations. However, if oil and gas producers are unable to shift production elsewhere, up to seven companies could be impacted, based on the number of companies operating on leases within the Bitter Lake Habitat Protection Zone with the potential for additional well development.<sup>115</sup> 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. Detailed data required to estimate the potential for such impacts are not available.
10. Several of these companies with leases in the Bitter Lake Habitat Protection Zone are considered the top-producing operators of natural gas within New Mexico, according to New Mexico Oil and Gas Association.<sup>116</sup> Moreover, most of the oil and gas companies that operate within Chaves County are headquartered outside of the proposed critical habitat region and have operations in multiple locations. Therefore the relevant area for purposes of this small business analysis is at the state level. There are approximately 211 small businesses in the oil and gas extraction sector within the state of New Mexico that generated \$189.2 million in revenue in 2002.<sup>117</sup> Given the large number of oil and gas businesses within the New Mexico and that many regional oil and gas businesses also operate outside Chaves County, the number of potentially affected small businesses is a small percentage of all small oil and gas entities in New Mexico.
11. As described in Section 4.2.1 of this analysis, oil and gas drilling also occurs on private lands outside of Diamond Y Spring in Unit 3 of the proposed critical habitat. Unit 3 is comprised of lands managed as a preserve by The Nature Conservancy. While oil and gas activities in this area may present water quality issues, they are not considered

---

<sup>114</sup> Personal communication with Dan Baggao, Wildlife Biologist, Bureau of Land Management, Roswell Field Office, December 14, 2004.

<sup>115</sup> U.S. Bureau of Land Management, Roswell Field Office, Habitat Protection Zone Environmental Assessment, EA-NM-060-00-030, October 2002.

<sup>116</sup> New Mexico Oil and Gas Association accessed at <http://www.nmoga.org/index2.html>.

<sup>117</sup> US Census Bureau, 2002 County Business Patterns.

a threat to groundwater levels in the region.<sup>118</sup> This analysis does not forecast modifications to oil and gas production in Texas and therefore no impacts to small businesses are quantified.

### **A.1.2. Irrigated Agricultural Production**

12. Agricultural production dependent on groundwater irrigation occurs within Chaves County, New Mexico and Pecos and Reeves Counties, Texas. This analysis assumes that all farms operating within the regions in the three counties are small entities.
13. Extensive groundwater pumping associated with irrigated agricultural production may impact the groundwater resource areas on which the four invertebrates depend within New Mexico and Texas. The state of New Mexico is currently in process of retiring water rights of irrigated farmland adjacent to Units 1 and 2 to ensure water deliveries to Texas under the Pecos River Compact. Moreover, Federally reserved water rights within Bitter Lake NWR will likely ensure minimum surface water discharge at Units 1 and 2.<sup>119</sup> Within Texas, further hydrological studies are necessary to determine the impact of groundwater pumping on surface and groundwater levels at Units 3 and 4. As a result, groundwater withdrawal activities for agricultural production are unlikely to change as a result of the presence of the four invertebrates in the region. Thus, no impacts to small entities within the irrigated agricultural industry are expected.

### **A.1.3 Livestock Operators**

14. According to information provided by the NMED, Surface Water Quality Bureau, approximately 47 CAFO facilities exist within Chaves County. This analysis assumes that all CAFOs within Chaves County are small entities. This analysis assumes that every CAFO facility within Chaves County will need to ensure that operational discharges avoid or eliminate impacts to the four invertebrates and their habitat. This will most likely be ensured associated with the facility's securing of a wastewater discharge permit through either through EPA or the State as described in Section 4.2.2. In the event that CAFO operators are required to implement additional measures to ensure groundwater protection within the Roswell aquifer on which the four invertebrates depend, small entities within the livestock operations industry could potentially be impacted the proposed critical habitat rule.
15. According to the Texas Commission on Environmental Quality, CAFO facilities do not occur in Pecos County or in Reeves County within 60 miles of the proposed

---

<sup>118</sup> Karges, J. 2003. Aquatic conservation and The Nature Conservancy in West Texas. Pp. 145-150 In Garrett, G. P. and N.L. Allan (eds.) Aquatic fauna of the Northern Chihuahuan Desert. Special Publication 46. The Museum of Texas Tech University.

<sup>119</sup> U.S. Fish and Wildlife Service, *Endangered and Threatened Wildlife and Plants; Listing Roswell springsnail, Koster's tryonia, Pecos assiminea, and Noel's amphipod as Endangered With Critical Habitat*, Federal Register, Vol. 67, No. 29, February 12, 2002.

critical habitat units 3 and 4. As such, this analysis does not anticipate impacts to small entities within the livestock industry in Pecos and Reeves Counties, Texas.<sup>120</sup>

## **A.2 Potential Impacts to the Energy Industry**

16. 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.”<sup>121</sup> 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” when compared without the 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.<sup>122</sup>

17. Two of these criteria are relevant to this analysis: (1) reductions in natural gas production in excess of in excess of 25 million mcf per year and (2) increases in the cost of energy production in excess of one percent. This analysis determines that the oil and

---

<sup>120</sup> Personal communication with Greg Larson, Texas Commission on Environmental Quality, Region 7, Midland office, December 8, 2004.

<sup>121</sup> Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance For Implementing E.O. 13211, M-01-27, Office of Management and Budget, July 13, 2001, <http://www.whitehouse.gov/omb/memoranda/m01-27.html>.

<sup>122</sup> Memorandum For Heads of Executive Department Agencies, and Independent Regulatory Agencies, Guidance For Implementing E.O. 13211, M-01-27, Office of Management and Budget, July 13, 2001, <http://www.whitehouse.gov/omb/memoranda/m01-27.html>.

gas industry is not likely to experience “a significant adverse effect” as a result of conservation efforts for the four invertebrates.

18. The proposed CHD is not anticipated to impact natural gas production in excess of 25 million mcf per year. Additional modifications to drilling activities within the Bitter Lake Habitat Protection Zone are forecast to increase drilling costs by approximately 10 to 20 percent per well. An estimated 63 wells will require additional project modifications to ensure well integrity. As examined above, these modifications can potentially increase capital costs or administrative burden up to the point where an operator may decide not to drill a well. In 2002, there were 35,873 producing gas wells within New Mexico that produced a total of 1,655,906 million cubic feet of natural gas.<sup>123</sup> Thus, the potential yield of the 63 impacted wells within the Bitter Lake Habitat Protection Zone represents a small percentage of total State natural gas production.
19. While drilling modifications increase operating costs to producers within the Bitter Lake Habitat Protection Zone, the proposed rule is not anticipated to result in increases in the cost of energy production in excess of one percent within the state of New Mexico. As noted above, there are approximately 35,873 gas wells within New Mexico that produced a total of 1,655,906 million cubic feet of natural gas in 2002. Increased drilling costs for a maximum of 63 wells is therefore not likely to translate in a one percent increase in energy production costs across the state.
20. Impacts to ongoing oil and gas production in Pecos County, Texas are not forecast as it is unclear whether these activities will require conservation efforts for the invertebrate species. As described in Section 4.2.1, while oil and gas activities in this region may affect groundwater quality, they are not anticipated to affect groundwater levels.

---

<sup>123</sup> Energy Information Administration, New Mexico Natural Gas Summary accessed at [http://tonto.eia.doe.gov/dnav/ng/ng\\_sum\\_lsum\\_dcu\\_SNM\\_a.htm](http://tonto.eia.doe.gov/dnav/ng/ng_sum_lsum_dcu_SNM_a.htm).